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The effects of Internet guided practice with aural modeling on the sight-singing accuracy of elementary education majors

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THE EFFECTS OF INTERNET GUIDED PRACTICE WITH AURAL MODELING ON THE SIGHT-SINGING ACCURACY OF ELEMENTARY EDUCATION MAJORS

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ABSTRACT

The purpose of this study was to determine the effectiveness of aural modeling in guided practice through the Internet on the sight-singing improvement of elementary education majors. Students enrolled in a music methods course for elementary education majors (N=37) used software delivered via the Internet to practice sight-singing. The experimental web page included visual examples of sight-singing exercises as well as aural modeling of each of the exercises. The control web page included only visual examples. A *t test* for independent samples indicated no significant difference in the posttest scores of the two groups in rhythm ($p > .05$), pitch on solfege ($p > .05$), or pitch on text ($p > .05$) at the conclusion of the 15 weeks of study. However, both groups did improve significantly from pretest to posttest, indicating that the skill of sight-singing can be taught to elementary education majors using multimedia technology.

REVIEW OF LITERATURE

Sight-singing, which can be defined as the ability to sing a piece of music on seeing it for the first time (Randel, 1986), has been a fundamental part of music education in America since the 1700s. What began as a desire to be able to participate in the singing of music in church led to the development of singing schools and singing societies that focused on reading music and becoming exposed to the music of some of the great European composers. Lowell Mason, a music educator in the early 19th century, used this tradition of singing schools to raise popular support for adding music to the public school curriculum (Robertson, 2001). From this time, sight-singing has been a part of the music curriculum in the public schools. However, this is an acquired skill, and there are not always trained musicians available to teach these skills.

Elementary education majors all too frequently take on the role of music teacher in their classrooms, should the school in which they teach lack a music specialist. Even if these students teach at schools with music specialists, they are still a vital link between the children and that music specialist. Also, the classroom teacher is responsible for including students in musical activities outside of the limited time allotted for music instruction (Jones, 1989). As music educators, we want these future teachers to understand the importance of music and have a firm grasp of musical concepts so that they can successfully incorporate these into their classroom activities. It is equally important that we help them achieve a level of comfort and confidence with the material such that they will be willing to focus on music as an objective in their classroom.

Now that nine National Standards for Music Education have been established (Consortium of National Arts Education Association, 1994), it is important that we educate future teachers in these areas and help them feel comfortable teaching as many of them as possible. Elementary education majors have indicated that musical ability and positive feelings for music are main factors for contributing to success in teaching music (Kvet & Watkins, 1993). Specifically, Byo's (1999) study on classroom teacher's perceived ability to implement the national standards for music education indicated that the classroom teachers surveyed from the state of Florida felt the least comfortable incorporating the standards of improvisation, composition, playing instruments, and reading and notating music. Classroom teachers indicated a greater willingness to implement the standards of "understanding relationships between music and other subjects" as well as "understanding music in relation to history and culture" over the other seven standards. While the inclusion of music in the regular classroom can always be seen as positive for children's education, these two standards that classroom teachers feel the most comfortable incorporating are those that deal the least with the teaching of music fundamentals. For these reasons, we need to find ways to help these future teachers feel more comfortable with their knowledge of the fundamentals of music education.

The education of these future teachers takes several different formats across the country. Gauthier and McCrary (1999) conducted a nationwide study regarding the purpose, format, and content of music courses available to elementary education majors. With survey responses from over 300 universities, they determined that three types of courses were taught: fundamentals, methods, or a combination of the two. Responses indicated that the development of musical performance skills was deemed a course purpose by 77% of those teaching fundamentals courses, 86% of those teaching combined courses, and only 47% of those teaching methods courses. The development of an understanding of musical concepts was deemed a course purpose by over 97% of both fundamentals and combined course instructors and 81% of methods instructors. Furthermore, the goal of increasing positive attitudes toward singing music in the classroom was reported by 71% of the fundamentals instructors, 93% of the methods instructors, and 100% of the combined instructors. While it appears that singing and the understanding of musical concepts are stressed in the majority of courses, and the development of musical performance skills are stressed in the fundamentals and combined courses, the importance of developing positive attitudes towards singing in the classroom, which could lead to a greater inclination of teachers to include this as a regular part of their classroom activities, seems to be stressed more in the methods and combined courses.

Sight-Singing

While there are different formats of music courses for elementary education majors, it is imperative that as much material as possible be covered in the small amount of time allotted for music instruction. Sight-singing is one way to work on a number of skills simultaneously, including the use of a singing voice, melodic contour, intonation, and music reading and notation. When working on sight-singing, students have to focus on the notation of the music by determining what pitches are needed as well as how to accurately perform the rhythm of the piece. In addition, since it is improbable that it would be possible to teach each student to play each melody they encounter on instruments that they would both know how to play and have access to in the classroom, teaching them to sight-sing is a positive and useful way of teaching them to read and perform music.

We want teachers to be able to accurately sing a melody. One way to teach that in the classroom is through rote teaching, in which teachers and students engage in a call-echo learning strategy. While this can be effective, students cannot learn everything by rote. They must develop some independence. Learning a song “by note” can be a more effective strategy for developing independence. This strategy involves students learning a song by reading the music on the page, clapping out the rhythms, and singing the melody using solfege syllables (Anderson & Lawrence, 1998). Achieving this type of independence, though, requires prior knowledge. Hutton (1953) suggested that, "Before a student can understand such an abstract, complicated problem as that encountered in reading music, the teacher must build into the child's experience a framework of concepts that will relate each new problem to something already known" (p. 119). In addition, Hutton found that the lack of musical ability did not hinder students' ability to recognize familiar melodies. A method of teaching sight-singing such as that proposed by Choksy (1988) following the philosophy of Zoltan Kodaly supports the strategies of experience before labeling, providing a way to introduce musical concepts to students on a familiar level without compromising the success of those students that have less experience.

When teaching according to the Kodaly method, the first interval that is taught is the interval of a descending minor third (*sol-mi*) (Choksy, 1981; Choksy, 1988). This interval is familiar to students from such childhood songs as *Nanny-nanny boo boo* and *Rain, Rain Go Away*. From this familiar sound, each of the other scale degrees are added individually, first building a pentatonic scale, and eventually adding the full diatonic scale. This method, as suggested by Choksy for use with elementary children, incorporates the use of Curwen hand signs, as well, in order to provide students with the opportunity to physically experience the different solfege syllables.

In her study of the effects of various sight-singing strategies on the pitch accuracy of university nonmusic majors, Cassidy found that subjects using Curwen hand signs along with solfege, as well as students using solfege alone, completed a sight-singing task with significantly higher pitch accuracy than did subjects using staff letter names or the neutral syllable "la" (1993). While the use of Curwen hand signs may have contributed to the success of subjects in that group, the fact that subjects in the solfege alone group performed just as well leaves room for doubt that the use of Curwen hand signs actually led to improvement in pitch accuracy while sight-singing among these adult learners. However, they were also not seen as a hindrance (Cassidy, 1993).

Another important variable in sight-singing accuracy is the ability to match pitch. In order to lead songs in the classroom, teachers must be able to find a suitable starting pitch as well as maintain a tonal center throughout the song. McCoy (1997) studied the ability of 42 elementary education majors to find a starting pitch and then maintain a tonal center after that pitch had been sung. Subjects were asked to sing *Row, Row, Row Your Boat* first beginning on a self-selected pitch, followed by three additional times in keys demonstrated by tonic pitches or cadences played on the piano or autoharp. Results indicated that most subjects who experienced moderate to high success at pitch matching also maintained a consistent tonal center. Additionally, subjects who self-selected higher starting pitches generally scored higher in pitch accuracy. However, these subjects also demonstrated a preference for singing in lower keys, both through their self-selected starting pitches, and their tendency to modulate to a lower key rather than singing the higher pitches needed for the second phrase of the song ("Merrily, merrily") in the prescribed key. These results indicated that matching a starting pitch is important in maintaining a tonal center. However, the starting pitch must be in a key area that is comfortable for the singer to be able to perform the entire piece. One additional finding of this study was that aural information provided by chords tended to be more confusing than helpful.

In contrast, Boyle and Lucas (1990) found that the use of tonal harmonic accompaniment improved the sight-singing accuracy of college music theory students. In this study, undergraduate music majors sight-sang eight melodies, once with tonal accompaniment and once without any accompaniment. While subjects performed with significantly higher accuracy when singing with tonal accompaniment, the greatest difference in accuracy was found to occur at the lowest level of sight-singing accomplishment. The researchers suggested that tonal accompaniment be used as a sight-singing aid, particularly in the beginning stages of sight-singing instruction. However, caution must be used to keep the presence of tonal accompaniment from becoming a crutch.

In a later study, Lucas (1994) looked at the effects of the contextual condition on the sight-singing achievement of middle school choral students. Lucas found that subjects who sight-sang with melodic accompaniment were significantly more accurate than subjects who were accompanied by harmonies provided by either a piano or another voice. Vocal harmonies were provided by having the subject sing either the upper or lower voice of a two–part vocal exercise while the other voice was performed as accompaniment. Piano harmonies were provided by playing full chords as accompaniment to the sight-singing exercise. The fact that subjects performed significantly better with the melody-only accompaniment further expands on Boyle and Lucas' findings (1990). While Lucas' subjects (1994) performed more accurately when accompanied by a harmonic context, specifically one provided by a piano as opposed to a voice, subjects were even more accurate when accompanied by a melody line. Lucas suggests that this could be due to the age and inexperience of the subjects. Their lack of musical experience may make it more difficult for them to extract the useful knowledge provided through the harmonic accompaniments.

Instructional context has also been seen as a factor in sight-singing improvement. Due to time constraints, it is not feasible to provide individual sight-singing instruction in the music course for elementary education majors. Therefore, sight-singing is typically practiced in class as a group. However, group sight-singing achievement may not provide an accurate description of individual sight-singing achievement. Henry and Demorest (1994) suggested that the weaker sight-singers tend to follow the lead of the stronger sight-singers to achieve accuracy when performing as a group, but when asked to perform alone, they are unable to perform as accurately.

Though individual instruction is not feasible and group assessment is not an accurate description of individual achievement, individual testing of sight-singing achievement has been found to be a useful tool in encouraging the transfer of skills learned as a group to individual performance (Demorest, 1998). Single subjects who received individual testing were significantly more accurate on sight-singing tests than subjects that did not receive periodic individual testing. Perhaps the requirement of individual testing encouraged those students to practice their sight-singing skills out of the classroom setting.

