2009

The effect of rhythm-based computer-assisted music instruction designed for individual learning style preferences on the learning of preservice elementary education majors

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THE EFFECT OF RHYTHM-BASED COMPUTER-ASSISTED MUSIC INSTRUCTION DESIGNED FOR INDIVIDUAL LEARNING STYLE PREFERENCES ON THE LEARNING OF PRESERVICE ELEMENTARY EDUCATION MAJORS

A Dissertation
Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The School of Music

by

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May 2009

This paper is dedicated to my mother, Mrs. Evelyn Joyce Aaron Guilbeaux and grandmother, Mrs. Birdie Beatrice Thompson Ingram Aaron, whose music inspiration is the center of my musicianship.

ACKNOWLEDGMENTS

"The function of education is to teach one to think intensively and to think critically. Intelligence plus character - that is the goal of true education."

Martin Luther King, Jr.

I have achieved the goal of a true education from the many minds and hands that have touched my life at Louisiana State University. Whether it was my instructors or words of encouragement from family, extended family, colleagues, classmates, and friends – you all have contributed to the completion of this degree. My most sincere gratitude is extended to my major professor, Dr. Evelyn K. Orman, for not only sharing every technological possibility with regards to music education, but for also sharing moments of expertise, confidentiality and optimism. Thanks to you for helping me to realize that I should only be concerned about situations that I can control and sometimes those may be few. I would also like to give a very special thank you to Dr. Jane Cassidy, not just for being an incredible professor, but for also being a good friend. Your thoughtfulness and encouragement have meant more that you could ever imagine. Dr. S. Kim McGregor, what can I say, your classes have not only been informative, but also most stimulating. To the rest of my committee, Dr. James Byo and Dr. Sharon Naquin, I would like to take this opportunity to express my sincere gratitude for your time and valuable recommendations. And to Dr. Cornelia Yarbrough, your words of wisdom, academically, professionally, and personally, will never be forgotten.

I would also like to give immeasurable gratitude to Dr. Richard Webb, Dr. Joyce O'Rourke, Dr. George Whitfield, Mr. Herman Jackson, Mr. Harry Anderson, Ms. Myrtle E. David, Dr. Jocelyn Freeman Bonvillain, Dr. Mahmoud Braima, Dr. Regina Patterson, Sandra Ballentine Smith, Leslie Paige Rose, Jonathan Hare, Regina N. Thomas, the Southern University

and A&M College Music Department and the Department of Engineering Faculty, Staff and Students. You were there when I needed immediate support and answers to questions that only you could provide.

I give my unending gratitude to my parents, Eddie John Guilbeaux and Evelyn Joyce Aaron Guilbeaux, for their unconditional love, support and prayers for any undertaking that I have desired. My only regret is that my beloved mother did not live to witness the completion of this undertaking. My accomplishments as an adult would not have been truly realized if it had not been for the support and sharing that I have always experienced with my siblings – Beth, Ted, and Benny. We represent what children can do when the foundation of their lives is constructed with prayer. Last, but most certainly not least, I must acknowledge and give thanks to the most important persons in my life – my husband, Louis J. James, Jr. and our twins, Cydney and Trey. I love you with all of my heart! None of this would have been possible without your understanding, support, and patience.

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ABSTRACT

This study investigated the effect of rhythm based computer-assisted music instruction designed for individual learning style preferences. Participants were undergraduate preservice elementary education majors (N = 82) enrolled in Fundamentals of Music. The Perceptual Learning Style Preferences Survey and the Diablo Valley College Learning Style Survey were used to measure learning preferences. Two content knowledge assessments were administered as pre and posttest: (a) *Music Achievement Test* (MAT) Test 2-Part 3-Auditory and Visual Discrimination subtest *b* and (b) Researcher-Developed Rhythm Test (RDRT). Researcher-developed software programs were constructed, teaching participants the basic elements of rhythm based on learning style preferences.

Forty-three of the participants (13 auditory, 13 visual, and 17 tactile/kinesthetic) completed software programs designed for their individual learning preferences. A stratified randomly selected group (11 auditory, 10 visual, and 18 tactile/kinesthetic) was assigned software that addressed all learning style strategies (n = 39) to complete the rhythm unit.

A repeated measures multivariate analysis of variance (MANOVA) conducted to determine the effect of three types of learning style strategies and two treatments (learner specific and all learning styles) on the two dependent variables (MAT and RDRT) revealed significant differences between the dependent measures. Two separate three-way repeated measures ANOVAs calculated on the MAT and RDRT found significant differences from pretest to posttest, indicating a significant increase in skill level on both measures. MAT scores revealed no significant differences with regards to treatment or learning style preferences. A significant two-way interaction between treatment and pretest to posttest was found for the RDRT. Both groups made significant gains due to treatment from pretest to posttest. The gain was greater for

participants who used all learning styles software than for those who used individualized learning styles software. A significant two-way interaction among learning style strategies, RDRT pretest to posttest, was revealed. All participants made large gains due to treatment; tactile/kinesthetic learners gained noticeably less than aural and visual learners.

