AN ABSTRACT OF THE THESIS OF

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Title: Computer Assisted Instruction in Aural Music Skills: An Experimental Study of the Effectiveness of Music Lab Series@ by Ronald Thomas and Gary Barber in College Basic Music Classes

Abstract approved: Terry Barber

This study evaluates the effectiveness of the Music Lab Series (MLS) software program written by Ronald Thomas and Gary Barber and distributed by Temporal Acuity Products as compared with a classroom-only approach for teaching sight-singing / ear-training skills. A control group, receiving only classroom instruction, is compared with an experimental group receiving classroom instruction and the MLS. Pre-tests and post-tests in rhythm, sight-singing, and solfege identification are analyzed for variance. Existing literature dealing with aural music skills (sight-singing and ear-training) is reviewed in chronological order. Though significance at the $p < .05$ level was not found, some significance was found at the $p < .10$ level.

Computer Assisted Instruction in Aural Music Skills:

An Experimental Study of the Effectiveness of

Music Lab Series by Ronald Thomas and Gary Barber

in College Basic Music Classes

A Thesis Presented to

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Chapter I: Introduction

The use of computer-assisted instruction (CAI) in music has had a quarter of a century to grow and develop. Chapell (1993) states:

> The computer in the music classroom is here to stay....Through the use of the computer, it is possible to merge all current classroom aides into one integrated learning system....The biggest benefit of the computer to education is the fact that the computer interacts with the student, something that has been done only by the teacher until now. (p. 6)

With the increasing technology available to children and young adults, students are expecting more sophistication in the modes of instruction. Not only do students expect to be taught, but they also expect education to be as instant as the society in which they live. David Marsh (1991), Assistant Dean of Curriculum for Academic Technology at Berklee College of Music, gives the idea of instant learning a not so futuristic sound. Marsh states:

You walk into class and turn on the computer. You type in your personal identification code and are automatically connected via high speed network to all the files in your home computer, your office computer, and a large database of examples generated by faculty who also teach this course. The computer also knows which class you are teaching, because it knows the day, time, and room, and has accessed the school's scheduling database, so it now connects you to your roll and grade books as well. With a few clicks of the mouse, you have taken roll, and attendance records for each student are automatically updated.

You begin talking about Beethoven's use of motivic development and want to use his Ninth Symphony as an example. A click of the mouse and the score is projected in front of the class. Another mouseclick and the music plays, the pages of the score automatically turning in synchronization with the music. After playing one section, you want to compare the use of a given motif with the way Beethoven uses it later in the piece. You click again and the next occurrence shows on the screen and then plays. A student says that this motif reminds her of a popular recording she once heard. You search the database and find two occurrences of popular recordings based on themes taken from Beethoven's Ninth. You audition a sound clip from each, and the student recognizes the second example as the recording she remembered. You click on the example and the sheet music appears and the recording plays. The class compares Beethoven's use of the motif to the popular version and makes observations about rhythmic variation and harmonic treatment. You also point out orchestration issues. A lively conversation ensues with students making critical judgment on each version....Next class, the students return with their disks, each in turn playing their project in satisfying the required task. You comment on their work dealing with aesthetic issues, and make helpful suggestions for improving each students project (as cited in Ozeas, 1991, p.27).

With the advent of CD ROM and computer networks, access to information has changed in numerous ways. However, before students and teachers can fully utilize this technological classroom, it must be proven that the use of computers in education is efficient and cost-effective and is not limited to crunching numbers and preparing good manuscript.

Purpose of the Study

Sight-singing is a basic and essential tool for the musician. Collins states:

> The use of the voice in this manner is basic to good musicianship for several reasons. The voice is the one instrument which is common to all musicians, it is the most readily accessible, and it is one sure way to demonstrate musical understanding. When students sight-read with wind or string instruments, a portion of their performance might be attributed to learned fingerings or positions. It may demonstrate some comprehension of the aural process, but it does not necessarily tell the listener if this performer has truly internalized the music. However, when students use the voice to demonstrate the relationship

between symbol and sound, a more accurate assessment of the student's aural comprehension can be made (as cited in Goodwin, 1990, p. 3).

Educators have examined the usefulness and feasibility of CAI in numerous areas of music instruction. Studies have compared the CAI approach vs. traditional classroom methods; competency-based methods vs. sequential learning methods; utilization of CAI as an alternative or supplement to traditional classroom methods; and the relative effectiveness of CAI in music. Due to increases in technology and a call for more results in less time with no increase in cost, research should continue in this area. With the increasing availability and decreasing cost of micro-computers, educators should be making every attempt to utilize them to enhance their educational programs.

Research has proven computers to be at least as effective as classroom methods in many areas of music training. Ozeas (1991) concluded that "the areas in which the computer functioned best were in teaching the skills which could be isolated and which required repetition" (p. 25). Skills that require repetition could be delegated to CAI, leaving the classroom teacher more time for presentation of materials. The Music Lab Series (MLS) by Ronald Thomas and Gary Barber used for this study does just that.

MLS isolates eight areas of sight-singing and ear-training for drill and practice. These eight modules are then broken down into 20 levels, each adding new materials or increasing in difficulty. The first module, Names, teaches students to relate pitches to a tonal center and to identify them singly and in combinations using solfege with a movable *do.* The second module, Notes, teaches the students to recognize the solfege names of notes on the staff in all major and minor key signatures, and also in both treble and bass clefs. The third module, Sing, aids students in accurately singing the pitches represented by solfege names. The fourth module, Echo, has three objectives: (1) to assist students in remembering the rhythms of the melodic phrases they hear; (2) to assist students in performing rhythmic passages accurately; (3) to acquaint students with the symbols and procedures of rhythmic notation.

The fifth module, Play, is similar to Echo except the students read the notes rather than repeat phrases from memory. The sixth module, Notate, helps students develop the ability to notate the values they hear. The seventh module, Write, is similar to Notate, except the students are asked to notate the correct pitches. The eighth module, Read, drills the students on singing musical phrases (Thomas and Barber, 1993, p. 13-25).

While some educators may still feel threatened by CAI, it has been in use long enough for most to realize that computers will never replace teachers. Calvo (1991) states "the computer may be the most revolutionary teaching tool in the educator's arsenal, but we can never replace the teacher" (as cited in Chapell, 1993, p. 6). As early as 1971, Suppes states: "I don't see the computer as an instructional device in competition with the teacher. The role of the computer is like the role of books: to amplify the skills and time of the teacher" (as cited in Vaughn, 1978, p. 35). Thomas and Barber (1993) state:

> With MLS as a primary source for acquisition of procedural skills of music literacy, the role of the teacher in the classroom changes. The teacher's responsibility is now far more slanted toward the higher level application and

expansion of skills rather than the basic drilling of music literacy skills.

> Consider that while the MLS teaches all the procedural component and synthesis skills involved in translating notes into sounds and sound into notes, the longest phrase dictated in the lab is three measures; there is no contrapuntal or part-singing; notational skills are not employed to record personal musical thoughts; and one does not sing or notate inner voices, even a bass line. These and other applications of procedural skills are the responsibility of the teacher in the classroom. It is only through practice in such real-life applications of literacy skills in the classroom that one develops a functional command of the language of his or her art (p. 3-4).

The earliest studies of computer-assisted instruction in music were conducted in the late 1960's. Since 1991, little new research can be found relating to CAI in music. With the advances of micro-computer and MIDI technology, new studies are needed. Many of the studies completed over the past 25 years could be replicated using more up-to-date equipment. The micro-computer is currently taking the lead as an educational computing tool. Mainframe computers, which had dominated the educational field till the late 70's, are costly. In addition, the software being written for micro-computers is more than adequate for educational purposes. The cost of setting up a computer music workstation has decreased enough to be a viable consideration for most schools. Many programs exist that utilize micro-computers for teaching different aspects of music.

Compiling a list of currently available programs for teaching music could be another worthy research project.

The current study utilizes the Music Lab Series (MLS) written by Ronald Thomas and Gary Barber and distributed by Temporal Acuity Products. It is being used as a part of the music theory program at a mid-sized Midwestern university. The study examines the effectiveness of two different treatments using MLS to that of more traditional classroom techniques in the teaching of beginning sight-singing. The study will examine the use of MLS as a supplement to more traditional methods, and will further examine the effectiveness of MLS as a substitute for classroom methods. An opinion survey analyzes the student responses to the MLS program and classroom approach. The results of this study may offer productive ways of utilizing the MLS program in college music theory and basic music classes.

Definition of Terms

Basic Music - a college course in music fundamentals, usually taken by elementary education majors in preparation for elementary music methods

CD ROM - a compact disk on which computer data can be stored and accessed

Competency-based learning - progression through instructional materials as mastery is achieved. Assessed through testing.

Pitch extractor - a computer peripheral which accurately determines the pitch of vocal and instrumental sounds.

Sequential learning - progression through instructional materials at a pre-determined pace without assessment of mastery.

Mastery Learning - progression through instructional materials as mastery of each level is determined by some testing device.

MIDI - musical instrument digital interface.

Chapter II: Review of Literature

Historical Review

This historical review offers a chronological look at the studies and major events in the development of CAI in music. One of the first applications of CAI in music was completed at Stanford University in 1967. A pitch extractor device was developed and used to judge the accuracy of melodic patterns sung into a microphone. Von Feldt (1971), in an early study, compared CAI with traditional classroom methods in teaching fundamentals of notation to seventh-grade students.

In the early 1970's, the University of Illinois' PLATO (Programmed Logic for Automated Teaching Operation) computer-assisted instruction system was used by Placek to conduct a study with prospective elementary teachers. Placek (1974) designed and programmed lessons in rhythm for the teachers to use. Thompson (1973) designed and tested a CAI sight-singing aid in which a computer generated phrases of equal-note rhythms. Students were able to control difficulty level. In 1974, CAI was established as a part of the university curriculum at Stanford. Much of Stanford's use of CAI consisted of "drill and practice" modes (Kuhn, 1974).

Between 1975 and 1978, Fred Hofstetter, a teacher at the University of Delaware, used GUIDO (Graded Units for Interactive Dictation Operations). This system was named for Guido d'Arezzo, an eleventh century monk who developed a systematic method of teaching sight-singing. GUIDO was originally developed as a way of analyzing learning patterns in aural training (Hofstetter, 1975).

In August of 1975, representatives from eleven universities met on the campus of the University of Delaware and formed the National Consortium for Computer-Based Musical Instruction (NCCBMI). The purposes of the Consortium were to provide a means of exchange of ideas for CAI in music, to establish and maintain a library of musical courseware, reduce redundancy in research in CAI, and offer consultation to new users of CAI (Hofstetter, 1976).

In the late 1970's the University of North Texas implemented a CAI system to serve its 600 undergraduate music theory students. AMUS (Automated Music System) incorporated all aspects of basic music theory - ear-training, sight-singing, keyboard, part-writing, and analysis. Ottman (1980) states:

> The object of our CAI program is to correlate, support, and reinforce the students' classroom experience.... Aural concepts are most effectively presented in the classroom, with student competence and mastery developed through individualized CAI. The classroom instructor brings his broad understanding of music to bear upon the learning process and demonstrates the relevance of aural skills to music literature and its performance and understanding. Student competence can then be furthered through a CAI system modeled on the curriculum explored in the classroom (as cited in Eddins, 1981, p. 11).