Factors related to individual sight-singing performance have been studied, with varying results. The results of Demorest and May's (1995) study of 414 high school students in Texas indicate that the number of years of school choir experience was the single strongest predictor of sight-singing success, followed by years of piano and other instrumental or vocal instruction. In this study, musical background and school choral experiences were predicting factors of success. However, Daniels (1986) determined that successful sight-singing was effected more by factors relating to the school (ethnic makeup, size, rural/urban, etc.), the individual students (having a piano in the home, participating in all-state chorus, etc.), and the teacher than by factors relating to the curriculum of the course. She cites the attitude of the teacher in presenting sight-singing as more influential than the specific teaching methods, indicating that students may be more successful at learning to sight-sing if this is treated as a major objective of the course.

In order for classroom teachers to be able to lead children in the successful singing of songs, they must be able to perform the piece accurately themselves. The model from which they learn largely influences performances of children. Several studies have been conducted addressing the pitch matching accuracy of children. Price, Yarbrough, Jones, and Moore (1994) found that inaccurate child singers attempted to model both the timbre and the octave of the model singer. Also, Yarbrough, Green, Benson, and Bowers (1991) found that children sang more accurately following a female model than a male model. Further, Yarbrough, Benson, and Bowers (1992) found that children responded more accurately to a non-vibrato female model and a child model than to a vibrato female model, though they were most accurate with the non-vibrato female model. These studies indicate a need to teach elementary education majors skills relating to vocal timbre and how to accurately model a singing voice in order to encourage the greater possibility of children's success.

Guided Practice

Practicing these sight-singing skills, regardless of the techniques used, is necessary for the eventual success of these students. However, productive practice sessions can be elusive, even for some musicians. Research has indicated that the amount of time students practice, though not an accurate prediction of their performance success, is often related to their level of nervousness regarding the performance and their intrinsic motivation to succeed (McPherson & McCormick, 1999). This study also found that students who were cognitively involved in their practice sessions considered these sessions both more effective and efficient.

Kenny (1998) describes cognitive involvement as critically thinking in the practice room. Since practicing is largely self-directed learning, it is important for students to be successful at self-assessment as well as setting their own goals for improvement (Lindberg, 2000). In order to accomplish this, students must have enough prior knowledge to recognize their musical strengths and weaknesses as well as proper guidance to select reasonable goals. These abstract concepts can be difficult for musicians to apply to practice sessions effectively, indicating that there may be a need to teach not only the skill that we want to see in future teachers, but also the way in which they need to practice to achieve the skill.

One aspect of practice technique discussed by Brooks (1995) is the independent and combinative use of mental and physical practice. Mental practice is a useful technique employed in many areas of music education. This would include a choir member mentally singing through their part before a performance, or silently evaluating a score before performing. While this can be an effective tool, it is generally found to be more effective when combined with physical practice, or the actual act of performing the task.

Rosenthal, Wilson, Evans, and Greenwalt (1988) examined the effects of different practice conditions on the performance accuracy of advanced instrumentalists. In this study, subjects were divided into five groups, each with a specifically defined method of practice. The modeling group spent their practice time listening to a recording of the piece to be performed while looking at the score. The singing group spent their practice time singing the composition. The silent analysis group spent time silently studying the music, and the free practice group was told to practice the piece on their instrument. One final group, which served as the control group, practiced an unrelated piece before performing the experimental piece. Results indicated that the modeling group and free practice groups were the most successful, while the singing group and the silent analysis group performed with minimal difference from the control group. With the exception of rhythmic accuracy, silent analysis was not found to be an effective practice technique when used alone.

By specifically defining the type of practice technique to be used by each subject, Rosenthal et al. (1988) guided the practice of their subjects. This technique provides a way for teachers to focus the activity of their students when they are in the practice room. Research has indicated that students, both in the field of music and in other fields, benefit from guided practice. Practice may be guided by a model, or through the use of a worksheet, multimedia interaction, or individual tutorials.

In her study on the effects of error-detection practice on the keyboard sight-reading achievement of undergraduate music majors, Kostka (2000) found that guiding the practice of students in the area of error detection along with sight-reading practice by silently playing the notes on top of the keys improved their sight-reading accuracy. Though the difference was not significant between this group, the control group, and the shadow-only group, error-detection practice was found to be effective, and that practice was guided through specific instructions.

In 1984, Rosenthal looked at the effects of guided practice and the use of a model on the accuracy of instrumentalists' performance. In this study, a guide was defined as a verbal explanation of the piece and a model was defined as an aural example of the piece. Different combinations of these practice techniques were studied, and results indicated that subjects in the model-only group scored significantly higher than did all other groups, while subjects in the guided model group scored significantly better than did subjects in the guide only and practice only groups. These results suggest that guiding the practice of students by incorporating aural models may be an effective practice technique.

Sehmann (2000) also found that guided practice was an effective technique in improving the breath management of elementary brass players. Subjects who received specific instruction on breath management through a psychomotor instructional sequence significantly improved in their breath management skills over subjects who did not receive this instruction. As breath management is an essential skill in playing brass instruments, subjects in the control group were practicing these skills, as well. However, by providing specific instruction to subjects in the experimental group, Sehmann guided their practice on this skill, which led to significant improvements.

The effects of guided practice in the area of rubato usage on the onset timings of musicians performing a piece by Bach have been studied as well. Johnson (2000) found that the performance of subjects who received guided practice through the use of an aural model of the piece incorporating appropriate rubato significantly correlated with the rhythmic model on their posttest, while control group posttests and all pretests did not significantly correlate with the model. Again, the use of an aural model was found to be an effective technique in guiding students to practice a specific skill.

An additional aspect to successful practice time is the ability to trouble shoot and problem solve. Hurst and Milikent (1996) found that successful prediction in problem solving depends on several factors, including a subject’s procedural and declarative knowledge, stage of cognitive development, and experience in applying predictive reasoning. The use of guided practice in predictive reasoning skills was found to significantly increase scores on a problem-solving test. Regardless of the method we choose, when we show students how to practice, and work with them on certain techniques that we feel are important to their success, research shows they are more likely to succeed.

The Use of Technology

When guiding the practice of students learning to sight-sing, one option is to provide aural examples for use during practice sessions. A number of possibilities exist in developing these aural examples. As improved technology has become more readily available, so have options for aiding future classroom teachers to become more competent and confident with their sight-singing skills. The tape recorder allowed us to send home aural examples of the exercises we chose to use to guide their practice. However, not only do we have the options of tapes and CDs, but now, the popularity of computers, use of software, and wide access to the Internet provides students an interactive format to both see and hear the musical skills we want them to learn. Baltzer (1996) suggested that students may be more actively involved in learning if they are engaged both visually and aurally. Thus, they may be more likely to practice accurately and, in the end, learn more effectively. In addition, Kozma (1991) cited that the multimedia capabilities of computers provide a way to bring together many different forms of presentation into a single instructional environment, which, when used appropriately, can facilitate learning. These multimedia capabilities can include the combination of sound, text, and graphics in an interactive environment.

Forsythe and Kelly (1989) found that the use of visual cues paired with melodies, which could be accomplished using multimedia capabilities, was an effective learning tool for fourth-grade students. However, they also found that this combination should be consistent. Whether the visual cues come from written examples of the melodies, hand motions indicating the melodic contour, or the use of Curwen hand signs, when students are able to both see and accurately hear the melody, they may be more readily able to make judgments regarding accurate melodic contour and pitch discriminations, improving their sight-singing abilities.

Dobbe (1998) found that subjects' viewed the incorporation of multimedia technology in a music fundamentals course for non-music majors as helpful. Additionally, Nowaczyk, Santos, and Patton (1998) found that the use of multimedia in the classroom contributed to the instruction and interest level of the students. They did suggest, however, that the use of multimedia instruction in the classroom should be balanced with other traditional forms of instruction, both to facilitate learning and to maintain student-instructor interactions. The availability of this variety of instructional presentation provides teachers with more options in the classroom.

Computer-Assisted Instruction (CAI) is a popular use of technology in the classroom, commonly distinguished by its primary purpose of teaching. CAI software can be divided into five basic categories: (1) tutorials, (2) drill and practice, (3) simulations, (4) games, and (5) testing (Alessi and Trollip, 1991). Tutorials may provide the user with textual and graphic information. Drill and practice software might provide the user with opportunities to work on aural and notation skills. Simulations attempt to teach the user by placing them in a "real life" situation (learning in context). Games and testing are examples of reinforcement and assessment.

Research has indicated that CAI can be an effective teaching tool in the music classroom. Parrish (1997) determined that, when used appropriately, CAI could be a time-saving tool in the classroom. When students learn the material at the computer out of class, it frees class time for answering questions, reviewing material covered by CAI, and leaves time for instruction and discussion of topics that would otherwise not have been discussed due to time constraints.

However, one weakness of CAI is the possible lack of control the instructors have over content and layout. Lord (1993) felt that one weakness of the drill and practice software available to him for use at his university was the fact that aural skills were taught out of context rather than building on the knowledge his students already had. As a result, he and his colleagues developed new software to use in conjunction with the previously used software in order to better fit their students' needs.

The options of using pre-developed software, as well as the popularity and widespread accessibility of the Internet, provide chances to guide aural practice in ways unimaginable just a few years ago. When having students buy software, the benefit is that the teacher does not have to develop the guided practice, they only have to lead their students to use the software appropriately. However, there is the added expense of students having to purchase the software or the inconvenience of the professor having to set up specialized computer labs that are properly equipped with necessary hardware and software. In addition, office hours may need to be set so that students could practice in a monitored environment.

Instructor developed software, however, provides greater flexibility. Though the teacher has to work to develop the program of study, they are able to more directly guide their students in the areas they feel are most important and fit the overall course of study for the class. Dobbe (1998) found this to be an effective teaching strategy when developing original multimedia software for use in a music fundamentals course for non-music majors. Guided practice using the Internet provides even greater flexibility. A benefit of the Internet is its ability to provide greater access to materials and activities normally restricted to the classroom or specialized computer labs without the added expense or complication of adding new equipment or software (Liske, 1999). For these reasons, the Internet may be well suited for multimedia instructional support.