Participants with the highest and lowest posttest scores (*n* = 23) from each learning style preference were selected for interviews. Overlapping themes indicated positive acceptance of the program, superior educational value, and creative program design.

CHAPTER 1

INTRODUCTION

Music education's roots were in the singing schools of the early days of the nation (Nye, Nye, Martin, & Van Rysselberghe, 1992). More than a century and a half ago, the man that would become known as the father of music education, Lowell Mason, believed that every child had a right to study music during school hours (Winslow, Dallin, & Wiest, 2001). Because of this belief, Mason was able to influence an education committee in Boston to include music as a regular classroom subject. Although teachers versed in the art of teaching music were few, the inclusion of music as a regular classroom subject became the responsibility of the classroom teacher. It was not until the twentieth century that music education became an integral part of the teacher education programs of the nation (Nye, et al., 1992).

Currently, most school districts provide music specialists for regularly scheduled classroom instruction with suggested follow-up activities by the classroom teacher. The National Center for Education Statistics (2002) reported that: (a) 72 % of elementary music instruction was taught by full-time certified music specialists, (b) 20% by part-time certified music specialists, (c) 11% by classroom teachers, (d) 3% by artists-in-residence, and (e) 4% by other faculty or volunteers (percentages sum to more than 100% because respondents could select more than one category). Many arts organizations and educational leaders support an integrated approach to delivering the music curriculum, which allows for the infusion of musical concepts and practices into both the music and non-music curriculum (Boyer, 1989; Consortium of National Arts Education Associations, 1994; Goodlad, 1983). Studies also indicated that the shared responsibility for addressing the music curriculum is preferred by music specialists, classroom teachers, and administrators (Byo, 1999; Pendleton, 1976).

Music, as well as the other arts, has long been an inseparable part of the meaning of education (Winslow, et al., 2001). Elementary classroom teachers are the stakeholders for education and therefore should be the primary advocates for music education as a vital element in a quality education. It becomes incumbent upon university music educators to prepare prospective elementary education teachers with a firm grasp of the fundamentals of music so that they can successfully incorporate these concepts in their instructional practices.

The passage of *Goals 2000: Educate America Act*, which incorporated nine National Standards for Music Education, emphasized the importance of educating future music teachers in the areas of singing, playing instruments, composing, improvising, reading notation, listening and analyzing music, evaluating music, understanding relationships between music and other disciplines, and understanding music in relation to history and culture (Consortium of National Arts Education Associations, 1994). Because the elementary teacher plays a vital role in the development of the whole child, it becomes the responsibility of many university teacher preparation programs to instruct the preservice classroom teacher in the fundamentals and methods necessary for implementation of the National Standards for Music Education. Saunders and Baker (1991) discovered that fundamentals and methods courses in music education for preservice classroom teachers are often a one-semester course. Under such stringent time constraints, some potentially useful and desirable topics, such as using music to supplement other curricular areas, providing creative experiences, selecting appropriate songs, developing movement activities, developing listening lessons, selecting recordings for children, leading and teaching songs, playing piano, and using rhythm instruments are often omitted in order to cover essential music skills. Since the elementary music methods class could be the only structured involvement with music teaching and learning for preservice classroom teachers, Stein

(2003) recommended that it would be prudent for instructors to develop effective strategies for building positive attitudes toward elementary general music education.

Teacher-training programs in music education do not always offer the same course content. Gauthier and McCrary (1999) administered a national survey to determine the purpose, format, and content of courses available to undergraduate elementary education majors at institutions accredited by the National Association of Schools of Music (NASM). Survey responses from 276 universities revealed that three types of courses were taught—fundamentals, methods, and a combination of the two. The development of an understanding of music concepts was believed to be a course purpose for 97% of the fundamental courses, 81% for the methods courses, and 100% for the combined courses. Further analysis revealed that the highest ranked topics under music concepts were form, harmony, melody, musical expression, and rhythm. It is necessary for university music fundamentals and methods courses to strive for the most effective means of instruction for classroom teachers so that these future educators are more comfortable with their abilities in music education instruction. A possible solution for making music instruction more effective may be ascertained by addressing learning style preferences.

Keefe and Languis (1983) defined learning styles as “the composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment” (p. 3). Felder (1996) reviewed four instruments designed to identify various learning styles. Instruments investigated were: (a) Myers-Briggs Type Indicator (MBTI), which classifies students according to psychologist Carl Jung’s theory of psychological types—extraverts, introverts, sensors, thinkers, and judgers; (b) Kolb’s Learning Style Model, which classifies students as having a preference for concrete experience or abstract conceptualization and active experimentation or reflective