A vital part both of GUIDO and the AMUS was the saving, storing and processing of student response data. New research possibilities in the areas of musical perception, learning styles, and curriculum development became available due to the data that could be collected.

At the University of Canterbury, Christchurch, New Zealand, Lamb and Bates (1978) developed an interactive system that aided both the teachers and students. By analyzing the problem areas of students who used the system, teachers were able to develop modules specifically designed to target those areas. Once a module had been developed for one student, it could be used by any student who needed it.

In 1978, Vaughn studied the effectiveness of CAI as compared to traditional instruction in teaching ear-training. In 1979, Parker compared use of the TAP Master, a device designed to teach rhythm, with traditional classroom techniques. An interesting conclusion drawn from this study was that isolating and drilling one aspect of sight-singing (rhythm) could improve overall sight-singing ability. Humphries (1980) studied the effects of drill time on learning identification of intervals. Four groups were assigned differing amounts of time with the computer-assisted drills.

In 1981, Hofstetter examined computer-based recognition of perceptual patterns and learning styles in rhythmic dictation. He states that the purpose of the research was as a starting place for further inquiry into how aural skills are acquired. Using the GUIDO system, Hofstetter evaluated the response data of freshman music majors as they worked through units in the rhythmic dictation exercises. The data revealed perceptual patterns and learning styles common to both simple and compound meter. Hofstetter states "it is eventually hoped that as knowledge accumulates through this process of experimentation, a cognitive model of how students learn to conceptualize the music they hear can be developed" (p. 265-266).

Taylor (1982) studied the effectiveness of a CAI melodic dictation program as compared to classroom melodic dictation. The program MEDICI (Melodic Dictation Computerized Instruction) analyzed a student's current skill level, presented the appropriate instructional materials, evaluated the student's performance, and kept records of student progress. Lemmons (1984) developed and studied a CAI aid to reinforce melodic memory. The study was designed to extend the number of notes perceived as a unit and to encourage reading ahead. The study, conducted with wind instrument players, was concerned with aural perception skills. Jacobsen (1986) studied the effectiveness of CAI in teaching music fundamentals to elementary education majors.

In 1990, Goodwin studied the effectiveness of Pitch Master compared to traditional classroom methods in teaching sight-singing to college music students. Dalby (1992) studied the effects of a computer-based training program for developing harmonic intonation discrimination skills. Chapell (1993) studied the effects of CAI in aural acuity of seventh-grade instrumental music students. In the last ten years few studies have been completed in the area of CAI in sight-singing and rhythm instruction.

Synthesis of Procedures and Conclusions

The majority of existing research in CAI has dealt with comparisons of CAI with traditional classroom methods. CAI was administered to experimental groups and traditional methods were administered to control groups. Most studies used pre-test /

post-test methods to gather data and conclusions were then drawn based on statistical analysis of that data.

It is interesting to note that of the studies examined, only one, Goodwin (1990), mentioned a discrepancy in all previous studies that needed to be addressed. No attempt was made by any of the studies comparing CAI with traditional classroom techniques to define "traditional classroom," even though it was a principle variable. In each study the investigator assumed the classroom situation used was representative of a "traditional classroom." This researcher was also unaware of the assumption being made until clarified by Goodwin's revelation.

A study by Collins (1979) evaluated the current trends of teaching sight-singing in American colleges and universities and revealed interesting patterns. Of particular interest to the author's study were those that may explain why no investigator was able to adequately define "traditional classroom." Those conclusions were:

1. There was no standard concerning sight-singing skill. Competencies varied from institution to institution and within institutions.
2. Moveable *do*, numbers, and neutral syllables were named most often as methods used in sight-singing drill.
3. Most sight-singing activity included isolated drill patterns using solfege or numbers in triads and songs.
4. Sight-singing classes sang individually, in groups, and in two or more parts.
5. The piano was used more than any other medium to give pitch.
6. "Out of class" preparation included vocal drills and specific assigned melodies.

With the ambiguities of instruction in sight-singing, it is obvious that defining a "traditional classroom" would be difficult (as cited in Goodwin, 1990).

CAI vs. Traditional Classroom Methods

In studies that compared CAI to traditional classroom methods, the treatment period varied from as little as 240 minutes over six weeks to 810 minutes over nine weeks. As might be expected, the longer times produced the most significant results. Chapell (1993) used a treatment period of two ten-minute sessions per week for a total of five weeks. Her research showed no significant gains between mean scores of the experimental and control groups. She concluded that "it appears that the pitch discrimination skills should be developed over a more extended period of time than the present study allowed" (p. 37).

In the study conducted by Ortner (1990), the experimental group was asked to reinforce its classroom studies a minimum of 40 minutes per week for six weeks with The Magic Piano, a computer program in rhythm. Ortner found no significant differences between the control group and the experimental group on the post-test. He further found no significant differences on the post-test between students scoring high, middle, or low on the pre-test. He concluded that "the time span of the current study (six weeks) may have been too short a period for large enough learning gains" (p. 96). He states that "a few students in the experimental group did improve their rhythm reading skills beyond their instructor's expectation, indicating that while computer assisted drill may not help all students, it may help some" (p. 96).

Goodwin (1990), in comparing the effectiveness of the TAP Master to traditional classroom methods, used a treatment period of seven and one-half weeks. Students in the experimental group left class the last 20 minutes two times per week and worked with the program, while the control group stayed in the class and worked with the instructor on the same materials. He concluded that the TAP Master was more effective in developing sight-singing skills than the traditional classroom method.

An earlier study utilizing the TAP Master was completed by Parker (1979). Parker's treatment period was six weeks. He selected two experimental groups and two control groups. One set was first-year students, while the second set was second-year students. The experimental groups left class for five 15-minute sessions per week with the program. The control groups stayed in the class to work with the instructor on the same materials. He concluded that the TAP Master was an effective tool for teaching basic sight-singing skills to first- and second-year music students at the college level. He also concluded that the years in college had no bearing on adjusted gains. He noted no significant difference between high and low skills levels and achievement.

In the study by Ozeas (1991), students in a first semester solfege class were "assigned to either the experimental group, using the computer program one day a week (50 minutes) in addition to the two days spent in the classroom, or to the control group which met for three days in the classroom" (p. iii). The treatment lasted for 12 weeks. An interesting finding emerged after the first five weeks of class. Ozeas states:

> After the first five weeks of the study, the students in the control group scored higher on all but one of the measures of achievement. During the remainder of the semester, however, the two groups began to show less difference. The final test showed no significant difference in the ability to identify or sing intervals between the students in the two groups. The slower progress initially by the experimental group may have been due to the necessity of becoming familiar with the computer technology and electronic timbre (p. 102-103).

This study also concluded that:

> When the groups were divided by placement test scores with students who scored 40 or above in the high section of both the control and experimental groups and those who scored below 40 in the low sections, there was a dramatic difference between the control and experimental groups. It would appear that those students who enter the course with strong aural skills will learn the prescribed material from either presentation. Those students who had weak aural skills at the time of entry made significantly more progress when taught in the classroom with a teacher who was able to adjust instruction to their specific needs and who provided reinforcement for their achievement. The support of others in the class, and the knowledge that they were not alone in experiencing difficulty, were also possible sources of reinforcement (p.103).

In a study conducted by Dalby (1992), students in the experimental group worked two times per week for 45 minutes for a treatment period of nine weeks. The experimental group worked with a program designed by the researcher. The program was designed to teach harmonic intonation discrimination. Dalby concluded that the CAI treatment was effective in teaching harmonic intonation skills. He states that the CAI approach "makes it possible to provide intonation training without impinging on precious classroom time" (p. 151). He further states that "the results of this investigation support the idea that such training may assist in the development of crucial musical skills often left largely to chance" (p 151). He noted that high ability students spent more time with tuning exercises and quizzes than did medium and low ability students and that accuracy was higher during quizzes than during regular exercises.

With the exception of the study by Ozeas, all of the studies proved CAI to be at least as effective as traditional classroom techniques. It appears that the longer the students work with the given CAI program, the better the results.

Review of Competency-Based Studies

Two studies reviewed dealt specifically with competency-based use of CAI. Fred Hofstetter and Michael Arenson, both faculty members at the University of Delaware, began to experiment with a competency-based approach to CAI in ear-training. Both researchers utilized GUIDO, Hofstetter - with music majors and Arenson - with non-music majors. The experiment was conducted for two semesters. During the first semester all students used the GUIDO system for a minimum of one hour per week and proceeded through the program at their own pace. At the beginning of the second semester a pre-test was given to all the students. Students were then divided into control and experimental groups. The control groups continued with the program at their own pace. The experimental group proceeded through the same materials, but in a competency-based format, where a four-second time limit was given for response time. Any answer not made within that time was counted as incorrect and a competency level of 90% had to be achieved before progressing to the next level.

Hofstetter (1979) concluded the students in the experimental group achieved significantly higher scores than the students in the control group. He further concluded:

> The competency-based approach led to a much better use of the students' time than did the sequential approach. Students in the competency-based group spent less time on the beginning units and more time on the difficult units, whereas student time in the sequential group was more evenly distributed among all of the interval units (p. 225).

Arenson (1979) concluded there was no significant difference between the experimental and control groups. He states "it appears that for non-major students, the different instructional formats did not make any difference in aural-perceptual skill development" (p. 234). An interesting note in his study was of the twenty-seven students in the experimental group, only one finished all the units required for the course while fifteen out of twenty-five students completed the material in the control group. Arenson suggested that, for non-majors who would naturally be less secure in this area, the four-second criteria for responding was not likely to "insure feelings of self-confidence even in the best of students" (p.235).

Arenson (1979) offered this thought to the problem of ear-training for non-majors:

> The learning of even the most basic aural-perceptual skills required a great deal of drill. In the ear-training course for majors, such time is difficult to find in the classroom because the teacher must spend most of the available class time in sight-singing and in teaching students proper techniques for listening. In the non-major course, where so much of the class time is spent by the student learning written skills, drill work is virtually impossible. In the case of both majors and non-majors the drill must occur outside of the classroom (p. 230).

Both Hofstetter (1979) and Arenson(1979) concluded that the manner in which the competency-based tests were administered could increase its effectiveness. In their studies the computer constantly kept scores for the students and moved them ahead to the next unit when they met the competency. The researchers suggested this led to the students' feeling as if they were always being tested, whether they were ready or not. They felt a less frustrating approach would be for the students to use the system in a "drill and practice" mode until they felt secure enough to test.

Although the competency-based approach was successful for the music majors, Hofstetter (1979) felt that in order to alleviate some of the students' frustrations with the approach, the students' needed to understand that the competency-based approach would, in the end, build stronger skills. Arenson (1979) felt the frustration level of the non-majors negated the success of the competency-based approach.