Web-based instruction has many benefits, such as the ease of communication, access to information, and the ease of posting and sharing resources (Quinlan, 1997). However, when using web-based instruction, caution must be exercised by the instructor in guiding their students' use of the Internet. Web pages posted to the Internet do not go through the rigorous editing process that other educational mediums undergo. For this reason, it is essential that, through the design of the web-based instruction, the attention of the students be focused on accurate information. Additionally, the design of web-based instruction is important. As with any learning opportunity, web-based learning must be designed to provide the learner the opportunity to interact with the teacher, control the information they are processing, and give and receive feedback regarding the knowledge they are working to develop (El-Tigi & Branch, 1997). Though there are many benefits to incorporating technology into the classroom, it is necessary to remember that technology is only a tool available for educators' use (Williams & Webster, 1996). The most important aspect of any instructional tool is the accuracy of the information being presented as well as the proper use of the tool.

Purpose of Study

Research has indicated that a teacher's level of proficiency in a subject area is a strong predictor of their students' learning of that topic (Cassidy, 1989). Therefore, the single class required of elementary education majors to improve their proficiency in music must be as thorough as possible. The inclusion of computers in our everyday lives has opened many doors for educational opportunities. To date, little research exists in the field of guiding practice in sight-singing skills over the Internet. Also, due to the variety of results achieved through the current research in the area of sight-singing instruction, additional research in this field is warranted. Therefore, the purpose of this study was to determine the effectiveness of aural modeling in guided practice through the Internet on the sight-singing improvement of elementary education majors. Specifically, elementary education majors used instruction software delivered via the Internet to practice sight-singing. They received instruction in the form of guided practice that provided an interactive approach to learning.

METHOD

Subjects

Undergraduate elementary education majors enrolled in two sections of a sixteen-week music methods course for the elementary classroom at a large southern university served as subjects for this study (*N*=37). All of the subjects were females. Students' enrollment in each section of the course was based on course availability, university prescribed class size, and students' personal schedules. Division of subjects based on course section enrollment has been seen as acceptable in other studies (Cassidy, 1993; Lindberg, 2000; Liske, 1999). The researcher taught both sections of the course used in this experiment.

Section one of the course served as the experimental group. Twenty students were enrolled in this section, however, one enrolled student did not complete all of the assessments necessary for participation in the study (*n*=19). Section two of the course served as the control group. Nineteen students were enrolled in this section at the beginning of the semester, however, one student did not complete the course (*n*=18).

The investigator received approval for study by the Institutional Review Board for Human Subject Studies in the Louisiana State University Office of Sponsored Research. Additionally, the investigator asked subjects to complete consent forms in order to gain permission to use subject's test scores as data for the study (see Appendix A). Subjects were made aware that all tests would be completed regardless of their participation in the study due to regular course requirements. These forms were distributed and signed during the first week of classes. The subjects' identities as well as their individual scores were kept confidential in order to protect their privacy.

Independent Variables

The independent variable under investigation was the use of aural modeling in guided sight-singing practice. Two web pages were developed to guide the subjects' practice of sight-singing, one with aural modeling and one without. Both web pages were accessible through the use of *Blackboard 5*™ software from Blackboard Inc., an on-line teaching tool. The experimental web page consisted of sight-singing exercises combined with aural examples. Subjects had the option of hearing the starting pitch, hearing each pitch of the melody individually, or hearing the melody in its entirety (♩ = 60). The control web page contained the same sight-singing exercises but none of the aural examples. It seemed reasonable that the use of the control web page might eliminate the possible halo effect due to the experimental group's work with technology.

The web pages contained exercises developed by the researcher based on the Kodaly method as presented by Choksy (1988) of sight-singing instruction. Exercises were organized by solfege pitches, meaning that there was one page of *sol-mi* exercises, one page of *sol-mi-la* exercises, one page of *sol, mi, la, do* exercises, one page of *sol-mi-la-do-re* exercises, and a separate page of rhythm exercises. Each page contained three to seven exercises in varying key signatures and simple meters. The rhythmic values used on the pages concerning pitch were simplistic to allow subjects to focus on the development of pitch accuracy. Rhythmic values on these pages were limited to quarter notes, eighth notes, half notes, whole notes, dotted-half notes, and quarter rests in simple time.

The page dedicated to rhythm consisted of a number of exercises in various simple meters, incorporating quarter notes, half notes, whole notes, eighth notes, dotted-half notes, dotted-quarter notes, sixteenth notes, and quarter rests. On the experimental page, subjects had the option to hear a metronomic pattern of either three or four beats, depending on the meter of the exercise, to help them establish a tempo (♩ = 60). For instance, if the exercise was in common time, the subjects would hear a pattern of four beats prior to the exercise. They could also choose to hear the entire rhythmic exercise played (♩ = 60; exercise sounding on *G* above middle *C*). The control page again contained the same rhythmic exercises but none of the aural examples.

The web pages were constructed using the Composer component of Netscape Communicator Version 6.1. Notation for the sight-singing and rhythm files were developed using Finale 2001® (2000), and aural examples consisting of Musical Information Digital Interface (MIDI) files were developed using Cubasis AV (1996).

Procedures

All subjects participated in a pretest during the second week of the semester. The pretest included each subject sight-singing a short pentatonic melody (see Appendix B) written by the researcher. No sight-singing instruction had yet been given in class, and no specific directions regarding what method of sight-singing to use were given. Each subject signed-up for a 10-minute test time and performed the test individually in a room equipped with a tape player and a microphone. Subjects turned on the tape player, spoke their name, and vocalized the melody. They had been told in advance that they would have to sing a song they did not know by looking at the music. No course grade was assigned to this pretest, so subjects were informed that the information gathered would be used to help the instructor determine the level of sight-singing ability of the class.

Following the pretest, sight-singing instruction became a regular part of both sections of the course. In addition to coursework dealing with pitch notation, melodic contour, rhythm notation, and staff attributes, subjects received specific training in sight-singing using the Kodaly method (Choksy, 1988). Sight-singing instruction was provided for approximately 20-25 minutes during 17 class sessions. Instruction was provided in three areas: rhythmic sight-reading, solfege sight-singing, and the learning of unfamiliar melodies from notation. Instructional strategies included echoing pitch and rhythm patterns, clapping rhythms, using rhythm syllables, using Curwen hand signs, and practicing melodies on solfege syllables. Instruction was the same for both sections of the course.

In addition to sight-singing instruction, a preparation sequence for sight-singing was established. First, the rhythm was clapped and spoken, using rhythm syllables. If text was present, the text of the song was then spoken in rhythm. Next, the solfege syllables were determined and spoken in rhythm. Following this step, the subjects were instructed to sing a scale to establish a tonal center and "find their pitches." Subjects selected a *do*, and then sang in stepwise motion up a major 6^{th} and back down a perfect 4^{th}. During class, the tonal center would be more firmly established by the instructor indicating solfege syllables using Curwen hand signs followed by the subjects singing the pattern. Subjects then sang the song on solfege and finally sang the song on text.

While sight-singing practice time was provided in class, subjects were also encouraged to practice out-of-class using the web page. The web page was available for their use for the 15 weeks of the semester following the pretest. Subjects in the experimental group were given access to the experimental web page, while subjects in the control group were given access to the control web page. The appropriate web page was introduced in class by the researcher to ensure that subjects knew how to access the web page as well as how each page worked. Subjects were asked to self-report (see Appendix C) the amount of time they spent practicing at their web site.

This information was then cross-referenced with a frequency count of how often each subject accessed the web site.

Twice during the remainder of the semester, subjects were assessed on their sight-singing abilities in the form of a performance test, per the requirements of the course. On the first test (see Appendix D), the song *Plainsies, Clapsies* from The Kodaly Method (Choksy, 1988, p. 170) was used. This melody contained the pitches *sol, mi,* and *la* in the key of C Major, and rhythmic values of quarter notes, eighth notes, and quarter rests. On the second test (see Appendix E), the song *Donkey, Donkey* from the 2nd grade volume of Share the Music, published by McGraw-Hill (2000, p. 144) was used. This melody included the pitches *do, mi, sol,* and *la* in the key of D Major and the same rhythmic values included on the first test with the addition of the half note. Both tests also included rhythm exercises developed by the instructor containing more complicated rhythms than used in either song. However, neither of these rhythm exercises were scored for purposes of this study.

Subjects were given the exercises included on each test a couple of days before their assessment, to provide an opportunity for them to practice the test at home before performing it for a grade. For both tests, subjects signed-up for a 15-minute test time over the course of 3 days. All subjects were tested individually in a room equipped with a tape player and a microphone. Subjects turned on the tape player, spoke their name, and completed the test. Instructions were given that required subjects to use a preparation sequence similar to that used in class (see Appendices D & E). Subjects were instructed to write the rhythm syllables and solfege syllables on the music, and were given the option of speaking the rhythm syllables, text, and solfege syllables, prior to singing the song. The test required them to establish their own tonal center and then record their singing of the song in rhythm on both solfege and on text. If subjects were unhappy with their initial taped performance, they could re-record it as many times as necessary for them to be happy with their performance. For the purpose of data collection, errors were counted on the first full performance of each portion of the test. Subsequent performances were not considered in this study, and partial or incomplete performances were not considered.

Finally, a posttest was given during the last week of the semester. This posttest involved subjects sight-singing the same pentatonic melody included on the pretest (see Appendix B). Subjects recorded themselves singing the melody on both solfege and text. However, no additional instructions on preparation of the melody or testing requirements were given, though subjects were encouraged to use the same preparation procedure practiced in class. The testing procedures were identical to those the subjects had followed previously with the exceptions that subjects were allowed to sign-up for a 20-minutes test time, and they were not given the melody prior to the testing time.

Dependent Variables

The design of this study included a pretest and a posttest, with two additional tests included throughout the semester. The purpose of these intermediate tests was to gauge the subjects' ability to sight-sing an unfamiliar melody. Though these tests were scored, they were not compared statistically with either the pretest or the posttest. In addition, reliability was not determined on the scoring of these tests. Therefore, the dependent variables in this study were the scores received through pretest and posttest given at the beginning and end of the 15 weeks of study.