observation; (c) Herrmann Brain Dominance Instrument (HBDI), which organizes students in terms of their relative preferences for thinking in four different modes based on the task-specialized functioning of the physical brain: left brain, cerebral, left brain, limbic, right brain, limbic and right brain, cerebral and, (d) Felder-Silverman Learning Style Model, which catalogs students as sensing learners, visual learners, inductive learners, active learners, and sequential learners. Felder opined that a balance of instruction based on the learning style and/or preferences of students is most useful if the presentation meets the learning needs of all students. Caldwell and Ginther (1996) defined the Dunn, Dunn and Price Learning Style Instrument (LSI) as a model that is divided into five broad categories including 21 elements that demonstrate how learners are affected by their: (a) immediate environment, (b) own emotionality, (c) sociological preferences, (d) physiological characteristics, and (e) processing inclinations. Important studies by Park (2000) and Ramburuth and McCormick (2001) have utilized the Perceptual Learning Style Preferences Survey (PLSPS; Reid, 1998). In this questionnaire, students self-identified their preferred learning styles among six categories: visual, auditory, kinesthetic, tactile, group, and individual learning. Since instruction in the fundamentals of music requires a multiplicity of activities that incorporate the use of visual (reading notation), auditory (listening to music), kinesthetic (clapping rhythms and or singing), and tactile (performing on instruments) learning skills, it seems reasonable that the LSI and the PLSPS may be helpful in ascertaining the preferred learning style of music students.

Addressing the learning styles of students is one means to allow education to become more individualized. Computer-based instruction is another. A meta-analysis summarizing research studies completed between 1967 and 1978 compared computer-assisted instruction (CAI) and conventional lecture methods among college students and revealed that CAI positively

affected the attitudes of students toward instruction and learning (Kulik, Kulik, & Cohen, 1980). CAI also substantially reduced the amount of time needed for instruction. Atkinson and Wilson (1968) believed the use of CAI would answer one of the most pressing need of education - - individualized instruction.

The development of high level programming languages, such as the Programmed Logic for Automatic Teaching Operations (PLATO) system developed at the University of Illinois by Don Bitzer during the 1960s, initiated use of the computer for educational institutions and led to the first true effort in institutional computer-assisted instruction (Berz & Bowman, 1995). Kuhn and Allvin (1967) investigated methods of presentation in music with CAI by applying programmed instruction to enhance individualized instruction in music education. Allvin (1971) and Knuth (1971) concluded that CAI in music education could enhance individualized instruction by allowing students to receive immediate feedback on progress, make adjustments based on individual learning differences, and benefit from opportunities for individual practice.

Once individual learning differences are addressed in the format of CAI for music instruction, it would be logical to investigate the achievement levels of students. Several studies (Hofstetter, 1978, 1979, 1980) concluded that with the assistance of CAI in music fundamentals, significant learning gains were made in student achievement. Additionally, Ottman, Killam, Adams, Bales, Bertsche, Gay, et al. (1980) reported that for CAI to be used effectively, the program format must be implemented in conjunction with a cohesive pedagogical philosophy. This is evidenced by the format of most textbooks used for instruction in music fundamentals courses.

Most music educators believe that an understanding of music fundamentals by elementary classroom teachers is paramount before attempting to teach music in schools

(Saunders & Baker, 1991). Rhythm is a concept that is presented early in textbooks used for undergraduate music courses for elementary classroom teachers (Rozmajzl & Boyer, 2006; Winslow, et al., 2001). Hofstetter (1981) investigated the effect of CAI in teaching rhythm dictation and concluded that a CAI approach to teaching rhythm dictation was most effective. Likewise, the use of commercial CAI was discovered to be as effective as the traditional classroom lecture format for individualized instruction in teaching notation elements (Netusil & Willett, 1989), a concept often taught in conjunction with reading and responding to rhythm. Furthermore, if students can learn the elements of theory just as effectively with a computer, CAI in music education can be an effective time-saving tool in the classroom (Parrish, 1997), thus, leaving more time for instruction in the aesthetic aspects of music (Netusil, et al.,1989). Many benefits are perceived by the inclusion of technology in the classroom; however, it is essential that educators remember that CAI is only a tool that is accessible for educators and students to enhance not replace the traditional classroom presentation of concepts to be learned (Williams & Webster, 2008). Therefore, it is the general purpose of the present study to explore the hypothesis that rhythm based CAI targeted towards individual learning differences will enhance the learning of basic rhythms by elementary classroom teachers.

Definition of Terms

Delving into a study that investigates the use of computers and learning requires the need to offer some definitions of CAI and its emerging vocabulary. As Kulik, Kulik, and Bangert-Drowns (1985) pointed out in their research summary, "the terminology in the area is open to dispute" (p. 59). Therefore, it is necessary to make some sense of the array of terms used by educators and researchers. The following definitions are a synthesis of those offered by Allvin (1971), Arenson and Hofstetter (1983), Atkinson and Wilson (1968), Bitzer (1960), Deihl

(1971), Grabinger (1993), Hannafin and Hopper (1989), Ho (2004b), and Ramsey (1979), and represent commonly accepted (though certainly not the only) definitions of these terms:

Computer-Assisted-Instruction (CAI) Instruction delivered with the assistance of a computer. The student interacts with the computer and proceeds at his or her own speed. CAI software is commonly classified into these categories: drill-and-practice, tutorial, simulation, educational games, problem solving, and applications.