Relative effectiveness of CAI in music

Studies of the relative effectiveness of CAI in music involved the development and trial of a program in CAI or evaluating the effectiveness of a pre-existing program. Placek (1974) designed and tested a computer-assisted lesson in rhythm using the TUTOR language and the PLATO III system at the University of Illinois. His objectives for the lesson were: "(1) The student can demonstrate a knowledge of the function of basic rhythmic notation, and (2) the student can demonstrate a knowledge of the relation of rhythmic notation to aural rhythmic patterns" (p. 13). He interviewed each participant after each session to get general attitudes about the program. Although students felt that certain messages of the audio output were transmitted poorly, generally, they found the lessons enjoyable and valuable.

Vaughn (1978) studied the effectiveness of CAI in teaching the ear-training portion of a Basic Musicianship class. He wanted to evaluate the adaptability of CAI for use in ear-training reinforcement. He concluded:

> Computer-assisted instruction was a better medium than the traditional classroom for the teaching of the ear-training skills found in basic musicianship. Analysis showed that significantly more growth occurred when students utilized

> Prior to the competency based treatment in the experimental group, the students in both groups were in basic agreement on the questions. They agreed that PLATO was an enjoyable learning experience, and that the instructional variables were set just right for them.... On the post-test their opinions were very similar to those expressed on the pre-test. However, on the post-test there were two questions in which a marked difference in students response was found....
>
> The competency-based students expressed opinions which were totally unanticipated. In response to question #8, the competency-based students reported a much higher level of frustration than did the sequential control students. Seventy-five percent of the competency-based students agreed that they were frequently frustrated, whereas only twenty-five percent of the sequential students agreed with that statement.... Sixty-six percent of the competency-based students agreed that they found themselves just trying to get through the materials rather than trying to learn, whereas none of the sequential control students had this feeling (p. 223-225).

When Hofstetter (1981) met with the student council of music majors to ask if the students would like to have the competencies either lowered or done away with entirely, even though the students found the competencies frustrating, "it was the unanimous feeling of the council that the competency-based mastery learning model should be continued" (p. 52).

Ozeas (1991) reported that eighty-nine percent of the students enjoyed working with the computer. The students felt the computer's best features were that it provided constant drill on material requested and that it was self-paced. The students listed the worst feature as timbres that didn't sound like familiar instruments.

Vaughn (1978) summarized his student's attitudes in this ways. The use of synthesized sound did not hinder ability to correctly identify the audio examples used in the program. The student's work load was not appreciably increased, nor was it difficult to adjust work habits. The program did not detract from the study of music, and preference was shown for use of computer materials in future classes. The materials were a valuable addition to the basic musicianship class, and did not depersonalize instruction. The computer made efficient use of time, and in some cases, was superior to the regular classroom experience.

Review of Recommendations for Further Research

Most researchers recommended that their research be replicated with different samples. If similar results were found, both studies would gain credibility. If differing results were found, a need for further research would be the result.

Ozeas (1991) states that "in general less research has been done on the effects of computer-aided instruction in music than in other subjects" (p. 26). Ozeas gave another good reason for further research in CAI as applied to aural music skills. She states:

> The inability of entry level college students to sing and aurally identify and label melodic intervals leads to their inability to sight-sing and to take melodic and harmonic dictation. These skills are basic to the study and performance of music, and without them students are forced to rely on an instrument, usually piano, to know what something "sounds like." The process of learning new music becomes both dependent and labored. The performance of atonal contemporary music is almost impossible (p. 5-6).

Goodwin (1990) recommends that when comparing a particular CAI treatment with the traditional classroom method, it is the responsibility of the researcher to define a traditional classroom by:

> Reviewing pertinent literature and preparing a list of student activities and teacher behaviors which are apparent. The list of activities/behaviors should then be put in survey form and distributed to a broad sample of teachers and students in the specific kind of activities. The responses should give a picture of the kinds of activities/behaviors that are actually present in the existing classroom, and the extent to which each is used (p. 128).

Humphries (1980) and Parker (1979) recommended research into optimum drill time. Parker suggested research into the effects of melodic drill on the total sight-singing experience. Chapell (1993) suggested using several different programs in CAI to enhance total sight-singing ability and to reduce boredom. Ozeas (1991) recommended further study to determine if CAI in music would be best used as a supplement to traditional instructional methods. Jacobsen (1986) also suggested study of CAI programs as a supplement to traditional methods and states that, in his study "the instructors of the course reported that the CAI method might be of more benefit if used in an ancillary fashion" (p. 81). Expanding the time span of studies, while sometimes cost prohibitive, is listed by several researchers as a variable in future research (Gross and Griffin, 1982; Killam, 1984; Ortner, 1990; Chapell, 1993). Research into the transfer of learning and learning styles are suggested by Hullfish, 1972; Hofstetter, 1981; Willett and Netusil, 1988; Ortner, 1990; Goodwin, 1990; and Hoffmann, 1991. Further research in all aspects of CAI in music is recommended by all the studies examined.

Chapter III: Design of the Study

Objectives and Limitations

The objectives of this study are to examine the effectiveness of the MLS program to teach sight-singing to Basic Music students. This study will compare the effectiveness of classroom methods alone with classroom methods supplemented by the MLS program. It will also examine whether MLS can substitute for classroom methods in teaching sight-singing to Basic Music students. This study is limited to students enrolled in Basic Music at a mid-sized Midwestern university in the spring of 1995.

Question to be Addressed by Study

Are there differences in achievement between students receiving only classroom instruction in sight-singing and those receiving the same classroom instruction and 30 minutes per week, working with the MLS computer program, and those receiving only 90 minutes per week working with the MLS computer program?

Hypotheses

The following null hypotheses apply to this study:

1. There will be no difference in the mean gains scores for rhythmic accuracy of those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in

sight-singing and those students receiving only computer instruction in sight-singing.

2. There will be no difference in the mean gains scores for solfege accuracy of those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing and those students receiving only computer instruction in sight-singing.
3. There will be no difference in the mean gains scores for sight-singing accuracy of those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing and those students receiving only computer instruction in sight-singing.
4. There will be no difference in the mean gains scores for singing rhythmic accuracy of those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing and those students receiving only computer instruction in sight-singing.
5. There will be no difference in the mean gains scores for singing solfege accuracy of those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing and those students receiving only computer instruction in sight-singing.

6. There will be no difference in the mean gains scores for singing pitch accuracy of those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing and those students receiving only computer instruction in sight-singing.
7. There will be no difference between the means scores for dictation between those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing.

The Design

The experiment was designed as a two-way analysis of variance. The independent variable was the group assigned. The dependent variables are rhythmic accuracy, melodic accuracy, solfege identification accuracy, and melodic dictation accuracy.

The Subjects

The study was conducted using students from the Basic Music courses at a mid-sized Midwestern university during the Spring of 1995. This course is an introductory music course for elementary education majors. A demographic survey was given to assess the students' previous musical and computer experience (Appendix B).

Instruments of Measurement

The Tests

A pre-test and post-test were designed by the researcher and juried by faculty advisors for bias. The first testing designs were determined to be both biased to the experimental groups and too long. After revisions, the test was shortened and the bias was eliminated.

The final pre- and post-tests had three sections. The first section was a rhythm test in which the students were asked to count off one measure and clap the rhythm of each line (Appendix F). The second section was a melody test in which the students were asked to sight-sing two melodies using solfege (Appendix F). Students not familiar with solfege, were asked to use a neutral syllable. The third section of the test was a solfege identification test in which the students were asked to identify, with movable *do*, the solfege for several key signatures (Appendix G).

A separate dictation post-test-only test was developed by the researcher for administration to the control group and experimental group #1(Appendix I). Since experiemental group #2 never received instruction in dictation it was not given to them.

Scoring Procedures

The rhythm section was scored by counting the number of rests and notes to be performed and assigning each one point. If a student clapped on the given note, he was given the point. If he clapped during the rest, he was not given a point.

The melody section was scored on three levels: (1) rhythmically, a point for each note or rest to be performed; (2) pitch accuracy, a point for each pitch to be sung; (3) solfege accuracy, a point for each solfege syllable to be sung. These scores were combined to make a composite melody score. The solfege section was scored for correct solfege usage, one point for each solfege syllable. An interesting development in this test was that one student who took the pre-test was quite confused by the concept of movable *do* since he had learned a fixed *do* system. This was taken into consideration, but this student didn't finish the study. The dictation test was scored on two levels, first, rhythmically, one point for each correct rhythmic element, second, pitch accuracy, a point for each correct pitch.

Testing Procedures

All the students were scheduled for fifteen-minute pre-test times with the researcher. Scripts for administering the tests were utilized to ensure uniformity in testing procedures (Appendix C). During that time, students were given sections one and two, rhythm and melody, of the test. Sections one and two were audio recorded, using a Califone Electronic Echo cassette recorder and a HM-700B Dynamic Microphone for later evaluation. Section three, solfege identification, was a written test given to the group as a whole with a three-minute time limit. The procedures for the post-tests were the same as the corresponding pre-tests.

A dictation test was given to the control group and experimental group #1 after the students had been given two lectures and practice dictation exercises. The melody was played six times at a moderate speed with a thirty-second delay between playings.

Scoring of the rhythmic and sight-singing tests was done using trained graders. A grading sheet was utilized to aid in scoring those tests (Appendix H).

General Procedures

Students were randomly assigned to one of the three groups. The first group, the control group, received only classroom instruction and individual practice with the classroom materials. The second group, experimental group #1, received classroom instruction and computer-assisted practice. The third group, experimental group #2, received only computer-assisted drill and practice.

Control Group Procedures

The control group received 60 minute class lectures once a week for seven weeks. They were asked to spend 30 minutes a week outside of class practicing the classroom materials. As with traditional sight-singing and ear-training classes, there was no method for monitoring student practice outside the class.

Experimental Group #1 Procedures

Experimental group #1 received 60-minute class lectures once a week for seven weeks. They were asked to spend a minimum of 30 minutes each week working with the

MLS computer program in the computer lab. The computer kept track of the amount of time the students spent working with the MLS program.

Experimental Group #2 Procedures

Experimental group #2 was asked to spend 90 minutes each week with the MLS program for the length of the study. The computer kept track of the amount of time the students spent working with the MLS program.

Classroom Instructional Methods and Materials

Classroom Materials

The materials used for the class were designed by the researcher to teach concepts corresponding to the first four levels of the advanced version of the MLS program (Thomas and Barber, 1993). The concepts were broken down into chapters roughly corresponding to those four levels.

Table 1

Pitch Elements in Music Lab Series

LEVEL	MODE	PITCHES	KEYS	CLEF
1	Major	*ti do re mi*	F	Treble
2	Major	*sol ti do re mi*	add A C	Treble
3	Major	*sol ti do re mi fa*	add F# Ab C#	Treble
4	Major	*sol la ti do re mi fa*	add E Eb G Gb	Treble

Note. From The Music Lab; Excerpts from Teacher's Manual (p. 28) by R. Thomas and G. Barber, 1993, Bellevue, WA: Temporal Acuity Products

Chapter one contained the pitch elements of *ti, do, re*, and *mi* and used the key of F major in the treble clef. The rhythmic elements of chapter one included quarter notes and quarter rests in 4/4 meter.

Chapter two added the pitch element of *sol* below *do* and the keys of A and C major in treble clef. The rhythmic elements now included the half note and the half rest in 4/4 meter. This chapter continued to emphasize materials from chapter one.