Audio recordings of each subjects' pretest were analyzed by transcribing the performance into written musical notation. Each transcription was scored and used to determine equivalence between the two groups prior to treatment by assigning a score based on each subjects' accuracy of pitch and rhythm. Each rhythmic value in the piece was scored as either correct or incorrect, allowing for a possible rhythm score of 19. An incorrect rhythm was defined as anything that differed from the musical notation on the printed page by more than half a beat, a pause lasting one beat or longer, the addition or deletion of notes, and holding through a rest (Betts & Cassidy, 2000). Since students had to establish their own tonal center, an incorrect pitch was defined as anything that differed by intervallic relation when compared to the notated score, or a pitch that was inaccurate in the tonal center they established with the first sung note. Each pitch was worth two points, one for the correct pitch based on the tonal center established with the first note of the song and one for the correct interval as compared to the pitch of the previous note. This allowed for a possible pitch score of 35.

The posttest was similarly analyzed and scored, and the definition of errors remained the same. However, on the posttest, subjects were instructed to sing the song twice, once on solfege, and once on text. This allowed for the rhythm score to be determined twice, each resulting in a possible rhythm score of 19. The pitch score was also determined twice, once singing on solfege and once singing on text, each resulting in a total possible pitch score of 35.

Following the performance of sight-singing Test 1 and Test 2, audio recordings of each subject's performance were also analyzed. The subject's performance of the song was assessed in the areas of intervallic and pitch accuracy as well as rhythmic accuracy as previously described. Both performances of the melody were assessed (solfege and text). On Test 1, rhythm scores were determined out of a possible score of 24 each time the melody was sung, and pitch scores were determined out of a possible score of 45 for each time the melody was sung. On Test 2, rhythm scores were determined out of a possible score of 30 each time the melody was sung, and pitch scores were determined out of a possible score of 55 for each time the melody was sung. For purposes of comparison between the different tests, all scores were converted to a percentage out of 100%. The number of errors was counted for each individually assessed area and converted to a mean score for both the experimental and control groups.

The researcher scored all of the tests throughout the study. Subsequently, 20% of the audio recordings of the pretest and posttest were randomly selected and independently analyzed for performance accuracy by a qualified instructor with experience in teaching sight-singing. Reliability of grading was calculated by determining the number of agreements and disagreements using the formula [agreements/(agreements + disagreements)] X 100. There was 90% agreement between observers for rhythm, 93% agreement for pitch and 92% agreement between observers for intervals.

RESULTS

The purpose of this study was to determine if the use of aural modeling with Internet guided practice aided in the development of sight-singing skills in elementary education majors. Analysis of the pretest scores using a *t test* for independent samples indicated no significant difference between the two groups prior to treatment in the areas of pitch [$t(35) = .551$, $p = .585$] or rhythm [$t(35) = .194$, $p = .847$].

The posttest scores were analyzed using a *t test* for independent samples, indicating no significant difference between the two groups following the treatment in the areas of rhythm on solfege [$t(35) = .659$, $p = .5142$], rhythm on text [$t(35) = 1.06$, $p = .296$], pitch on solfege [$t(35) = .782$, $p = .440$], or pitch on text [$t(35) = .955$, $p = .346$]. Though there was no significant difference between the two groups, the experimental group performed more accurately on solfege than did the control group, as can be seen in Table 1. Table 1 also indicates that the control group performed more accurately than did the experimental group on text and in the areas of rhythm.

Though no significant difference was found between the two groups at the conclusion of the study, a *t test* for paired samples indicated that both the experimental and control groups improved significantly from the pretest to the posttest. Significant difference was found between the pretest and posttest scores of the experimental group in the areas of pitch on solfege [$t(18) = 5.770$, $p = <.0001$] and pitch on text [$t(18) = 3.545$, $p = .002$]. However, no significant difference was found between the pretest and posttest scores of the experimental group in the area of rhythm on text [$t(18) = 2.056$, $p = .054$]. The control group improved significantly from pretest to posttest in all areas, including rhythm on text [$t(17) = .3.107$, $p = .006$], pitch on solfege [$t(17) = 4.772$, $p = .0002$], and pitch on text [$t(17) = 3.305$, $p = .004$].

Table 1

Mean Performance Scores

	Solfege		Solfege Rhythm		Text		Text Rhythm	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
				Experimental				
Pretest	—	—	—	—	18	21	72	26
Test 1*	58	28	92	23	45	28	93	21
Test 2*	55	31	94	16	44	31	91	22
Posttest	47	25	84	16	28	20	86	16
				Control				
Pretest	—	—	—	—	15	10	74	23
Test 1*	74	22	93	4	59	32	93	4
Test 2*	47	27	95	7	39	28	91	10
Posttest	40	28	88	16	36	30	90	8

Note. *Data were not verified for reliability. Dashes indicate that no data were obtained.

Mean difference scores indicate that the experimental group demonstrated greater improvement from pretest pitch scores to posttest solfege scores (M = 29) than the control group (M = 25). However, mean difference scores of pretest to posttest show the control group demonstrated a greater improvement from pretest text scores to posttest text scores (M = 21) than the experimental group (M = 10). Finally, the control group also demonstrated slightly greater improvement in rhythm scores when singing on solfege (M = 14) and on text (M = 16) than the experimental group when singing on solfege (M = 12) and on text (M = 14).

A *t test* for paired samples indicated that there was a significant difference between the pitch accuracy of the experimental subjects when singing on solfege than when singing on text. The experimental group was significantly more accurate on solfege [$t(18) = 3.571$, $p = .002$]. However, no significant difference was found between the solfege and text pitch scores of the control group [$t(17) = 1.073$, $p = .298$], though solfege mean scores were slightly higher than text mean scores (see Table 1).

A *t test* for paired samples indicated that there was no significant difference between the rhythmic accuracy of the experimental subjects when singing on solfege than when singing on the text [$t(18) = .318$, $p = .754$]. Similarly, a *t test* for paired samples indicated that there was no significant difference between the rhythmic accuracy of the control subjects when singing on solfege than when singing on the text [$t(17) = .710$, $p = .487$]. However, for both groups, subjects were slightly more rhythmically accurate when singing on the text than when singing on solfege (see Table 1).

Though the scores of the two tests given throughout the period of the study were not statistically analyzed, they were scored in the same way as the pretest and posttest, and provide interesting information. The mean scores of the experimental group improved from the pretest to

Test 1 in all three areas, with the greatest degree of improvement found in the area of pitch when subjects sang on solfege. The means scores decreased very slightly from Test 1 to Test 2 in the pitch areas, but the scores improved in the area of rhythm. The mean scores decreased in all areas from Test 2 to the posttest (see Table 1).

The control group experienced similar changes between their mean scores. All scores increased from the pretest to Test 1, with the greatest degree of improvement again being found in the area of pitch when subjects sang on solfege. The mean scores more drastically decreased between Test 1 and Test 2 than had scores for the experimental group in the areas of pitch, and they remained consistent in the area of rhythm. All scores decreased between Test 2 and the posttest for the control group, though not as drastically as the decrease in scores demonstrated by the experimental group (see Table 1).

Subjects' self-reported practice time was also analyzed. For Test 1, seventeen of the nineteen experimental subjects turned in their self-report forms. However, the frequency count indicated that eighteen of the nineteen subjects accessed the web site, suggesting that one of the subjects that did not turn in a self-report form had still spent time logged on to the web page. Though subjects were instructed to practice a minimum of fifteen minutes, three of the subjects who turned in their self-report forms indicated times of less than fifteen minutes. Since the web-hosting software provided only a frequency count of each subject's use of each page, no determination could be made about the accuracy of the subject's self-reported time. However, it was possible to look at data obtained during a period of a specified number of days. For Test 1, data available from the web-hosting software were analyzed from the first day the topic of solfege was introduced in class to the last day subjects were able to take their test.

The same process of self-reporting took place between Test 1 and Test 2. For this period, only ten of the nineteen experimental subjects turned in their self-report forms along with their test, and two of those subjects reported having not practiced at all. A cross reference with information obtained from the frequency count indicated that, from the first day of new sight-singing instruction following Test 1 to the last day subjects were able to take Test 2, eleven subjects accessed the web page, including one of the subjects who reported having not practiced. The average amount of time reported practicing decreased for the group as a whole but actually increased among those subjects that reported. In addition, the number of times each page was accessed decreased from Test 1 to Test 2, as well (see Table 2).

All experimental subjects turned in self-report forms for the posttest, though five reported not practicing during this time period, which included the first day of class following Test 2 through the last day possible for subjects to take their posttest. The frequency of web page access indicated that two of the five subjects who reported not practicing had accessed all of the web pages. However, there was no record that two of the subjects who reported practice times had actually viewed any web page. This could be explained, however, by the fact that several subjects practiced together, during which time the web page was only accessed under one student's name and password. Average reported practice times were up slightly from Test 2 to the posttest for the class as a whole, but decreased from the previous mean due to the fact that a greater number of subjects reported. The number of times each page had been accessed also increased from Test 2 to the posttest (see Table 2).

Control subjects were given the same instructions regarding practice as the experimental subjects. For Test 1, seventeen of the eighteen control subjects turned in self-report forms, all indicating practice totals greater than the fifteen-minute requirement. There were no frequency

Table 2

Self-Reported and Obtained Frequency of Web Use Between Groups

	Self-Reported Time			Frequency of Web Access					
	N	*M*	Range	N	*Sol-Mi*	*Sol- Mi-La*	*Sol-Mi-La-Do*	*Sol-Mi-La-Do-Re*	*Rhythm*
				Experimental (n=19)					
Test 1	17	31.6	9-73	18	240	193	162	157	175
Test 2	10	27.5	0-50	11	31	42	52	36	39
Posttest	19	15.3	0-45	14	51	49	51	64	47
				Control (n=18)					
Test 1	17	86	18-607	16	94	87	69	65	82
Test 2	13	48.5	7-220	12	31	32	38	31	35
Posttest	18	21.5	0-60	10	13	13	14	16	14

Note. Time reported in minutes

counts for the one subject that neglected to turn in her form, as well as one subject who did turn in a form. In fact, over the course of the semester, there was no record of this subject ever accessing to the web site, though she continually reported practice times. There was a wide range in the amount of self-reported practice by this group (see Table 2), however, there is no consistent relationship between the amount of self-reported practice and the number of times the students accessed the web page. For instance, one control subject reported practicing for a total of 607 minutes prior to Test 1, and the frequency count indicated the subject accessed the five pages a total of 36 times. However, another control subject reported practicing a total of 35 minutes, and the web-hosting software registered a total of 106 times the web pages were viewed by this student. Though these two examples present the extremes of the group in both amount of self-reported practice time and frequency count, they illustrate the inconsistent relationship between the two forms of information.