Computer-Assisted Music-Instruction (CAMI) Computer programs that are primarily drill-and-practice type programs to assist in the teaching of music theory and ear training,

Computer-Assisted Program in Error Detection (CA-PED) Computer programmed methods for teaching/assisting in the skill of error detection in pitch and rhythm.

Computer-Based Instruction (CBI) One of the broadest terms that refers to virtually any kind of computer use in an educational setting, including drill and practice, tutorials, simulations, instructional management, supplementary exercises, programming, database development, writing using word processors, and other applications. This term may refer to stand-alone computer learning activities or to computer activities that reinforce material introduced and taught by teachers.

Computer-Based Training (CBT) Identifies courses that use the computer as the primary delivery method of instruction. No textbook is required. It may be self-paced, self-contained interactive instruction on a CD, or instruction through e-mail and small group computer conferences with other students. The term CBT is often used interchangeably with Computer-Assisted Instruction (CAI).

Drill and Practice Computer software programs that help to reinforce recently introduced knowledge and skills.

Graded Units for Interactive Dictation Operations (GUIDO) Developed at the University of Delaware and provides intervals, melodies, single chords, harmonic progression and rhythms.

Information Technology (IT) Any equipment or interconnected system or subsystem of equipment, that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information. The term includes computers, ancillary equipment, software, firmware and similar procedures, services (including support services), and related resources.

Learnability The ease and speed with which users can figure out how to use a computer program.

Learner Control Allows the learner to select options that control various functions of the computer program such as level of difficulty or type of feedback.

Multimedia The integration of video, graphics, and audio through the computer.

Program Control Program Does not allow the learner to select any options. Options are predetermined by program designers.

Program in Error Detection (PED) Developed to teach and/or assist in the skill of error detection in pitch and rhythm.

Programmed Logic for Automatic Teaching Operations (PLATO) Developed at the University of Illinois' Computer Education Research Laboratory in partnership with the Control Data Corporation and the National Science Foundation. It was designed to use a mainframe-based system rather than a smaller minicomputer because of greater program and storage capability.

Retrieving, Orienting, Presenting, Encoding, and Sequencing (ROPES) A suggested method to develop better frameworks for determining how the capabilities of CBI should be managed.

Simulation A computer software program that is based on the discovery approach to learning, that is, learning by doing. The user can see the effects of using different strategies in solving the problems presented by the program.

Studyability The ease with which a user can examine and learn from a screen of information.

Tutorial A Computer software programs that teach new information. Typically, a program presents a body of information and then questions the user on that information.

CHAPTER 2

REVIEW OF LITERATURE

The review of literature will be organized as follows: An overview of the history and development of computer-assisted instruction will establish the context of the present study. This will be follow by a review of preference and attitude research in CAMI because researcher-developed software will serve as the independent variable in the present study. The preferences and attitudes of software developers and users must be considered in the development of this software. As an instructional tool, the effectiveness of CAMI is contingent upon the quality of screen design, text, audio, feedback and cost effectiveness. When ascertaining CAMI's feasibility, research indicates that attention must be given to these elements; therefore, research in these areas will be reviewed.

The future setting for the present study is the computer laboratory dedicated to instruction in music. As such, research examining the integration and implementation of software into curricular structures will be presented. Given that the software will be designed to address specific needs of students of various learning styles, the research in learning styles—auditory, visual, tactile, kinesthetic—will be reviewed. Finally, the research in classroom teachers' attitudes and perceptions of music instruction will be considered because the target population of the present study is preservice elementary education teachers.

An Overview of the Development and Implementation of Computer-Assisted Instruction

Just a few years ago, the use of computers as an instructional device was only an idea that was being considered by a handful of scientists and educators. The earliest examples of using computers for instructional purposes date from the late 1950s. The development of programming languages, such as the Programmed Logic for Automatic Teaching Operations (PLATO) system

developed at the University of Illinois by Don Bitzer during the 1960s, began computer use for educational institutions and led to the first true effort in institutional computer-assisted instruction (Berz & Bowman, 1995). Today that idea has become a reality. Computer-assisted instruction (CAI), like other aspects of electronic data processing, has undergone an amazingly rapid development. This rate of growth is partly attributable to the rich and intriguing potential of CAI for answering one of the most pressing needs in education--the individualization of instruction (Atkinson & Wilson, 1968). A meta-analysis summarizing research studies completed between 1967 and 1978 compared CAI and conventional lecture methods among college students. The comparisons revealed that CAI positively affected the attitudes of students toward instruction and toward the subjects they were studying (Kulik, Kulik, & Cohen, 1980). CAI also substantially reduced the amount of time needed for instruction. Similar efforts were being made to develop and use new methods of presentation in music with CAI by applying programmed instruction to enhance individualized instruction in music education (Kuhn & Allvin, 1967). The earliest research of this era in music education is dominated by feasibility studies that describe the development and/or implementation of specific applications, often for use at a university. These studies either compare a new technological approach with traditional approaches or evaluate it in light of some outside criteria, such as time efficiency or achievement scores (Berz & Bowman, 1995).