Chapter three added the pitch element of *fa* above *do* and the keys of F#, Ab, and C# major in the treble clef. This chapter introduced the rhythmic concept of beamed eighth notes in 4/4 meter. Concepts found in chapters one and two were continued.

Chapter four added the pitch element of *la* below *do* and the keys of E, Eb, G, and Gb major in the treble clef. With this addition the solfege represented was *sol, la, ti, do, re, mi* and *fa,* or all the diatonic solfege syllables. Chapter four introduced the concept of eighth notes beamed in sets of four. It also combined all materials from previous chapters.

Classroom methods included rhythmic exercises, solfege identification exercises, pitch and solfege exercises, interval singing using solfege, melodic dictation, and melodic sight-singing. This was implemented in whole class and small group situations. An important point brought up by Goodwin (1990) was that no previous study had successfully defined "traditional" classroom methods. This researcher has made no effort to define the "traditional" classroom, as the work involved in doing that according to Goodwin would constitute a work of significance in its own right. Having said that, this researcher makes the following disclaimer. Drawing from the limited experience of this researcher, the classroom methods employed for this study were based on the classroom experiences of the researcher over eight semesters at three Midwestern universities.

Chapter IV: Results of Study

Statistical Procedures

A two-way analysis of covariance (ANCOVA) was used to analyze the data. The group assigned was the independent variable, with the post-tests used as the dependent variable. Using Minitab for Windows and SPSS on a university's main frame computer, the results of the pre and post-tests were analyzed.

The rhythm test was scored by assigning one point for each element performed correctly. The melody test was a composite test of pitch, rhythm, and solfege, with each element being assigned one point. The singing pitch was taken by giving one point for each pitch element correctly sung during the melody test. The singing rhythm was taken by giving one point for each rhythmic element correctly performed during the melody test. The singing solfege was taken by giving one point for each correct solfege element during the melody test. The solfege test was scored by giving one point for each correct solfege identification on a written test. The dictation test was scored by giving one point for each correct pitch and one point for each correct rhythmic element. The total was a composite score for the rhythm, melody, and solfege tests.

After collecting the final data, group 1 (classroom and individual practice) numbered 7; group 2 (classroom and computer practice) numbered 8; and group 3 (computer practice only) numbered 4. It was decided that due to the small number in group 3, it would be eliminated from the statistics pool and a comparison of only the post-test means in group 1 and group 2 would be performed.

Homogeneity between groups was determined by running t-tests on the pre-tests. No significant difference was found between the groups. To strengthen the analyses, the pre-test scores for each of the dependent variables were included in the analysis as the covariate. Separate analyses of covariance were performed on each of the dependent variables with the pre-test scores as the covariate to compare the pedagological benefits of the classroom vs. classroom and computer treatment.

Data

The data for the post tests means and standard deviations is listed in table 2.

Table 2

Table of Means (M) and Standard Deviations (SD) by Groups

Source	n	M	SD
Rhythm			
Group 1	8	16.25	3.808
Group 2	7	19.143	1.464
Melody			
Group 1	8	32.62	13.17
Group 2	7	46.86	11.71
Singing Pitch			
Group 1	8	6.625	5.449
Group 2	7	11.286	6.157
Singing Rhythm			
Group 1	8	11.000	6.676
Group 2	7	17.000	5.972
Singing Solfege			
Group 1	8	15.000	4.811
Group 2	7	18.571	1.134
Solfege			
Group 1	8	20.758	5.825
Group 2	7	19.000	7.234

Table 2 cont.

Table of Means (M) and Standard Deviations (SD) by Groups

Source	n	M	SD
Dictation			
Group 1	8	22.000	8.701
Group 2	7	22.714	10.499
Total			
Group 1	8	69.62	17.04
Group 2	7	85.00	18.35

Figure 1 graphically shows the results of the post-test means. While it appears that the experimental group is achieving ahead of the control group this advantage does not show significance when analyzed by the covariate of the pre-test scores.

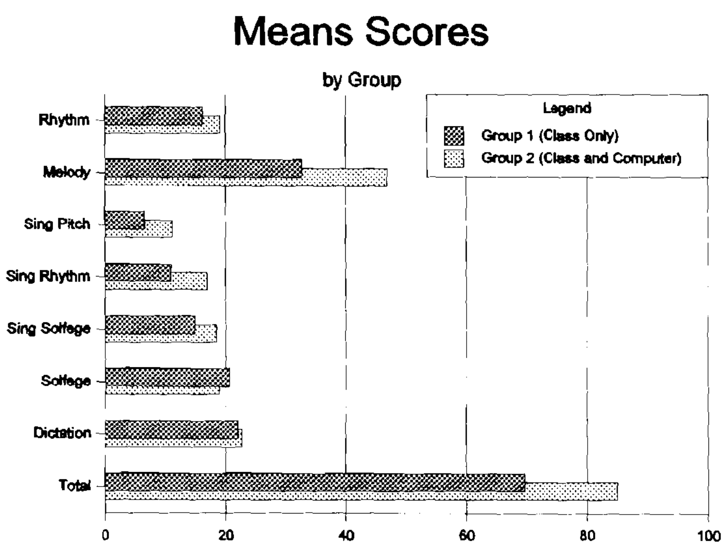

Figure 1

The data for the analysis of covariance of post-test scores by groups with pre-test scores is listed in Table 3.

Table 3

Analysis of Covariance

	DF	MS	F
Rhythm			
Group	1	32.35	.067 *
Covariate	1	18.73	.151
Residual	12	7.97	
Melody			
Group	1	396.71	.087
Covariate	1	669.12	.32
Residual	12	113.97	
Singing Pitch			
Group	1	16.54	.406
Covariate	1	167.32	.018
Residual	12	22.33	
Singing Rhythm			
Group	1	87.58	.147
Covariate	1	88.20	.146
Residual	12	36.48	

Table 3 cont.

Analysis of Covariance

	DF	MS	F
Singing Solfege			
Group	1	46.21	.096
Covariate	1	.18	.912
Residual	12	14.13	
Solfege			
Group	1	57.84	.219
Covariate	1	139.60	.067
Residual	12	34.32	
Total			
Group	1	81.82	.465
Covariate	1	2420.88	.001
Residual	12	143.82	

Note *p < .10

The data for post-test means were also analyzed by gender and those results are listed in table 4.

Table 4

Post-test Means by Group and Gender

	Male			Female		
Source	n	M	SD	n	M	SD
Rhythm						
Control	3	18.0	2.0	5	15.2	4.4
Experimental	2	18.0	2.8	5	19.6	0.5
Melody						
Control	3	35.0	14.4	5	31.2	13.9
Experimental	2	42.5	23.3	5	48.6	7.5
Singing Pitch						
Control	3	8.3	7.2	5	5.6	4.7
Experimental	2	8.5	12.0	5	12.4	3.9
Singing Rhythm						
Control	3	9.0	9.5	5	12.2	5.3
Experimental	2	15.0	11.3	5	17.8	4.3
Singing Solfege						
Control	3	17.7	2.3	5	13.4	5.4
Experimental	2	19.0	0.0	5	18.4	1.3
Solfege						
Control	3	23.7	0.5	5	19.0	7.0
Experimental	2	20.0	5.7	5	18.6	8.4

Table 4 cont.

Post-test Means by Group and Gender

		Male			Female	
Source	n	M	SD	n	M	SD
Dictation						
Control	3	30.0	3.0	5	17.2	7.1
Experimental	2	20.5	13.4	5	23.6	10.8
Total						
Control	3	76.7	15.7	5	65.4	18.0
Experimental	2	80.5	31.8	5	86.8	15.4

The MLS program kept track of the time students spent working in the practice mode. According to the data reported by the program the experimental group spent an average of 23.4 minutes per week working with the program. Several of the students spent time in the quiz mode of the MLS period. During quizzing the computer does not keep track of time spent. Since several of the students passed several quizzes it can be assumed that more time was spent each week by the experimental group than reflected by the computer.

The data for the demographic survey is listed in Table 5. Of particular interest is the musical experience of the experimental group. The experimental group's musical experience was twice as great as that of the control group. This may also have affected the post-test means and is likely responsible for the higher scores on the post-test for the experimental group.

Table 5

Demographic Data by Group

Source	Control	Experimental
Age	24.6	19.7
Year in School	1.75	1.85
Music Experience	6.0	13.3
Computer Experience	2.1	1.3

Note. Year in school was freshman = 1, sophomore = 2, junior = 3, and senior = 4. Music experience was calculated by number of years of musical experience previous to this study. Computer experience was 0 = no experience, 1 = little experience, 2 = some experience, and 3 = lots of experience.

The results of the opinion survey are listed in Appendix J. The results from experimental group #2 are included to compare their experience with that of experimental group #1.

Chapter V: Conclusions and Recommendations

Statement of the Problem

This study was designed to evaluate the effectiveness of the Music Lab Series by Ronald Thomas and Gary Barber. MLS is a drill and practice program for teaching sight-singing and ear-training skills. This study compared the effectiveness of a classroom approach, in which the students supplemented the classroom time with individual practice time utilizing the same materials used for class, with a classroom approach in which the students supplemented the classroom time with drill and practice time with the MLS program.

Null Hypotheses

After removing experimental group #2 the null hypotheses were as follows:

Fail to reject; 1. There will be no difference in the mean gains scores for rhythmic accuracy of those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing.

Fail to reject; 2. There will be no difference in the mean gains scores for solfege accuracy of those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing.

Fail to reject; 3. There will be no difference in the mean gains scores for sight-singing accuracy of those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing.

Fail to reject; 4. There will be no difference in the mean gains scores for singing rhythmic accuracy of those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing.

Fail to reject; 5. There will be no difference in the mean gains scores for singing solfege accuracy of those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing.

Fail to reject; 6. There will be no difference in the mean gains scores for singing pitch accuracy of those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing.

Fail to reject; 7. There will be no difference between the means scores for dictation between those students receiving only classroom instruction in sight-singing with those students receiving classroom instruction along with computer supplemented instruction in sight-singing.

Conclusions

The study examined the effect of the use of the Music Lab Series computer program on the achievement levels of student performance on rhythmic tests, melodic sight-singing tests, solfege identification tests, and dictation tests. The study compared the achievement of 15 students in Basic Music classes. They were randomly assigned to either the control group, receiving 60 minutes per week classroom instruction and spending a minimum of 30 minutes per week outside of class practicing with the classroom materials, or the experimental group, receiving the same 60 minute classroom instruction and working 30 minutes a week with the MLS computer program. The testing period lasted seven weeks. A comparison of the scores on pre-tests at the beginning of the study showed no significant difference between these two groups.

The analysis of the means on the post-test revealed that in all areas except solfege identification, the group receiving the treatment excelled. This, most likely can be attributed to the broader musical experience of that group. When analyzed against the covariate, the post-test showed no significant differences between the groups at the $p < .05$ level. Thus a failure to reject any of the null hypotheses resulted. However, the rhythmic test did show significance at the $p < .06$ level. Students in the experimental group had a far greater degree of achievement. This finding may be accounted for by the fact that on the opinion survey, students using MLS listed the Play and Echo modules as the most enjoyable modules of the eight. Enjoyment likely led to greater use of these two modules that drilled rhythmic elements. Since MLS forced the students to be more strict with rhythmic patterns, it can be assumed those students using MLS would be more strict in their rhythms. The data would seem to agree.