The number of subjects who turned in self-report forms along with Test 2 decreased for the control group as it had for the experimental group. Thirteen of the eighteen control subjects turned in self-report forms for Test 2. Of these, no record of practice was reported in the frequency count for four of the subjects. Additionally, three subjects who neglected to turn in self-report forms were registered as having accessed the web pages. Again, the range of practice times for this group was very wide, and the relationship between the number of times the web pages had been accessed and the amount of practice time reported for each student remained inconsistent. Both the number of times each page was accessed and the average amount of reported practice time decreased from Test 1 to Test 2 for the control group (see Table 2).

All eighteen control subjects turned in self-report forms for the posttest, though two reported no practice time. However, the frequency count indicated that both of these students accessed the web page during this study period, though each subject viewed each page only once. Additionally, eight subjects who reported practicing were not identified in the frequency count. This could be explained by subjects practicing together, or the fact that control subjects mentioned that they preferred to print out the examples and practice from these instead of continuing to use the Internet. Six subjects reported spending fewer than fifteen minutes practicing. The average practice time of the class as well as the number of times the web page was accessed decreased from Test 2 to the posttest (see Table 2).

DISCUSSION

The purpose of this study was to determine if the use of aural modeling with Internet guided practice aided in the development of sight-singing skills in elementary education majors. Though no significant difference was found between the two groups at the end of the study, both groups demonstrated significant improvement. In this case, sight-singing was a focus of attention in the classroom and significant improvement was demonstrated. While neither group mastered the skill of sight-singing over the course of the study period, improvements were seen in both groups. This finding is a replication of previous research (Cassidy, 1993).

Since both groups improved in their development of sight-singing accuracy, the current study also indicates that the use of technology was not a hindrance to the development of this skill. Both groups had access to their guided practice over the Internet, so both groups were encouraged to use technology to practice these skills. The control web page included only visual examples of the sight-singing exercises. Several subjects in this group reported having printed the pages so that they did not have to log on to the Internet in order to practice. Other subjects in this group reported practicing by using other melodies they had acquired through the course. It seems that some of the control group subjects did not feel the need to use the technology in order to practice their sight-singing.

The experimental web page, however, included visual and aural examples of the sight-singing exercises. For this reason, subjects in the experimental group could not practice using the aural model without logging on to the web page. Therefore, data indicated that this "necessary" use of the technology did not hinder the development of the skill for experimental subjects. This finding is supported by other research as well (Forsythe & Kelly, 1999; Parrish, 1997). Furthermore, additional research suggests that the use of an additional manipulative, while it may not significantly improve performance, does not serve as a hindrance (Cassidy, 1993; Kostka, 2000). Finally, the improvement experienced by the experimental group in their sight-singing skills further supports Rosenthal's (1984) and Johnson's (2000) findings that guiding the practice of students by incorporating aural models may be an effective practice technique.

Additionally, some subjects in the experimental group indicated their enjoyment of using the web page through casual conversation with the researcher and other people who saw them practicing. Since no attitude survey was conducted as part of this study, it is impossible to determine how all subjects felt about the use of technology. However, the comments made by several of the subjects suggested positive attitudes toward the web page. This would support Nowaczyk, Santos, and Patton's findings (1998) that the use of multimedia in the classroom contributed to the interest level of students.

Self-Report and Frequency Count

When the concept of sight-singing was introduced in class, the web page for that class was demonstrated to the group and subjects were encouraged to use it to practice. At this time, subjects were given a self-report form (see Appendix C) used to keep track of what they practiced and how long they spent practicing. Subjects were also instructed to turn in their self-report form along with each of their tests. Marginal success was achieved in this goal (see Table 2). Few determinations regarding the effectiveness of subjects' practice can be found in these data. The fact that so few subjects, both experimental and control, actually turned in self-report forms for Test 2 makes it difficult to draw conclusions about changes in scores compared to practice time from Test 1 to Test 2. It is also difficult to speculate with any certainty why there are inconsistencies between the reported practice time and the number of times each page was accessed. The greatest gains in scores for both groups were made from the pretest to Test 1, which is the period of time for which the greatest amount of practice was self-reported as well as recorded by the frequency count.

Speculations regarding the relation of practice time to score changes for the other tests are difficult to make. For instance, fewer experimental subjects self-reported practice time from Test 1 to Test 2, and the frequency count indicated fewer experimental subjects viewed the web page during this time than control subjects (see Table 2). However, mean scores for control subjects dropped in the pitch categories from Test 1 to Test 2, but stayed about the same for the experimental subjects (see Table 1). Furthermore, comparisons of individual subject's self-reported practice times with changes in their scores from Test 1 to Test 2 reveal few consistencies. Of the eight experimental subjects that self-reported practice time, four subjects' pitch scores improved, one subject's pitch scores decreased, and three subjects' pitch scores stayed about the same. Of the thirteen control subjects that self-reported practice time, one subject's pitch scores increased, ten subjects' pitch scores decreased, and two subjects' pitch scores stayed about the same.

It is interesting to note the pages that subjects viewed when practicing on the Internet. Though the practice site was divided into multiple pages, each one dealing with different combinations of solfege syllables, subjects did not only focus on the pages that dealt with the solfege syllables for which they were about to be tested. For instance, as Table 2 indicates, each of the pitch pages were viewed prior to Test 1, with the *sol-mi* page being most frequently used by both groups. However, Test 1 included only the pitches *sol, mi* and *la,* and subjects were made aware of this fact. Subjects still chose to frequently view the pages that dealt with the solfege syllables *do* and *re*, though these pitches had not yet been introduced in class. Also, subjects were informed that the posttest would be a pentatonic song. As one might expect, the frequency count indicated the greatest accesses by both groups on the pentatonic pitch page. However, unexpectedly, each of the other pitch pages were viewed a number of times by both groups, as well.

In general, little information could be determined from the practice information gathered. It is difficult to determine the accuracy of the subject's self-reported practice times. In addition, the lack of information available from the frequency count provided little additional help. At times, the frequency count indicated multiple accesses by specific individuals to various pages, yet these subjects reported no practice time. Could it be that subjects attempted to retrieve the web page but were unable to download the full page, and therefore did not practice, though the web-hosting software registered the access anyway? Finally, one must consider that even though subjects were logged-on, no conclusions can be drawn about how long they were focused on sight-singing practice. These concerns could be focused on in future research.

The Testing Process

For the pretest and posttest, subjects were given little to no instruction regarding how to prepare the exercises to be sung. However, for Test 1 and Test 2, subjects were given detailed instructions and suggestions about how to prepare the exercise (see Appendices D & E). Furthermore, throughout the semester, a preparation sequence had been developed and consistently used when preparing exercises in class, one step of which was to sing a scale to establish a tonal center. Subjects were typically successful in the instructed preparation requirements for Tests 1 & 2, though no specific instructions were given about how to establish a tonal center. No scales were found on the audio recordings of Test 1, and only one subject sang a scale on the audio recording of Test 2. Subjects were allowed to turn the tape recorder on and off during their testing period so as to only record when they were ready. Therefore, it is possible that more subjects followed the class preparation sequence, and it was simply not recorded on tape. However, transcriptions of the subjects' performances indicate a general lack of maintaining one tonal center. When the apparent lack of this step was mentioned to subjects in class, they admitted to generally omitting this step during their tests. Perhaps this led to many of the pitch inaccuracies found in Test 1 and Test 2, though no conclusive decisions can be drawn. Regardless, this indicates a need for subjects to be provided direct instruction and explicitly encouraged to establish a tonal center, due to the importance of this in accurate singing.

Subjects were tested individually, though instruction was given in a group setting. Individual testing provided a way to gauge the development of sight-singing skills for each subject rather than focusing on the ability of the group as a whole to sight-sing an exercise. Casual observations indicate that subjects sang more accurately as a group than they performed individually, as suggested by Henry and Demorest (1994). Additionally, in-class group performances may have been more accurate due to the preparation of the exercise being led by the instructor rather than being the responsibility of the individual subjects. During class, subjects were able to receive immediate feedback regarding their performance, perhaps leading to greater success.

Experimental subjects were significantly more accurate in pitch and interval use when singing on solfege than when singing on text. Lindberg (2000) found similar results. It appears that subjects had difficulty making the transfer from singing on solfege to singing the actual song. While the control group's scores were not significantly different in this area, the transcriptions of both groups' singing indicate pitch, interval, and even melodic contour differences between the two times the exercise was sung. While subjects indicated a cognitive knowledge of the fact that the melody should sound the same on solfege and on text through in-class discussion, their inconsistency in accomplishing this task suggests the need for additional teaching strategies to facilitate this important transfer.

Change in Scores between Tests

As would be expected, the mean scores increased for both groups from pretest to Test 1. However, the mean scores decreased for the control group from Test 1 to Test 2 and stayed about the same for the experimental group from Test 1 to Test 2 (see Table 1). The substantial increase in scores from the pretest to Test 1 was expected due to the fact that subjects were introduced to the new skill and given a number of techniques for successfully performing it during this time. Also, Test 1 involved the fewest solfege syllables, so perhaps subjects found this test the least difficult.

It is interesting to note that the experimental group's scores remained about the same in the areas involving pitch and rose in the area of rhythm from Test 1 to Test 2 while the control group's scores dropped in the areas involving pitch and remained the same in the area of rhythm. It is difficult to make assumptions regarding the reason for this difference in scores between the two groups. Though Test 2 involved the use of one additional solfege syllable, the subjects had also spent more class time sight-singing. Data obtained from the transcriptions of subjects' performance indicated that control subjects continued to have trouble with melodic contour, decreasing the possibility for correct pitches and intervals, while experimental subjects demonstrated an improvement in this area. Both experimental and control groups demonstrated an improvement in rhythm scores when singing on solfege from Test 1 to Test 2. However, both demonstrated a decrease in rhythm scores when singing on text from Test 1 to Test 2. The mean improvement for both groups was 2% when singing on solfege. The mean decrease for both groups was also 2% when singing on text.