Allvin (1971) explored the possibilities of using CAI in music education. The use of computers with individualized instruction, sound-to-sight skills, and the programming and adaptation of subject material were investigated. Findings revealed that CAI could enhance individualized instruction by allowing the student to receive immediate feedback on progress, make adjustments for individual differences among students, and change the criteria once a

student becomes proficient in a given skill. Knuth (1971) investigated the integration of the learning systems approach and electronic technology in learning and teaching music. This investigation suggested that a systems approach and electronic technology would benefit students by providing opportunities for individual practice and immediate feedback. Likewise, Diehl (1971) investigated ways to improve instrumental performance with CAI. Knowing that performance is a complexity of aural-cognitive concepts and psychomotor skills, he concentrated on mastery of an aural discrimination training section by means of drill and practice before allowing the student to progress to performance sections. Diehl concluded that CAI was beneficial to instrumental performance. At the University of Illinois at Urbana-Champaign, Placek (1974) designed and implemented a CAI lesson in rhythm using the TUTOR language and the PLATO III system. He also incorporated a prototype model of a random-access audio device designed for use with the PLATO IV system. Instructional strategies included were drill and practice, tutoring, and gaming. He found that the use of computer-generated instruction geared toward the teaching of rhythm to non-musicians to be beneficial.

Hofstetter (1978) investigated the effect of computer-based software, Graded Units for Interactive Dictation Operations (GUIDO), on the achievement levels of college freshman music majors in harmonic dictation. The GUIDO system included programs that taught the aural identification of intervals, melodies, chord qualities, harmonies, and rhythms. Results indicated that the level of student achievement on individual harmonies was highly correlated with the percentage of times the harmonies were tested in the curriculum. Hofstetter (1979) using the GUIDO system, examined the effect of a computer-based aural interval identification program on the achievement levels of college freshman music majors in a beginning ear-training class. During the first semester of the academic year, all students were taught using the traditional

learning sequence from the *Benward* (1969) ear-training series and practiced dictation exercises with the GUIDO system. The second semester of the academic year, one-half of the students continued learning aural intervals in the sequential method and the other half learned the intervals according to a competency-based approach. This approach defined proficiencies that students had to meet in order to proceed to succeeding units within the program. If a skill was not mastered at a 90% level with a response time of four seconds, the student either repeated the unit or regressed to a less difficult unit. Results indicated that students who participated in the competency-based approach had a trend of higher achievement scores. Similarly, Hofstetter (1980) measured the achievement levels of students using a computer-based recognition program (GUIDO) of perceptual patterns in chord quality dictation exercises. Likewise, findings indicated that students made significant learning gains after the computer-based program was utilized.

Humphries (1980) surveyed the effects of CAI aural drill time on achievement in musical interval identification. Findings revealed that subjects using the drill program 75 minutes per week attained a significantly higher level of achievement than subjects who used it 25 minutes per week. Canelos, Murphy, Blombach, and Heck (1980) investigated various types of instructional strategies that would effectively facilitate the learning of music intervals. Instructional strategies evaluated were programmed instruction, mastery learning using CAI and self-practice using a textbook-study approach. Results indicated that mastery learning using CAI produced significantly better learning of music intervals. Ottman, Killam, Adams, Bales, Bertsche, Gay, et al. (1980) reported that for CAI to be used effectively in ear-training courses the program must be implemented around a cohesive pedagogical philosophy.

Following a set of related studies, Hofstetter (1981) investigated the effect of CAI in rhythm dictation. This investigation suggested that a CAI approach to teaching rhythm dictation

was most effective when compared to generally held pedagogical beliefs. On the other hand, Deal (1985) investigated the use of CAI in pitch and rhythm error detection by comparing the results of Computer-Assisted Program in Error Detection (CA-PED) with Ramsey's Program in Error Detection (PED) in teaching error detection skills. Both methods for teaching error detection were successful and CA-PED was no more or less effective than Ramsey's PED.

Kolosick (1986) studied the data structure for pitch organization within computer-based instruction (CBI) lessons in music. Discussed were pitch, placement of intervals, chords, and scale patterns into the data structure so that the computer and the student could manipulate these elements with ease and accuracy. It was concluded that with more applications and supporting data structures, the use of pitch relationships and their implementation into a computer database would refine the use of CBI and its potential for music education. Prèvel and Sallis (1986) designed software that would satisfy the teaching of harmonic dictation and recognition. The results of the design gave the ear-training college student the ability to study harmonic dictation in a drill-and-practice fashion using a computer and software. Additionally, Netusil & Willett, 1989 researched the use of commercial CAI as a tool for teaching notation elements to elementary school students. This research involved comparing the effectiveness of computer-based individualized instruction and regular classroom instruction with a music specialist. Results indicated that students could learn theory skills effectively with the computer, therefore, classroom time could be used for teaching the more aesthetic aspects of music.