Due to the small size of the samples, the results of this study are less than hoped for. The performance of one individual within a group could have a dramatic effect on the achievement of the group as a whole. While little can be said about the effectiveness of the MLS as a pedogological tool based on this study, it is obvious from the opinion survey that the enjoyment level of those students in the experimental group was much higher than those in the control group. This would seem to indicate the MLS can be an effective motivational tool for instructors and provide valuable drill and practice.

The opinion survey yielded interesting results. Most of the students agreed the project had helped them in their understanding of reading music. Question 4 asked if the students enjoyed participating in the project. Those students in experimental group #1 were strongly in agreement with the statement, while those in experimental group #2 (computer only) were neutral in their feelings.

Both of the experimental groups agreed the MLS program was easy to use and that using the mouse to answer questions was simple. Experimental group #1 strongly agreed they found it easy to get into the lab to work on the computers while experimental group #2 was neutral on the question. This is probably due to the larger amount of time in the lab required experimental group #2.

Questions 16 and 36 stated "I found singing into the computer easy." Experimental group #1 strongly disagreed, while experimental group #2 only disagreed. This could be due to the fact that experimental group #2 did not work in any other way.

significance. Had the samples been larger the effects of one or two individual scores within a group would have been lessened.

The pedagogical benefit of MLS's quizzing capability should be investigated. Another study could compare a competency-based approach with a non-competency-based approach. A similar study could be constructed utilizing a control group receiving only classroom instruction with an experimental group given classroom instruction and progressing through the MLS with the requirement that subjects pass a quiz before moving to the next level and with a group given classroom instruction and progressing through the MLS on a prescribed schedule.

Since the experimental group using computer only was so small and therefore not used in this study, a study comparing the benefits of supplemental vs. substitutive use of MLS should be done. The current study should be duplicated using music majors and an analysis based on entering ability level done to see if the MLS is better suited to students with higher or lower ability levels.

Based on the studies of Kuhn and Allvin (1967), Von Feldt (1971), Thompson (1973), Placek (1974), Humphries (1980), Lemmons (1984), Jacobsen (1986), and Goodwin (1990), the usefulness of CAI in music seems to have been established. As stated earlier, educators are being pressured to produce more learning with less time and money. Since the usefulness of CAI in music has been established, it is imperative that research continue to advance our understanding of CAI's uses.

Further research in the area of CAI in music must be continued for several reasons: (1) Previous research has resulted in ambiguous conclusions, (2) New technologies have improved computer reliability and sound production, and (3) New software has been developed specifically for music instruction.

In the study by Collins (1979) most of the theory teachers responding to the study noted frustration with the lack of sufficient time to accomplish what was considered to be an important area of training. That frustration could be alleviated through further research in CAI in music. Collins (1979) reported that of the schools surveyed, 87% spent at least one or two hours per week in sight-singing training. He also reported that the majority of schools surveyed included sight-singing in the curriculum for four semesters. Based upon the amount of time spent in sight-singing, there seems to be an agreement as to its importance in the education of musicians. With something as important as sight-singing, we should be evaluating every possible mode of increasing our students' skills.

Even among college instructors "there seems, however, to be a consensus on the fact that the methods which have traditionally been used,... while helpful for some, are not satisfactory for all students" (Ozeas, 1991, p. 4). Ortner (1990) concurs with this by saying that "the use of CAI by all students gives no greater consideration to individual learning differences than the traditional approach; therefore, in the future, more attention must be paid to the program than to the mere use of computer equipment."

Ozeas (1991)states:

> Roger McRea from Temporal Acuity Products, a company which produces much music education software, stated that there is little real research demonstrating the effectiveness of computer-assisted instruction using their

> materials or others currently in use. Teachers sense an increased amount of learning and feel that they are able to move through more materials at a faster pace, but the limited funds which are available for research from companies producing educational software have not encouraged extensive research. A similar response was given by the Director of Education for Coda, the company that publishes the software used in this study (Perceive). (p. 28)

Though many of the studies examined are limited to college students, CAI in music is applicable to elementary and secondary levels as well as to private teachers for use in their studios. Jacobsen (1986) states "using a CAI program to provide drill-and-practice routines in music fundamentals may allow additional classroom time to more fully present aspects of music dealing with aesthetic performance skills" (p. 4). Upitis (1992) agrees with this point and states "using music software to reinforce or test skills associated with ear training and theory is arguably the easiest practical change based on new technology for studio teachers or specialist classroom music teachers to accommodate" (p. 32).

Ortner (1990) cited a synthesis of reviews of computer-based instruction by Niemiec and Walberg (1987), stating "the majority of comparative studies favored computer-assisted instruction over traditional study, but suggests that computer-assisted instruction decreases in effectiveness as the age of the user increases and microcomputers have proven more efficient than mainframe computers." (p. 42) Research needs to continue at all grade levels to assess effectiveness.

When we look at the picture of the technological classroom given to us by Marsh, it is easy for those of us who are technologically oriented to become over enthusiastic about the future of technology in music education. We imagine that total computer-assisted education will solve the problems of our everyday workload. While research has shown CAI sometimes to be more effective than the methods with which it is compared, that same research has also pointed out that in every method there are limitations and exclusions. Hullfish (1972) probably best described the current situation for CAI in education as a whole. He states:

> The basic problem of examining how CAI or any other specific teaching-learning situation will fit into education is just as pressing as any of the questions posed above. The question of what, specifically, CAI does best has yet to be answered. Its placement in the teaching-learning process has to be part of the larger content of comprehensive curriculum planning. The proponents of CAI must be cautioned by the history of other media that were oversold to educators and still are suffering because they did not come close to living up to their claims. (p. 361)

With that in mind, research must continue before broad conclusions as to the superiority of CAI in music are made. As educators, our primary responsibility is to our students, not to easing our workload. We must carefully examine every avenue for CAI in music. We must establish how best to use CAI to the advantage of our students and ourselves. We must primarily concern ourselves with the value of the use of CAI as an educational tool in the total learning experience of the student.

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APPENDIX A

STUDENT CONTRACTS

Computer-Assisted Instruction in Sight-Singing
Research Project

Group 1 Responsibilities

1. Attend sight-singing class every Friday at either 9:00, 10:00, 11:00, or 12:00.

2. Spend 30 minutes per week outside of class, practicing with the classroom materials.

3. Complete pre- and post-tests.

I understand that participating in this study will help my grade in MU 124 in two ways; further instruction on materials covered in Basic Music, and some percentage of my final grade added to that grade (decided by each instructor individually), most instructors are giving 5% for completing the study.

I am free to withdraw from this study at any time without penalty.

In order to not invalidate the test results and to receive the grade increase, I will not miss more than one class session.

I commit myself to full participation in this study.

Social Security Number: ________________________________

Dates:
Feb 17 - Class
Feb 24 - Class
Mar 3 - Class
Mar 10 - Class
Mar 17 - Class
Mar 24 - Spring Break
Mar 31 - Class
April 3 - 7 Post-tests

Computer-Assisted Instruction in Sight-Singing
Research Project

Group 2 Responsibilities

1. Attend sight-singing class every Friday at either 9:00, 10:00, 11:00, or 12:00.

2. Spend 30 minutes per week outside of class, working with MLS program in MIDI lab.

3. Complete pre- and post-tests.

I understand that participating in this study will help my grade in MU 124 in two ways; further instruction on materials covered in Basic Music, and some percentage of my final grade added to that grade (decided by each instructor individually), most instructors are giving 5% for completing the study.

I am free to withdraw from this study at any time without penalty.

In order to not invalidate the test results and to receive the grade increase, I will not miss more than one class session.

I commit myself to full participation in this study.

Social Security Number: ______________________________

Dates:
Feb 17 - Class
Feb 24 - Class
Mar 3 - Class
Mar 10 - Class
Mar 17 - Class
Mar 24 - Spring Break
Mar 31 - Class
April 3 - 7 Post-tests

APPENDIX B

DEMOGRAPHIC SURVEY

Demographic Survey

Social Security Number: ______________________________

1. Which group have you been assigned to? Group 1 Group 2 Group 3

2. What is your age? _____

3. What year are you in school? Freshman Sophomore Junior Senior

4. Rate your experience with computers. None Little Some Lots

5. Please mark any areas where you have experience:

Music Classes	How many years? _____
Voice Training	How many years? _____
Piano	How many years? _____
School Band	Instrument? ___________________
	How many years? _____
School Orchestra	Instrument? ___________________
	How many years? _____
School Choir	How many years? _____
Church Choir	How many years? _____

APPENDIX C

PRE-TEST / POST-TEST SCRIPTS

Pre-Test / Post-Test Scripts

Please state your social security number.

Rhythm Test

In this section of the test, you are asked to count off one measure to set the tempo, then continue to clap the rhythm you see before you, stopping at the end of each line.

Example: in 4/4 you would count 1.. 2.. 3.. 4.. then begin to clap the rhythm you see

Please take 30 seconds to examine the first line, then count off one measure and clap that line.

Please take 30 seconds to examine the second line, then count off one measure and clap that line.

Sing Test

In this section of the test, you are asked to sing the correct pitches, rhythms and solfege for each line. If you are not familiar with solfege, you may use a neutral syllable like *loo.*

The arrows indicate where *do* or the tonal center of each line is.

I will play the *do mi so* pitches for each line to give you the key to sing in.

Please take 30 seconds to examine the line. I will then give you the *do mi so* pitches again.

Please sing slowly and carefully through each line.

Here is the first *do mi so* **Play *do mi so.***

Please examine the line. **Wait 30 seconds.**

Here is the *do mi so* again.

Here is the second *do mi so* **Play *do mi so.***

Please examine the line. **Wait 30 seconds.**

Here is the *do mi so* again.

Please state your social security number again.

APPENDIX D

PRE-TEST/POST-TEST SCORES

Pre-test Scores

ID	Group	Rhyth	Melod	Sing P	Sing R	Sing S	Solfege	Total
1	2	20	51	14	20	17	22	93
2	2	5	4	2	2	0	0	9
3	2	19	22	6	16	0	16	57
4	1	16	11	0	11	0	8	35
5	2	20	34	16	18	0	0	54
6	1	18	43	14	17	12	24	61
7	2	15	2	0	2	0	6	23
8	1	13	3	1	2	0	0	16
9	1	11	0	0	0	0	0	11
10	2	10	8	1	7	0	0	18
11	1	13	10	4	6	0	0	23
12	1	20	21	3	18	0	0	41
13	2	19	25	8	15	2	24	68
14	1	18	13	1	12	0	0	31
15	1	16	3	1	2	0	2	21

Post-test Scores

ID	Group	Rhyth	Melod	Sing P	Sing R	Sing S	Solfege	Total
1	2	20	55	18	18	19	24	99
2	2	19	37	7	11	19	5	61
3	2	19	55	13	23	19	24	98
4	1	12	37	4	14	19	24	73
5	2	20	46	12	18	16	24	90
6	1	18	47	13	19	15	24	89
7	2	20	50	12	19	19	16	86
8	1	13	32	5	15	12	8	53
9	1	11	29	6	13	10	23	63
10	2	16	26	0	7	19	16	58
11	1	20	39	12	8	19	23	82
12	1	20	48	13	16	19	24	92
13	2	20	59	17	23	19	24	103
14	1	16	19	0	0	19	24	59
15	1	20	10	0	3	7	16	46

APPENDIX E

STUDENT OPINION QUESTIONNAIRE

Social Security Number: ______________________________

Use the following scale to answer the following questions.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Complete the survey for the group your were assigned to.