Scores for both groups decreased in all areas from Test 2 to the posttest. The posttest was more difficult than either Test 1 or Test 2 because it involved a full pentatonic scale. Even though no new rhythmic values were introduced on the posttest, solfege and text rhythm scores dropped. The fact that the posttest was given during the final week of class and exam week may have led to a decrease in out-of-class practice time for many subjects. In fact, more subjects did self-report having spent less than 15 minutes practicing for the posttest than had reported so for previous tests. Additionally, subjects expressed concern in class about determining the difference between *re* and *mi*. However, data obtained from transcriptions indicate that subjects struggled more with the melodic contour, indicating that confusion should have been less of a focal point.

<u>Accuracy of Solfege Syllables</u>

On the pretest, no instructions were given on what method of sight-singing to use. As a result, most subjects chose to sing the song on text. One experimental subject sang the pretest melody on the correct solfege syllables, and one control subject sang the pretest melody on the neutral syllable “la.” All other subjects sang the song on text. For the posttest, instructions were given for the subjects to sing the song first on solfege and then on text. With the exception of one control subject, all subjects sang the song on solfege using the correct solfege syllables. The one subject who used incorrect solfege syllables appeared to use the assumption that *G*=*sol*, even though the song was in D Major, and a number of examples had been used in class that were not in C Major. The overall accuracy in the use of solfege syllables by subjects in both groups indicates that they cognitively understood, though they demonstrated some trouble in actually performing accurately with their singing voices.

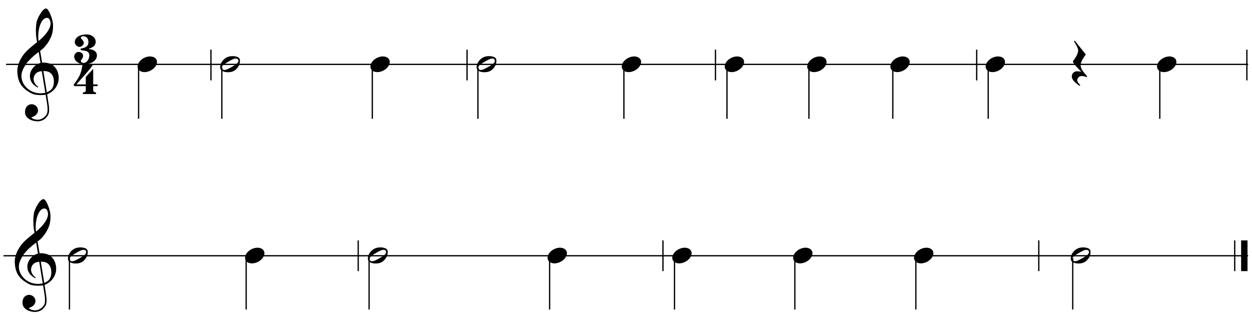
Rhythm Accuracy

The rhythm scores of both groups are interesting. On the pretest, the rhythm scores were substantially higher than the pitch scores, though neither pitch nor rhythm reading instruction had been given prior to the pretest. The experimental group's mean rhythm score for the pretest was 72% and the control group's mean rhythm score was 74%. The rhythm of the pretest song follows regular speech patterns, so perhaps these scores were higher due to the fact that the subjects' natural tendencies of speech rhythm were coincidentally correct for this musical example.

The rhythm of the pretest/posttest song was basic, including quarter notes, half notes, and quarter rests. As a part of regular course assignments not analyzed in this study, subjects were required to read rhythms far more complicated than those presented in the pretest/posttest, such as dotted-quarter notes and sixteenth notes. In addition, all rhythmic values included in the pretest/posttest were also included in Test 1 and Test 2. However, the rhythm scores on the posttest dropped for both groups from the rhythm scores they had achieved on Test 1 and Test 2 (see Table 1). Transcriptions of the subjects' singing indicates that common errors on posttest rhythm included lengthening note and rest values as well as adding unnecessary pauses in the song. One example of this can be seen in Figure 1, which shows the transcription of one subject's singing of the posttest on text in comparison with the correct rhythm of the song. The subject demonstrated an understanding of longer rhythmic values versus shorter rhythmic values, but she had a tendency to incorrectly increase the length of the longer rhythmic values and add additional rests.

Improvement in rhythm scores from the pretest to Test 1 by both groups was expected. On Test 1 and Test 2, both experimental and control subjects sang slightly more accurately on solfege than they did on text. However, on the posttest, subjects were slightly more accurate on text. The high degree of accuracy with which subjects performed rhythm led to little room for improvement between these tests. In general, subjects in both groups sang with accurate rhythm. The most common errors were those described above.

Posttest Song



Subject Performance Example

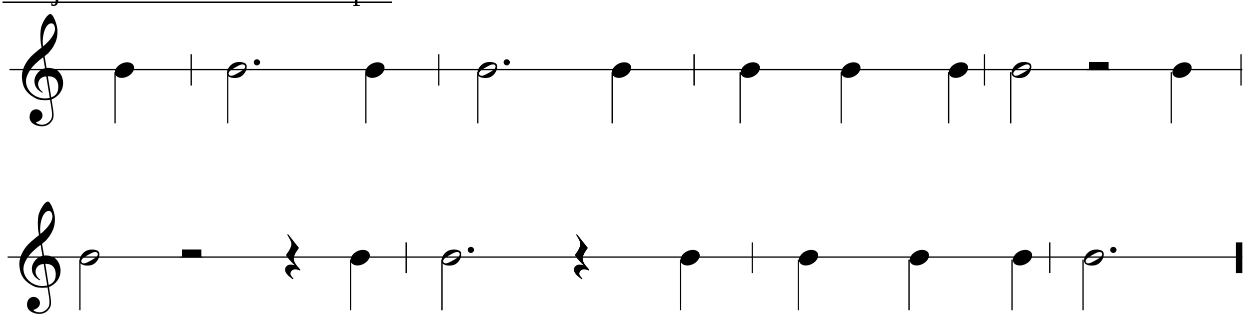


Figure 1

Rhythmic Discrepancy Example

Pitch Accuracy

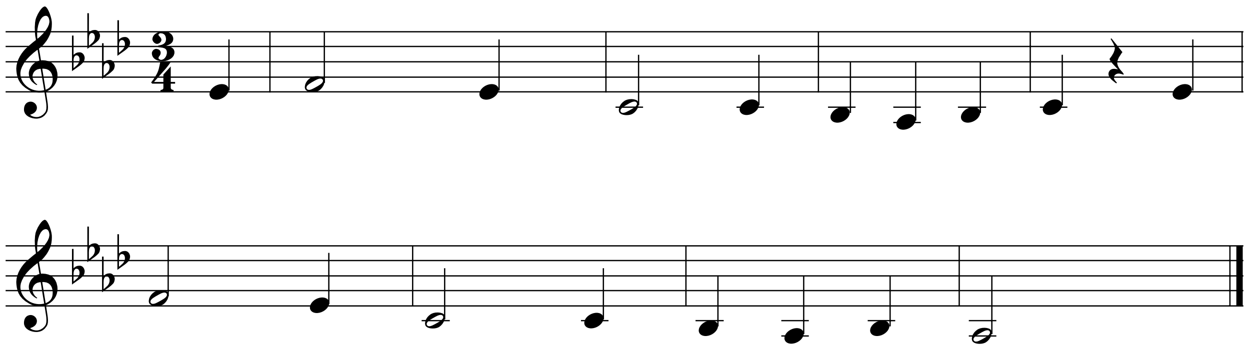
Information regarding subjects' improvement in the area of pitch can be determined by looking at the transcriptions of their performances. Figures 2 and 3 are transcriptions of two subjects' pretest and posttest performances. They demonstrate the improvement in pitch accuracy achieved from pretest to posttest by these subjects as well as some common pitch errors demonstrated by several subjects. In these examples, the control subject's performance on the pretest was more accurate in both pitch and rhythm than the experimental subject's performance.

The control subject was also more consistent with the accuracy of her melodic contour. However, by the posttest, the difference between these same two subject's scores had decreased. While both of these subjects improved from pretest to posttest, both subjects' posttest scores could have been higher had they sung more in tune. Both subjects were accurate with their melodic contour, however, several of the pitches that each sang were out of tune.

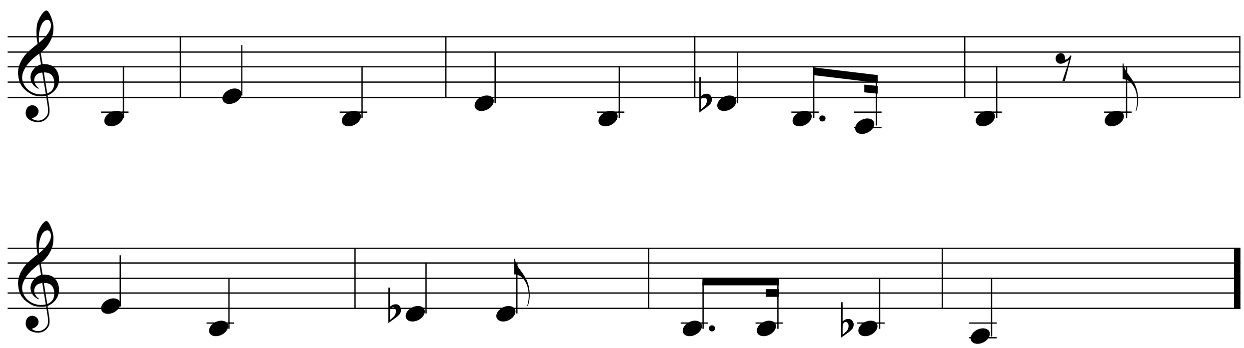
Figure 2 is a transcription of an experimental subject's pretest performance as well as her posttest performance on solfege. On her pretest, this subject scored low on both pitch (20%) and rhythm (32%). Additionally, her melodic contour was frequently inaccurate. However, her posttest demonstrated an improvement in her rhythm score to 100%. She also achieved a higher pitch score (69%) when singing on solfege. This pitch score was lower than perhaps possible due to her tendency to sing the last two measures of each phrase out of tune. While she was correct with her intervals within those measures, they were not scored accurately in the area of pitch because they were incorrect based on the first pitch the subject sang, indicating that she modulated at the end of each phrase. For instance, the melody calls for a descending whole step between measures two and three. However, the subject sang a descending half step, followed by three pitches also sung a half step too high. Though she corrected this tuning error at the beginning of the second phrase, she made the same mistake between measures six and seven. While the subject demonstrated a much greater understanding of the concept of singing on solfege, her lack of consistent tuning resulted in lower pitch scores.