Computer-Assisted Music Instruction (CAMI) Preference and Attitude

Designers of computer-assisted instruction software, especially software written for music instruction, have many elements to consider. Many times instructional software is constructed to foster learner outcomes with little attention given to the effect of design on those

outcomes. The present study not only investigated the instructional process of the software, but how instruction should be presented with regards to the researcher's pedagogy, screen layout, audio, text, graphics, feedback, development cost, and user acceptance.

Pembrook (1986) investigated the opinions of 75 college students who had been exposed to computer-based melodic dictation instruction and classroom instruction. A 34-item survey was used to assess students' opinions of the hardware, software, and departmental requirements regarding the computer-based instruction and asked for comparisons of this tutelage with the classroom instruction they had subsequently received. Results indicated favorable reviews of hardware and software. Students' opinions were almost evenly distributed when comparing the two instruction methods. Thirty-two percent felt they had learned more, 32% felt they had learned less, and 37% felt they had learned about the same as they would have in a traditional setting. However, students indicated that the computer program required too much time outside of classes, too much progress was expected in too little time, and pacing (the increase in difficulty levels) was not consistent throughout the program.

In a pilot study, Walls (1994) examined the effect of CAI in music fundamentals on the attitudes of pre-service elementary teachers. Concepts were presented in grouped categories of rhythm, melody, harmony, form, Curwen hand signs, and terminology. Subjects enjoyed having flexible times for using the computers and the freedom to review concepts as often as desired. Their performance on written examinations was as good as or better than students not participating in CAI, which resulted in an average positive change in attitude towards the use of computers for effective teaching in music. However, ineffective staff and the lack of equipment posed problems for the students.

Using semi-structured interviews, Ho (2004a) investigated gender difference between Hong Kong elementary and secondary boys and girls on their everyday preferences of information technology (IT). Ho found that 69.5% of girls and 67.3% of boys were confident in using the Internet, computer, synthesizers, and music software. Students also believed that technology is fast, reliable and a convenient means to learn about music. Boys preferred IT for composing and musical literacy and girls preferred IT for listening and performing. However, primary school students were more enthusiastic about IT for music learning than secondary students.

In a fundamentals class that covered basic music theory, singing, and keyboard skills Parrish (1997) concluded that pre-service teachers had no significant drop in posttest scores while using CAI. In addition, it was discovered that CAI could be an effective timesaving tool in the classroom. This coupled with no significant drop in test scores indicated that using CAI was valuable when using familiar folk songs, tutorials, drill-and-practice, unlimited chances to rehearse information and mastery-based testing, thus allowing instructors more classroom time to develop performance skills. Orman (1998) investigated the effects of development and implementation of an interactive multimedia computer program on the achievement and attitude of sixth-grade saxophonists. Findings suggested that multimedia technology was an effective means of increasing and/or producing academic achievement equivalent to traditional instruction when it was used as a replacement. Likewise, results also indicated that there was a strong acceptance of the program and its application among band directors and students.

Screen Design

Grabinger (1989) investigated the use of design elements such as time per screen, color-coding versus narrative formats and display of text. He discovered that the purpose of design

elements must be explained to students before they are encountered for them to have any effect. A study by Hannafin and Hopper (1989) examined the foundations and functions of screen design and layout. The foundations were identified as psychological, instructional and technological whereas functions were recognized as focusing attention on key aspects of the lesson, developing and maintaining interest in the lesson content and activities, promoting deep processing of important information, promoting engagement between the learner and lesson content, and facilitating lesson navigation. They suggested that the acronym ROPES (Retrieving, Orienting, Presenting, Encoding, and Sequencing) be used to develop better frameworks for determining how the capabilities of CBI should be managed.

Two studies conducted by Morrison, Ross, O'Dell, Schultz, and Higginbotham-Wheat (1989) inspected the use of "text density" (amount of text on screen) and "screen density" (amount of white space on screen). The first study examined preferences for high-density and low-density treatments of text. High-density text referred to large amounts of text presented on the screens and low density text referred to minimal amounts of text presented on the screen. There were no significant differences in achievement scores between the two density conditions; however, the high-density subjects took significantly longer to complete the lesson. The second study examined high-density and low-density treatments of screen design. In this situation, high-density screens referred to large amounts of white space in screen designs and low-density screens made reference to minimal amounts of white space in screen design. Results indicated that subjects preferred high-density screens. Findings also suggested that instructional designers ensure that adequate contextual support be provided on each screen even at the expense of white space (the portion of the page left empty) that may have been added for aesthetics.

Dirckinck-Holmfeld and Nielsen (1992) investigated the influence of image representation and written information on cognitive processes. Results indicated that graphics embodied an element of seduction, which caused the users to feel a greater affinity with the learning activity. Additionally, graphics enhanced the comprehension of the task without undue cognitive activity. Therefore, graphic design should be developed with due consideration to the specific meaning of the activity.