Questions 7 - 9 Group 1 - Classroom only
Questions 10 - 28 Group 2 - Classroom and computer
Questions 29 - 46 Group 3 - Computer only

GROUP 1 QUESTIONS - Answer only if in group 1 (classroom only)

7. I spent the required practice time each week with the classroom materials.

1 2 3 4 5

8. I found it easy to practice the classroom materials at home.

1 2 3 4 5

9. Working with other students in class made it easier to learn.

1 2 3 4 5

GROUP 2 QUESTIONS - Answer only if in group 2 (classroom & computer)

10. The computer was helpful in drilling the skills taught in the classroom.

1 2 3 4 5

11.The Music Lab Series program was easy to use.

1 2 3 4 5

12. Using the mouse to answer questions was easy.

1 2 3 4 5

Social Security Number: ______________________________

Use the following scale to answer the following questions.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

13. The computers were always functioning efficiently.

1 2 3 4 5

14. It was easy to get into the lab to work on the computers.

1 2 3 4 5

15. I needed more time with the computer.

1 2 3 4 5

16. I found singing into the computer easy.

1 2 3 4 5

17. I tried quizzing on some levels and modules.

1 2 3 4 5

18. The sounds used by the computer were easy to understand.

1 2 3 4 5

19. I enjoyed using the computer.

1 2 3 4 5

20. I found the visual representation of my pitch helpful in finding the correct pitch.

1 2 3 4 5

21. I enjoyed using the Names module of the MLS program.

1 2 3 4 5

Social Security Number: ______________________

Use the following scale to answer the following questions.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

22. I enjoyed using the Notes module of the MLS program.

1 2 3 4 5

23. I enjoyed using the Sing module of the MLS program.

1 2 3 4 5

24. I enjoyed using the Echo module of the MLS program.

1 2 3 4 5

25. I enjoyed using the Play module of the MLS program.

1 2 3 4 5

26. I enjoyed using the Read module of the MLS program.

1 2 3 4 5

27. I would have benefited from more classroom time.

1 2 3 4 5

28. I would have benefited from more computer time.

1 2 3 4 5

GROUP 3 QUESTIONS - Answer only if in group 3 (computer only)

29. The Music Lab Series program was easy to use.

1 2 3 4 5

Social Security Number: ______________________

Use the following scale to answer the following questions.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

30. I needed more assistance with the concepts than just using the computer could give me.

1 2 3 4 5

31. I would have felt more at ease working in a group situation.

1 2 3 4 5

32. Using the mouse to answer questions was easy.

1 2 3 4 5

33. The computers were always functioning efficiently.

1 2 3 4 5

34. It was easy to get into the lab to work on the computers.

1 2 3 4 5

35. I needed more time with the computer.

1 2 3 4 5

36. I found singing into the computer easy.

1 2 3 4 5

37. I tried quizzing on some levels and modules.

1 2 3 4 5

Social Security Number: ______________________________

Use the following scale to answer the following questions.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

38. The sounds used by the computer were easy to understand.

1 2 3 4 5

39. I enjoyed using the computer.

1 2 3 4 5

40. I found the visual representation of my pitch on the computer screen helpful in finding the correct pitch.

1 2 3 4 5

41. I enjoyed using the Names module of the MLS program.

1 2 3 4 5

42. I enjoyed using the Notes module of the MLS program.

1 2 3 4 5

43. I enjoyed using the Sing module of the MLS program.

1 2 3 4 5

44. I enjoyed using the Echo module of the MLS program.

1 2 3 4 5

45. I enjoyed using the Play module of the MLS program.

1 2 3 4 5

Social Security Number: ______________________________

Use the following scale to answer the following questions.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

46. I enjoyed using the Read module of the MLS program.

1 2 3 4 5

APPENDIX F

RHYTHM AND MELODY

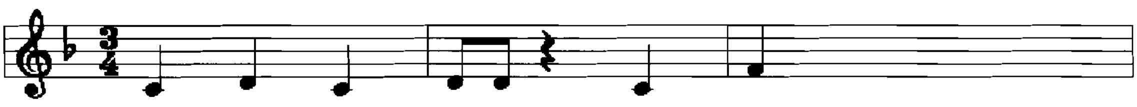
PRE-TEST AND POST-TEST

Date:__________________________

Socal Security Number:__________________________

Pre-Test

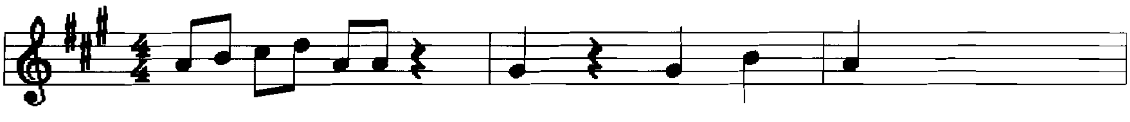
Count one measure at a moderate (or slow) tempo, then clap the following rhythm.



Count one measure, then clap the following rhythm.

Using solfege syllables, sing the following melody.

Using solfege syllables, sing the following melody.

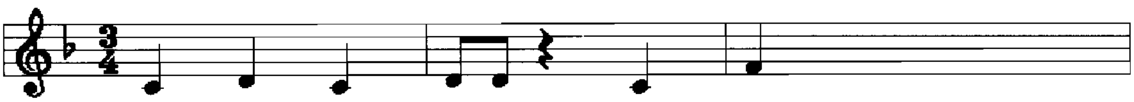


Date:________________________

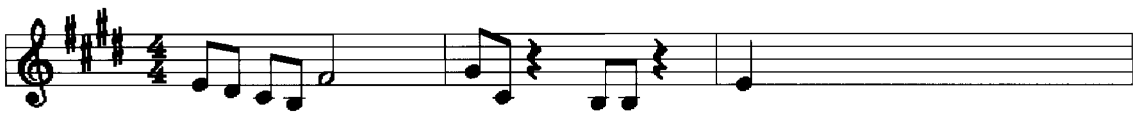
Socal Security Number:__________________________

Post-Test

Count one measure at a moderate (or slow) tempo, then clap the following rhythm.

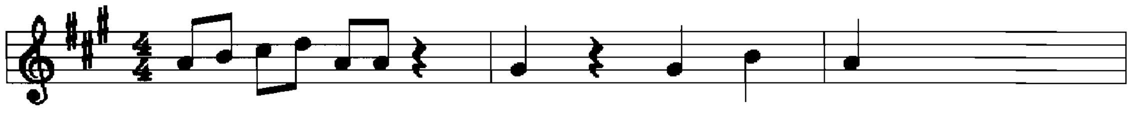


Count one measure, then clap the following rhythm.



Using solfege syllables, sing the following melody.

Using solfege syllables, sing the following melody.



APPENDIX G

SOLFEGE PRE-TEST AND POST-TEST

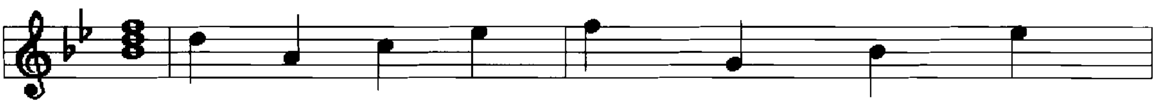
Date: ____________________

Social Security Number: __________________________

Solfege Pre-Test

You are given a key signature and a tonic chord for the key of each of the examples. Fill in the solfege syllables beneath the notes.

(a)


(b)


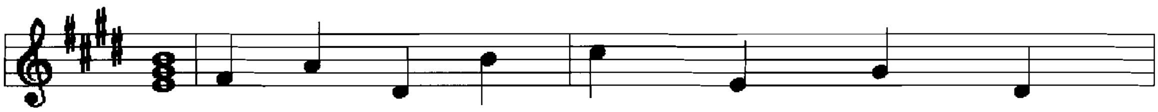
(c)


Date: ____________________

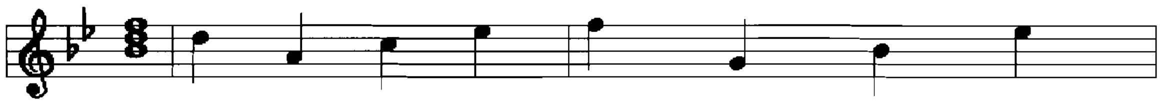
Social Security Number: ________________________

Solfege Post-Test

You are given a key signature and a tonic chord for the key of each of the examples. Fill in the solfege syllables beneath the notes.

(a) 

___ ___ ___ ___ ___ ___ ___ ___

(b) 

___ ___ ___ ___ ___ ___ ___ ___

(c) 