Figure 3 is a transcription of a control subject's pretest performance and posttest performance on text. Her pretest performance yielded some of the highest scores of any subject in both rhythm (79%) and pitch (37%). This subject had previous choral and

Correct Song Example *



Subject Performance Example – Pretest



Subject Performance Example – Posttest (solfege)

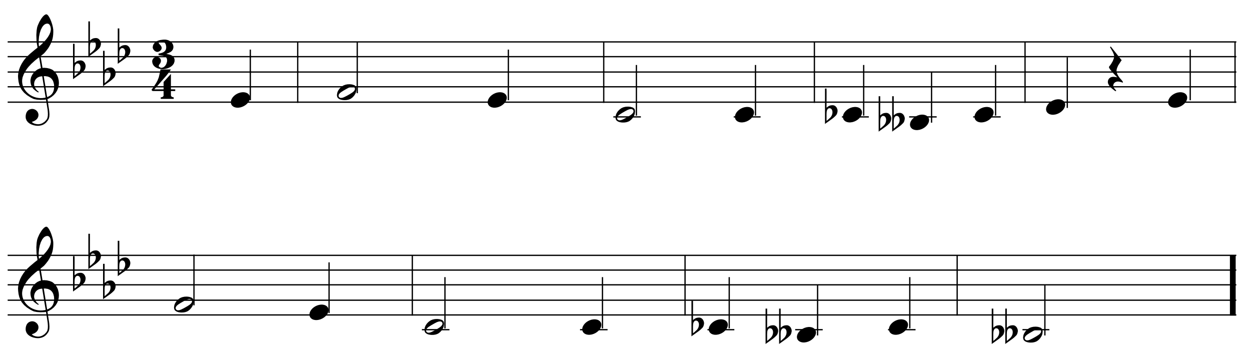
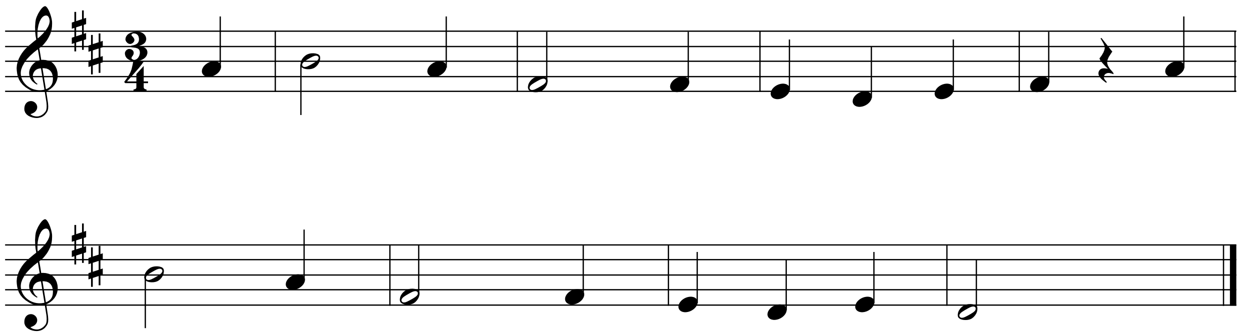


Figure 2

Experimental Pitch Example

*Note: Posttest song was transposed to the key determined by the subject's starting pitch for ease of comparison.

Correct Song Example *



Subject Performance Example – Pretest

Subject Performance Example – Posttest (text)

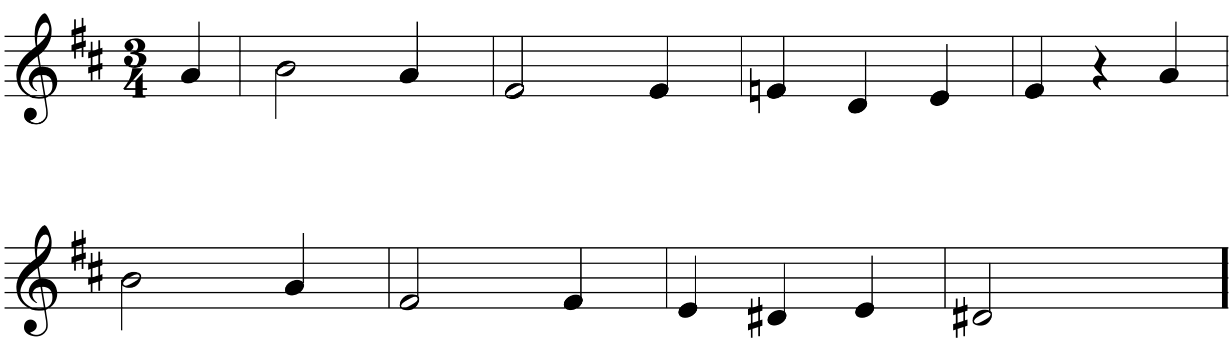


Figure 3

Control Pitch Example

Note: Posttest song was transposed to the key determined by the subject's starting pitch for ease of comparison.

sight-singing experience, providing a likely reason for her higher degree of initial success. Improvement was demonstrated by her posttest scores in rhythm (100%) and pitch (77%) when singing on text. However, as seen in Figure 2, this subject's tendency to sing notes out of tune led to a decrease in her pitch scores. While the experimental subject would "modulate" at the end of each phrase, the subject's performance included in Figure 3 demonstrates a tendency to sing only single notes out of tune without modulating. This resulted in just a few notes being classified as incorrect in pitch, and the intervals surrounding each incorrect pitch being counted as errors.

Implications for Future Research

Many different aspects of the sight-singing process were explored in this study. However, research in this area should continue. In the present study, sight-singing examples with aural modeling were made available to subjects via the Internet. These sight-singing examples were in a variety of major keys, all notated in the treble clef. However, the range of all examples was between middle C and the C an octave above, which was higher than most subjects normally sang. Cassidy (1993) determined that elementary education majors self-selected starting pitches centered around G, G#, and A below middle C. Casual observations of the subjects involved in this study suggest that, when asked to select a *do*, subjects would sing a pitch centered around G# or A below middle C. Because research continues to support the idea that inexperienced singers' self-selected tessitura is generally low, perhaps the sight-singing examples and aural modeling would have been more effective if they had been centered in this lower tessitura as well. McCoy (1997) suggested that, in order for subjects to accurately sing music, their starting pitch must be one that would enable them to sing the whole song in a comfortable range. Additionally, Price, Yarbrough, Jones, and Moore (1994) determined that inaccurate child singers attempted to imitate the octave of the model presented to them. While the current study did not deal with children, inaccurate singers were part of the subject pool. Further research is warranted in this area to determine if inaccurate college-age singers demonstrate similar tendencies as inaccurate child singers. If that were the case, the subjects' attempts to match the octave of a model that was in a range that was uncomfortable for them could lead to greater frustration and less successful practice time. Subjects may be more successful at singing the exercises if this was accounted for in the development of the exercises, therefore giving them more successful experiences from which to draw when faced with developing this new skill.

Additionally, future research is warranted to determine the effect of the timbre of the model on students' success. In the present study, subjects were presented a female vocal model for work in class, and a non-vibrato piano timbre (MIDI) when practicing on the web page. The use of vibrato by the female vocal model was not determined. Yarbrough, Green, Benson, and Bowers (1991) and Yarbrough, Benson and Bowers (1992) determined that the timbre and vibrato of the model did effect the accuracy of children's singing performance. Children sang more accurately following a female model (1991), particularly a non-vibrato female model over a vibrato female model (1992). Determining the effect of timbre on college-age subjects, particularly elementary education majors, could provide useful information for future singing instruction.

As with the development of any skill, practice is an important aspect of improving sight-singing accuracy. As previous research has shown, guided practice can be even more effective in encouraging the development of new skills (Hurst & Milikent,1996; Johnson, 2000; Kostka, 2000; Rosenthal, 1984; Rosenthal, Wilson, Evans, & Greenwalt, 1988; Sehmann, 2000). However, it is the responsibility of the subject to actually practice. Though self-reporting was used in this study, this way of gathering information was inconsistent and questionable on its accuracy. In addition, a frequency count from the web site was used to determine the number of times each subject accessed the web pages. However, no information was available regarding the amount of time that each subject was on the web site, nor how much time they actually spent practicing the skill. Furthermore, the format of this data collection did not take into account the subjects that practiced together but were only able to access the web page using one students' name and password. Neither was the practice time of some control subjects who printed the provided exercises rather than continue to view them on the Internet considered.

In order to determine the use of practice time, a more detailed and reliable way of gathering information should be implemented. Even if the frequency count kept track of the specific amount of time the web site was in use, the researcher has no way of knowing how much of that time was actually spent in practice by the subject and how much of that time could have been spent being distracted by other things. Though it would be time consuming, perhaps subjects could be observed as they practice to ensure that the goals regarding the amount of time they practice as well as their focus during practice time are achieved.

By providing the guided practice via the Internet, the web pages were available to subjects in a number of settings. However, not all subjects were able to access each part of the web site with ease. Several subjects in the experimental group did not have computers with sound capabilities in their homes. Other subjects had older computers that made accessing a web page the size of some of those developed for this study difficult and time consuming. Though subjects had access to computers throughout the campus, they were reluctant to use these computers because of their public placement. Subjects expressed preference for practicing these skills in private. Smaller, more private, computer labs were used by several subjects during the course of the study, but the availability of these rooms was also inconsistent. While the Internet is an accessible form of communication in today's society, the restriction of access to the manipulative through this type of technology was a complication of the study. Many subjects were able to access the web pages and practice with relative ease and privacy, though others found that difficult to do. For this reason, future research in this area should account for this fact and provide the necessary equipment and environment to be used by the subjects.

The inclusion of a formal attitude assessment would be advantageous in studies of this fashion. Though a few subjects indicated an enjoyment of the web site, only generalized statements can be made about the attitude of the groups, regarding both the skill of sight-singing and the use of the web pages to practice. In this study, knowing the opinions of subjects would have been advantageous in determining what the subjects viewed as helpful in the areas of presentation and practice. Also, their opinions on what changes or improvements could be made to the practice web sites would have been helpful and welcomed.