Grabinger (1993) conducted two studies that examined viewer judgments about the readability and studyability of two sets of computer screens. The first study investigated preferences for model screens in which screen layouts were presented but were free from content. The second study investigated preferences for model screens in which screen layouts were presented with content. Both studies found that subjects preferred screens that were organized to help them study and that were intriguing or visually interesting. The organization and visual aesthetics of screen design should provide some rule of thumb for positioning numerous text elements. Screen designers must decide where status and progress information, navigation buttons, content displays, control buttons, and illustrations should be located. Use of graphic devices such as shading, lines, and boxes to separate one area from another are essential for effective screen layouts. Screen organization should also incorporate headings, directive cues, and spaced paragraphs to indicate the hierarchy of the content and to break the content into studyable chunks of information. Furthermore, visual aspects must avoid excessive use of the above-mentioned elements as not to create screen complexity. This design method works only when uniformity is practiced throughout a program and its parts. For these reasons, organization of screen design should supersede visual features of screen design (Grabinger, 1993).

Smith-Gratto and Fisher (1998) reviewed the Laws of Perception as identified by the Gestalt theory. Although the laws were designed for the printed page, they discussed how the Laws of Perception could be applied to improve screen design and make the presentations clearer and more helpful in the learning process. The laws discussed were figure-ground contrast (relationship between the figure and the background), simplicity (presentation of text and graphics), proximity (grouping of objects), similarity (attention drawn to objects or text that is similar), symmetry (items carrying equal weight visually), and closure (closed shapes vs. open shapes). Recommendations suggested that since the computer screen presents information in a visual format it is very important that screen designers be cognizant of how the learner perceives the information. By using the Laws of Perception, designers can enhance the level of knowledge obtained from the screens.

Audio

Computer-based training (CBT) programs usually focused on visual presentation and eliminated auditory presentation because of hardware constraints. The introduction of digital audio created the need for successful incorporation of synchronized, random audio into CBT.

Shortly after the introduction of digital audio, a study conducted by Barron and Kysilka (1993) investigated whether the addition of digital audio to CBT would affect students' learnability. To provide three treatment programs for the study, a compact disc-read only memory (CD-ROM) was developed in three designs: (a) text base with no audio, (b) text and audio based with audio being delivered word for word with on screen text, and (c) text and audio based with text being reduced to bulleted items rather than full text and audio being delivered. Results indicated that the various CBT delivery methods did not have a significant effect on overall comprehension of the tutorial content.

The effect of audio and video presentation in music teaching and learning is relevant to the present study. Geringer, Cassidy, and Byo (1996) conducted an exploratory study that probed the possible effects of visual information on nonmusical students' affective and cognitive responses to music. One group of university students viewed the movie *Fantasia* (Disney, VHS1132) while listening to selected music excerpts; a second group was presented the music only. Based on the results of cognitive listening tests, Likert-type affective rating scales, and two open-ended questions, findings indicated that subjects in a music-plus-video group earned higher scores on both cognitive and affective measures than those in a music-only group. In a subsequent and related study, Geringer, Cassidy, and Byo (1997) compared the effects of different kinds of visual presentations and music alone on university nonmusical students' affective and cognitive responses to music. Four groups of students were presented with excerpts from the first and fourth movements of Beethoven's *Symphony no. 6 in F major* (*"Pastoral"*). Two groups heard music excerpts only, one interpretation conducted by Stowkowski, and one by Bernstein. One of the video groups viewed corresponding excerpts from the movie *Fantasia* while listening to the Stowkowski recording. A second group viewed and listened to a performance video of the Vienna Philharmonic filmed during a Bernstein recording session. One hundred and twenty eight subjects completed cognitive listening tests based on the excerpts, rated the music on Likert-type affective scales, and responded to two open-ended questions. Significant effects of presentation condition were found. Cognitive scores were higher for the performance video than the music plus animation video on both movements. Scores for the two music-only presentations were not significantly different from each other or the two video presentations. Although affective ratings were not significantly different in magnitude between

the presentation groups, the animation video presentation ranked consistently higher in affect than the other presentations.

Truman and Truman (2006) examined whether the simultaneous presentation of identical information using both sound and text enhances learnability and recall of presented information, as opposed to text alone. The learning systems included Science Computer-Assisted Teaching and Music Oriented Learning Environment. They discovered that a managed mix of text and concurrent narration is associated with an increase in learnability and recall of concepts. A significant amount of learning was imparted with either learning systems regardless of whether the systems were text-only based or auditory-verbal based; however, higher posttest scores were attained by participants within the auditory-verbal treatments.

Feedback

Gaynor (1981) studied four feedback conditions in CAI, immediate feedback, end of session feedback, a thirty-second delayed feedback, and no feedback with regards to short and long-term retention. It was discovered that all groups, with the exception of the thirty second delayed feedback group which performed somewhat worse, performed equally well on short and long term retention at the first three levels of Bloom’s taxonomy (knowledge, comprehension, and application). The author suggested that feedback should be appropriately placed within CAI based on the level of difficulty of the materials being presented.