___ ___ ___ ___ ___ ___ ___ ___

APPENDIX H

RHYTHM AND MELODY

PRE-TEST AND POST-TEST

GRADING SHEETS

Socal Security Number:______________________________

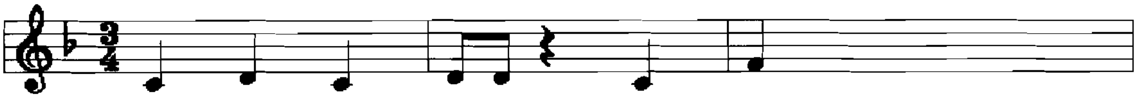
Date:____________________________

Pre-Test

Grading Sheet

Rhythm / 20

/ 8



/ 12

Melody / 62

Pitch / 9

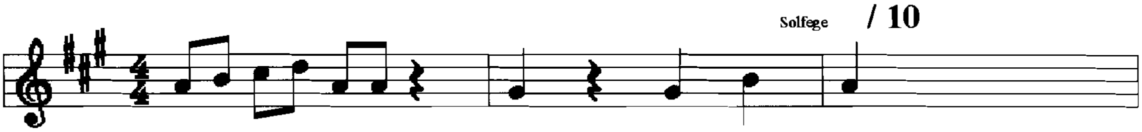
Rhythm / 12

Solfege / 9

Pitch / 10

Rhythm / 12

Solfege / 10



Socal Security Number:_______________________

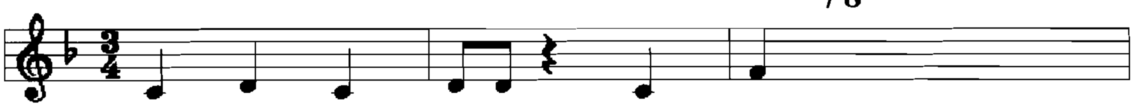
Date:____________________

Post-Test

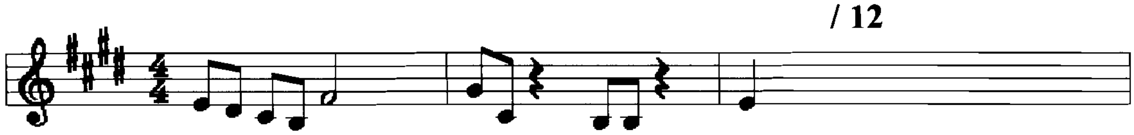
Grading Sheet

Rhythm **/ 20**

/ 8



/ 12

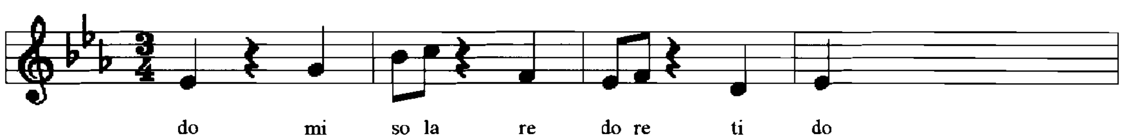


Melody **/ 62**

Pitch **/ 9**

Rhythm **/ 12**

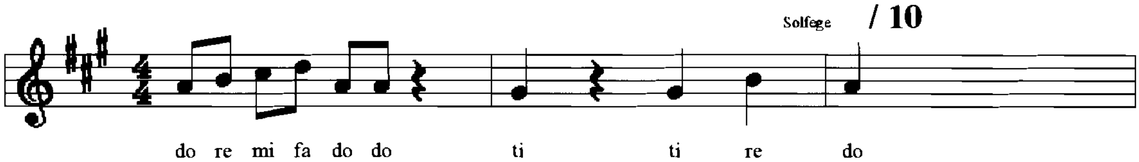
Solfege **/ 9**



Pitch **/ 10**

Rhythm **/ 12**

Solfege **/ 10**



APPENDIX I

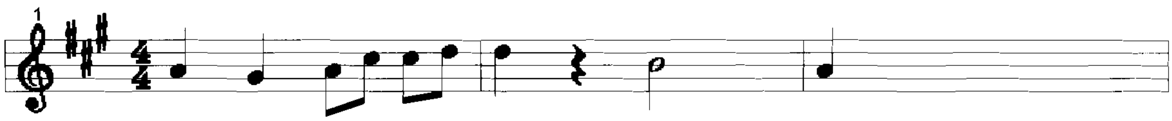
DICTATION TEST

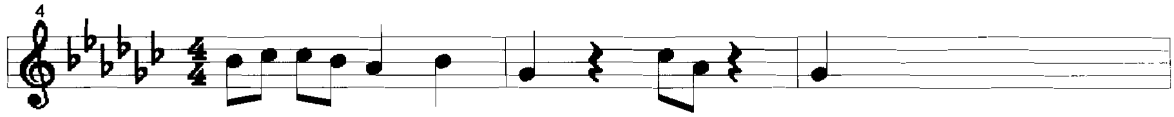
Date: ______________________

Social Security Number: ________________________

Dictation Post-Test
Answer Sheet

You are given a key signature and time signature, as well as the first note of the melody. The melody will be played six times. As you listen, fill in the correct notes and rhythms.





APPENDIX J

OPINION SURVEY RESULTS

Results of Student Opinion Survey

Question	Control	Experimental #1	Experimental #2
1. This project helped me in my understanding of reading music.	4.5	4.2	4.0
2. The use of solfege assisted my understanding of sight-reading.	4.25	4.0	3.3
3. I gained skills and knowledge which helped me in the Basic Music class.	4.5	4.2	3.7
4. I enjoyed participating in this project.	4.0	4.75	3.3
5. I feel confident now in my ability to sing a simple melody at sight.	3.0	3.0	2.3
6. My overall music skills have improved because of this project.	4.0	4.2	4.3
7. I spent the required practice time each week with the classroom materials.	4.4		
8. I found it easy to practice the classroom materials at home.	3.8		
9. Working with other students in class made it easier to learn.	3.8		

10. The computer was helpful in drilling the skills taught in the classroom.

4.25

11 & 29. The Music Lab Series program was easy to use.

4.75 4.3

12 & 32. Using the mouse to answer questions was easy.

4.5 4.0

13 & 33. The computers were always functioning efficiently.

5.0 4.3

14 & 34. It was easy to get into the lab to work on the computers.

4.75 3.0

15 & 35. I needed more time with the computer.

2.5 2.3

16 & 36. I found singing into the computer easy.

1.25 2.3

17 & 37. I tried quizzing on some levels and modules.

2.75 2.0

18 & 38. The sounds used by the computer were easy to understand.

3.5 4.0

19 & 39. I enjoyed using the computer.

4.75 3.0

20 & 40. I found the visual representation of my pitch on the computer screen helpful in finding the correct pitch.

3.5 3.6

21 & 41. I enjoyed using the Names module of the MLS program.

4.75 3.3

22 & 42. I enjoyed using the Notes module of the MLS program.

4.0 3.6

23 & 43. I enjoyed using the Sing module of the MLS program.

1.25 1.6

24 & 44. I enjoyed using the Echo module of the MLS program.

4.5 4.3

25 & 45. I enjoyed using the Play module of the MLS program.

4.75 4.5

26 & 46. I enjoyed using the Read module of the MLS program.

4.25 2.0

27. I would have benefited from more classroom time.

3.75

28 I would have benefited from more computer time.

4.25

30. I needed more assistance with the concepts than just using the computer could give me.

3.0

31. I would have felt more at ease working in a group situation.

4.3

Note. This scale was rated 1= strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 strongly agree.

APPENDIX K

CLASSROOM MATERIALS

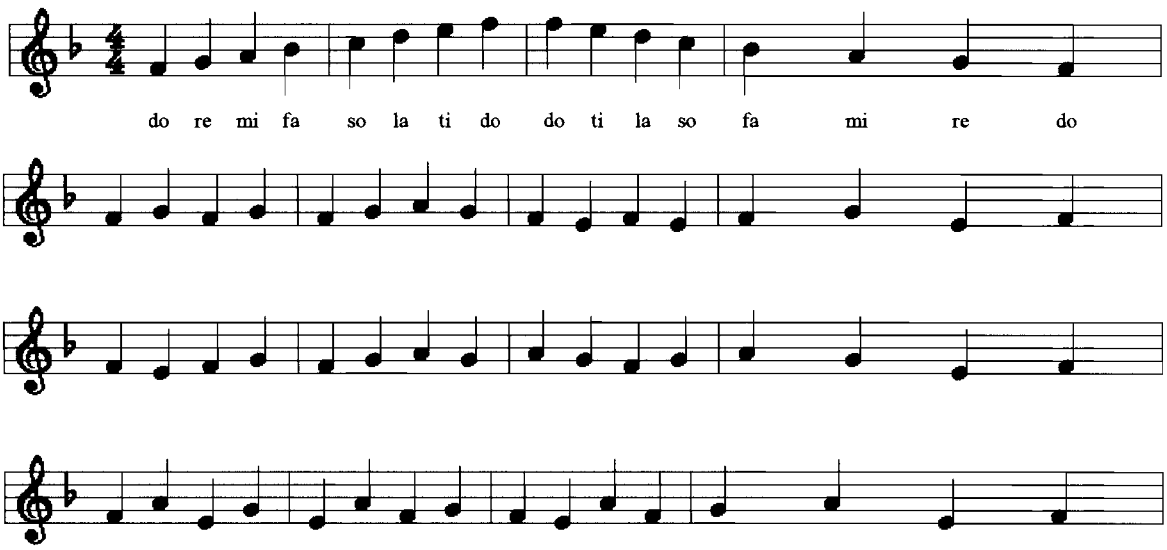
Chapter 1

Rhythm

Count and clap the following rhythms

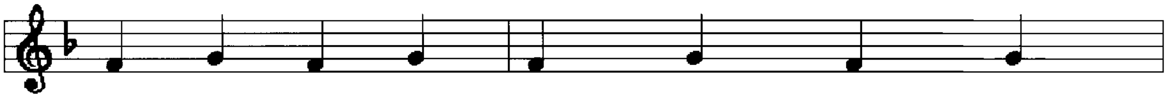
Solfege

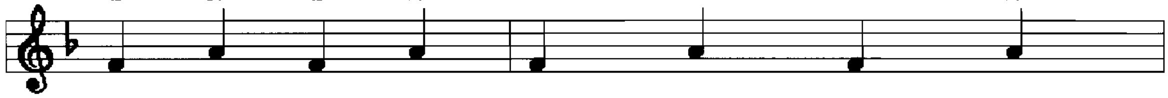
Practice saying the solfege syllables

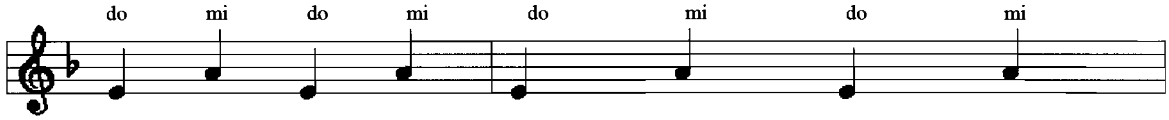


Intervals

Sing the following intervals using solfege

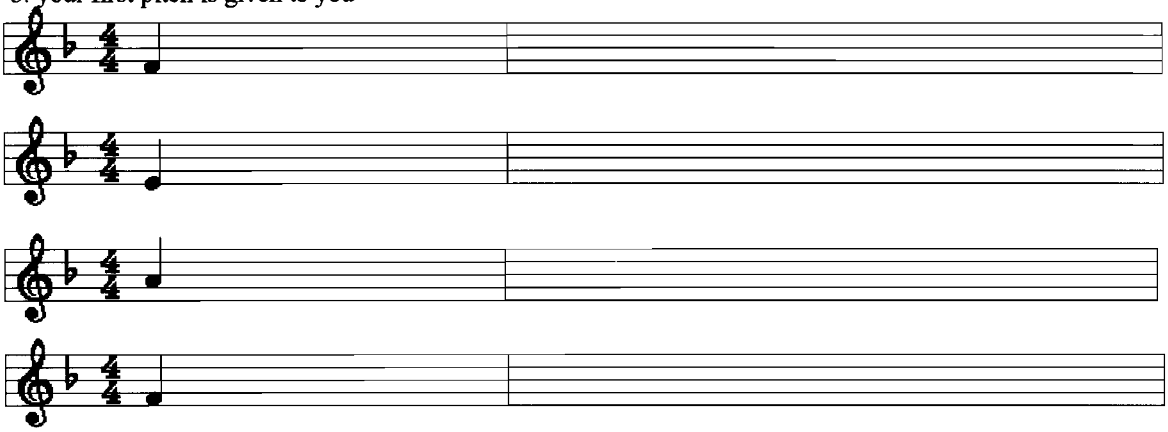






Dictation

1. listen for rhythm and mark the rhythm
2. listen for pitches and mark the pitches
3. your first pitch is given to you