Finally, it could be interesting to investigate the effect of this sight-singing strategy with a slightly different sample. For instance, this sample of elementary education majors included only female subjects. It would be worthwhile to determine if the effects were any different if males were included in the sample as well. While males were not specifically excluded from the present study, there were none enrolled in the sections of the course used in the investigation. However, there are males in the field of elementary education. So research including males is warranted. Additionally, it would be interesting to determine the effect of these strategies on subjects with no musical background. In the present study, the sample was determined by which students signed-up for the sections of the course used as subjects. Though it is to be expected that people with musical experience would be a part of a sample made up of elementary education majors, determining whether or not these strategies would have an effect on elementary education majors with no musical experience could be useful. By doing so, it would isolate the effectiveness of the manipulative rather than confusing the issue with the presence of prior training.

Conclusion

Though no significant difference was found between the two groups at the conclusion of the study, both groups improved significantly from their pretest performance. This indicates that sight-singing is a skill that can be developed in elementary education majors, and for many reasons, it should be a skill on which we focus. While sight-singing, students are able to focus on many different aspects of musical development, including reading and notating music, using a singing voice, maintaining a tonal center, and self-assessment. Also, previous research has shown that these future teachers will be more likely to incorporate music into their classrooms if they feel confident with the topic themselves (Byo, 1999; Kvet & Watkins, 1993). The use of Internet guided practice with aural modeling provided a way to aid in the development of these skills. Not only was it found to be non-detrimental, this medium provided a way for subjects to interact with an aural model while practicing their sight-singing. This study revealed an additional use of technology to accomplish a goal more efficiently than could be done without its use.

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APPENDIX A

CONSENT FORM

1. Study Title	The Effects of Internet Guided Practice with Aural Modeling on the Sight-Singing Accuracy of Elementary Education Majors
2. Investigators	The following investigators are available to answer questions about this study: Ms. Jessica Hall 225-709-6674 Dr. Evelyn Orman 225-578-9270
3. Purpose of the Research	The purpose of this study is to investigate the effects of guiding the sight-singing practice of elementary education majors through a developed web site on their sight-singing improvement and accuracy.
4. Subject Inclusion	Undergraduate students enrolled in two sections of MUS 2170: Music in the Elementary School at Louisiana State University during the Spring Semester, 2002
5. Procedures of Research	Subjects will complete a pretest in which they will be asked to sing a children's melody and sight-sing. Throughout the semester, sight-singing instruction will be given in class and subjects will be encouraged to practice out-of-class. Experimental subjects will be given access to the experimental web page containing sight-singing exercises and aural examples. Control subjects will be given access to the control web page containing only sight-singing exercises. Subjects will be evaluated based on their performance on two sight-singing tests given during the semester, and a posttest will be given at the completion of the study.
6. Potential Risks	There are no anticipated risks for participants.
7. Potential Benefits	This study may yield information regarding the effects of different practice strategies for sight-singing, as well as information about how to better prepare elementary education majors with musical knowledge and sight-singing skills.

8. Right to Refuse	Subjects' participation is entirely voluntary and they may withdraw consent and terminate participation at any time without consequence. Refusal to participate in the study will not exempt students from instructional activities associated with this course.
9. Protection of Confidentiality	Results of this study may be published, but no names or identifying information will be included in the publication. Subject identity will remain confidential unless disclosure is required by law.

I have been fully informed of the above-described procedure with all of its possible benefits and risks. All of my questions have been answered, and I may direct additional questions regarding study specifics to the investigators. If I have questions about subjects' rights or other concerns, I can contact Robert Matthew, chairman of the Institutional Review Board, 225-578-8692. I agree to participate in the study described above and acknowledge the investigators' obligation to provide me with a signed copy of this consent form.

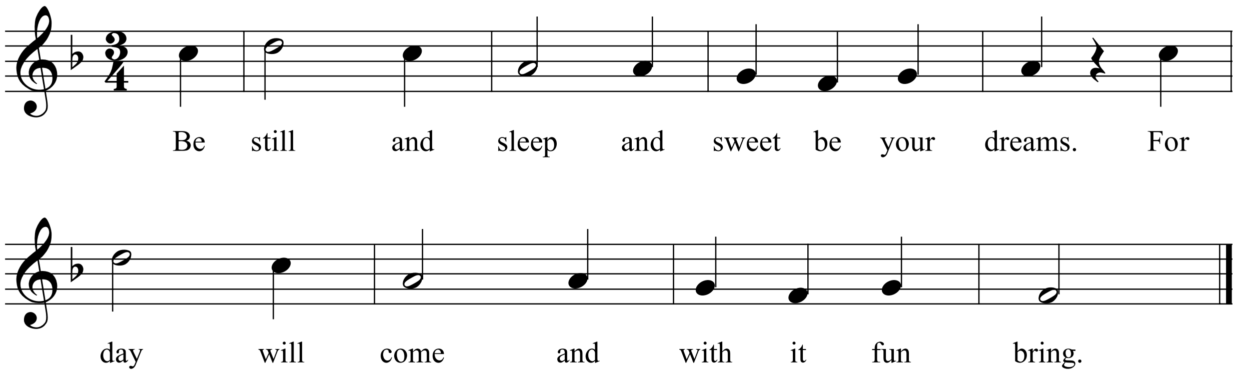
Name ____

Signature ____

Date ____

APPENDIX B

PRETEST



APPENDIX C

SELF-REPORT FORM

Name ______________________________________

Keep track of your sight-singing practice on the Internet using this form. Write down the date and list each page (solfege syllables/rhythm) you work on. Take note of how much time you spend on each individual page in addition to the total amount of time you spend practicing. Turn this form in along with your completed sight-singing test.

Date ______________________

Page Worked	Time Start	Time Finished
__________________________	___________________	___________________
__________________________	___________________	___________________
__________________________	___________________	___________________
__________________________	___________________	___________________

Total for Today ______________________

Date ______________________

Page Worked	Time Start	Time Finished
__________________________	___________________	___________________
__________________________	___________________	___________________
__________________________	___________________	___________________
__________________________	___________________	___________________

Total for Today ______________________

Estimated Total Practice Time ____

Signature ____

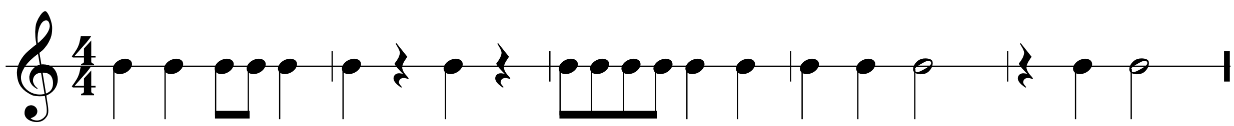
APPENDIX D

TEST 1

Name ______________________________ Date ________________________________

Say your name into the tape player and then audiotape yourself singing the exercises below in the order they are presented. Practice each one, then tape it. You may stop the tape in between exercises to practice. You may retape each exercise one time if you do not like your performance the first time. I will grade the second one unless you tell me otherwise on the tape. You may not go back and tape over anything. Slide this sheet under my door when you have finished taping.

1. You must do each of the items below:
   - Write the counts (1,2,3, etc) AND rhythm syllables (ta, ti ti, etc.) below each note below.
   - Practice off-tape and then tape yourself clapping and speaking the rhythm, using the rhythm syllables.



2. You must do the steps that are marked with a bullet. If you would like to do the others for partial credit, you may.
   - Write the solfege syllables above the melody.
   - Write the rhythm syllables underneath each note.

     Practice off-tape and then tape yourself clapping and speaking the rhythm.

     Practice off-tape and then tape yourself clapping and speaking the words.

     Practice off-tape and then tape yourself clapping and speaking the solfege.
   - Practice off-tape and then tape yourself singing the solfege in rhythm.
   - Practice off-tape and then tape yourself singing the song with words.

Music notation and text for *Plainsies, Clapsies*
were included in this space.

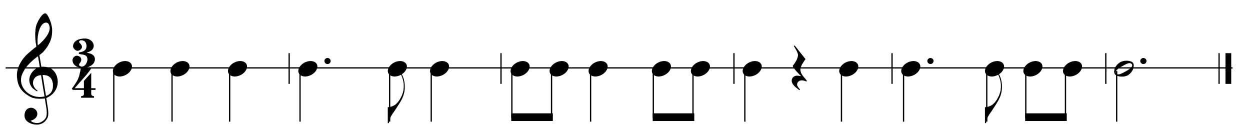
APPENDIX E

TEST 2

Name ______________________________ Date ________________________________

Say your name into the tape player and then audiotape yourself singing the exercises below in the order they are presented. Practice each one, then tape it. You may stop the tape in between exercises to practice. You may retape each exercise one time if you do not like your performance the first time. I will grade the second one unless you tell me otherwise on the tape. You may not go back and tape over anything. Slide this sheet under my door when you have finished taping.

1. You must do each of the items below:
   - Write the counts (1,2,3, etc) AND rhythm syllables (ta, ti ti, etc.) below each note below.
   - Practice off-tape and then tape yourself clapping and speaking the rhythm, using the rhythm syllables.



2. You must do the steps that are marked with a bullet. If you would like to do the others for partial credit, you may.
   - Write the solfege syllables above the melody.
   - Write the rhythm syllables underneath each note.

     Practice off-tape and then tape yourself clapping and speaking the rhythm.

     Practice off-tape and then tape yourself clapping and speaking the words.

     Practice off-tape and then tape yourself clapping and speaking the solfege.
   - Practice off-tape and then tape yourself singing the solfege in rhythm.
   - Practice off-tape and then tape yourself singing the song with words.

Music notation and text for *Donkey, Donkey* were included in this space.

VITA

Jessica Leigh Hall is a candidate for the degree of Master of Music in music education at Louisiana State University, where she served as a Graduate Teaching Assistant. While attending LSU, she was a member of the A Capella Choir and Chamber Singers. She also assisted the editor of the Journal of Research in Music Education, and taught MUS 2170: Music in the Elementary Classroom for three semesters. Ms. Hall received the degree, Bachelor of Music Education, in 2000 from Birmingham-Southern College in Birmingham, Alabama. At BSC, she was a member of the Concert Choir, served as a Vail College Fellow, student director of the Hilltop Singers, and was a member of the Collegiate chapter of MENC.

Jessica is a member of Pi Kappa Lambda, Music Educators National Conference, and American Choral Directors Association. Following her graduation, Ms. Hall plans to move to Birmingham, Alabama.