Melody

Using solfege, sing the examples

Chapter 2

Rhythm

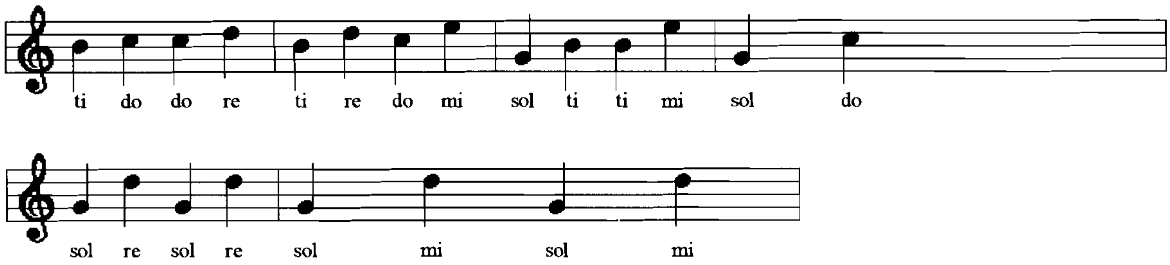
Count and clap the rhythm

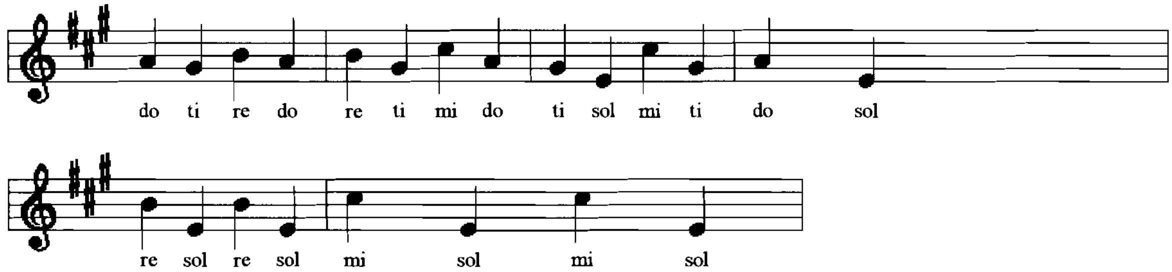
Solfege

Practice saying the solfege syllables

Intervals

Sing the following using solfege





Dictation

Melody

Using solfege, sing the following melodies

Chapter 3

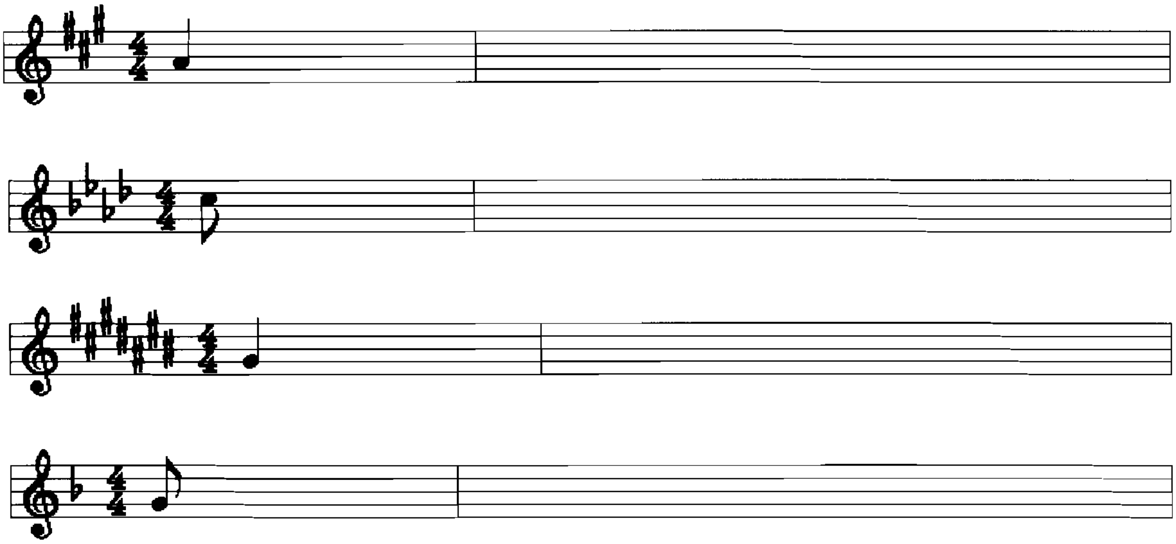
Rhythm

Solfege

Intervals


ti do ti do mi fa mi fa do re do re re mi re mi ti re ti re re fa re fa
do mi do mo sol ti sol ti ti fa ti fa
sol re sol re sol mi sol mi sol fa sol fa

Dictation



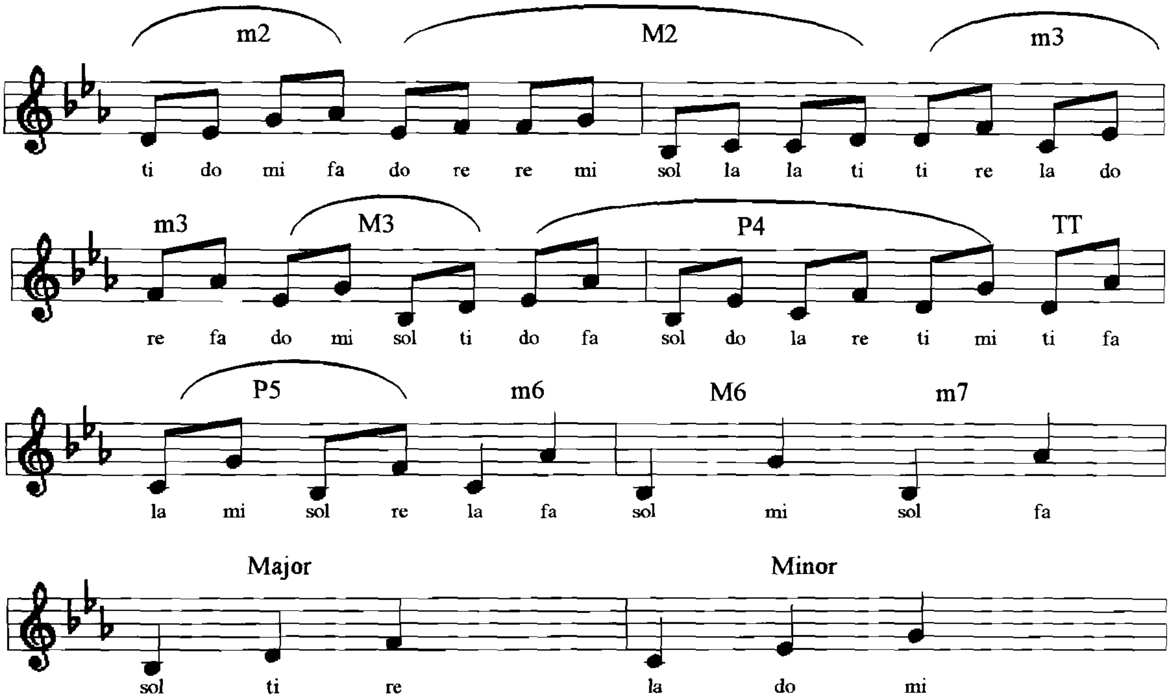
Melody

Chapter 4

Rhythm

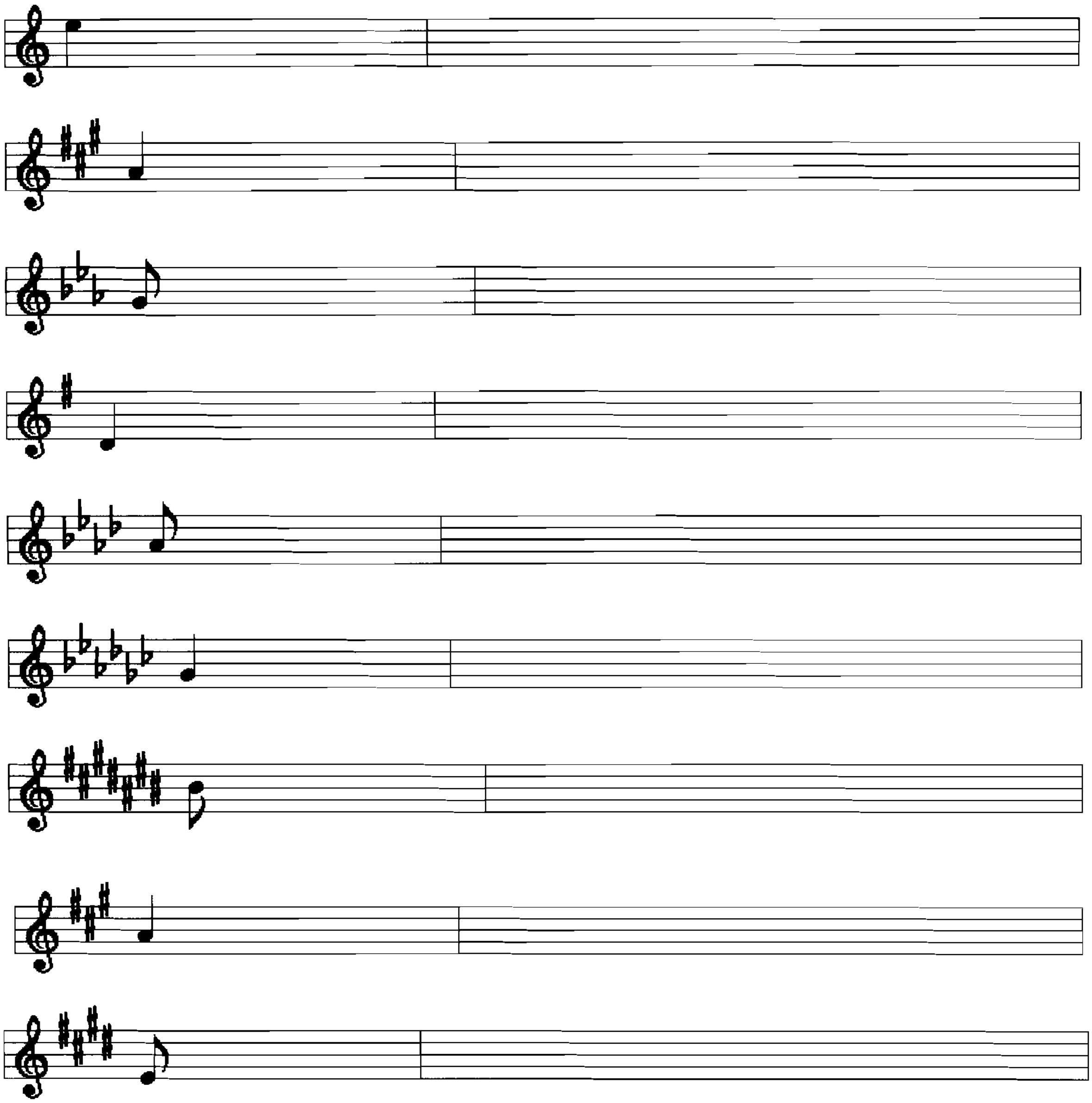
Solfege

Intervals



Practice these intervals and identify the interval as a major or minor 2nd, 3rd or 6th, tri-tone, perfect 4th or 5th, or minor 7th.

Dictation



Melody

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An Experimental Study of the Effectiveness of Music Lab Series

by Ronald Thomas and Gary Barber in College Basic Music Classes

Signature of Graduate Office Staff Member

June 26, 1995

Date Received