Grabinger and Pollock (1989) investigated the effectiveness of external and internal feedback in CAI. External feedback was provided by the instructor, and internal feedback was provided by an expert system within CAI that helped students to generate their own feedback about the quality of their work. The expert system provided questions that allowed students to analyze their work and make evaluative judgments related to each criterion for their assigned

projects. Results indicated that internal feedback was just as effective as external feedback. Internal feedback placed the responsibility for learning on the student, fostered a non-threatening means for students to generate feedback, and caused them to be more creative in evaluations of assigned projects.

A basic goal of instruction is for students to master content. To accomplish this task instructional designers and other educators must develop lessons that are informative and challenging without being overwhelming. Instructional support should adjust to specific individuals based on learner characteristics and/or demonstrated needs (Sales & Williams, 1988). A study conducted by Sales and Carrier (1987) examined the possible relationships among the learning styles of students and different forms of feedback. Students classified as Accommodators, Assimilators, Divergers, or Convergers based on David Kolb's Learning Style Inventory scores, were given the opportunity to select the desired type of feedback from the following selections: (a) no feedback – skipped directly to the next practice item without any feedback, (b) knowledge of results – informed students of correct or incorrect responses, (c) knowledge of correct response– informed students of correct or incorrect responses and provided the correct response if necessary, and (d) elaborative feedback – informed students of correct or incorrect responses and explained the reasoning for the correct response. Results indicated that most students, regardless of their learning style, selected elaborative feedback when given the opportunity to select from a continuum of choices ranging from no feedback to elaborative feedback.

In a related study, Sales and Williams (1988) explored two major loci of control, learner control or computer control, for feedback types and the possible interactions among learning styles and learner achievement. Learner control allowed the learner to select options that

controlled various functions of the computer program such as level of difficulty or type of feedback. Program control did not allow the learner to select any options. Options were predetermined by program designers. Students learning style types were identified using Kolb's Learning Styles Inventory. It was determined that the locus of feedback control did not have a significant effect on learner achievement. Learning style influenced the number of feedback selections made by students and once again, students asked for elaborative feedback more frequently. Therefore, the effect of feedback type could not be used to determine learner achievement.

Cost Effectiveness and Implementation

Watanabe (1980) reviewed the early use and development of CAI by Allvin, Kuhn, Deihl, Placek, and Williams to explore the possibilities of developing cost-effective audio devices that would expedite the writing of music lessons that are tailored to student needs. Because audio is so important to CAI in music education, he concluded that it is imperative that we attend to problems of audio in order to promote advancement in the area of CAI in music education.

With the increased development of music software and hardware, creative and knowledgeable researchers such as Foltz and Gross (1980) developed a four step cost effective plan for successful CAI implementation. The steps consisted of a thorough definition of instructional needs, a flexible overall structure, financial support, and established operational procedures. These steps can be successfully adhered to if the individuals charged with the responsibility of computer-assisted instruction implementation are motivated, dedicated, and possess a keen knowledge of administrative skills. Likewise, Ottman, et al. (1980) reported considerations for economically implementing CAI for music instruction. Economical

procedures with reference to site selection and management, budget for the implementation, student use, documentation, and the user community were presented. It should be noted that a CAI system involves ongoing development. Continued revisions are necessary to keep the system current with new curriculum materials, student needs and to avoid routine fatigue. Input from students and faculty is of utmost importance in the generation of new ideas for software and hardware modification and expansion. Prèvel (1980) offered numerous suggestions regarding cost factors of audio output, which can be a costly necessity for music CAI software and hardware. Suggestions included: (a) Cost cannot exceed that of an average quality tape recorder, (b) the station must be programmable allowing for flexibility of pedagogy, (c) each station should be a stand-alone system, (d) keyboard eliminates the need for touch panels as input devices and (e) audio should take precedence over graphic display.

Implementation of Computer-Assisted Instruction in the Music Curriculum

Placek (1980) developed a model for successful implementation of CAI materials into the music curriculum. His four steps for CAI integration include: (a) syllabi must contain statements of conceptual objectives or lists of concepts that need to be understood, (b) behavioral objectives should be drawn out so that they are relevant to the conceptual level objectives, (c) strategies for eliciting behaviors should be selected so that they coincide with the strategies used in the ordinary classroom, and (d) evaluations that monitor students' progress should be provided throughout the lesson. Also emphasized were the unique properties of CAI such as individualized paths of instruction, instantaneous and confidential feedback, data collected and computational results quickly reported, audio and visual effects may be accessed quickly, rate of learning speed may be individualized and the computer program never loses its patience.

Consequently, the student may have more flexibility in his path of instruction than exists in the ordinary classroom.

A study by Byrne and MacDonald (2002) investigated the issues identified by teachers in the use of information and communication technology in the Scottish music curriculum. With a qualitative focus, they discovered that two broad themes emerged in the transcripts, (a) what is taught in music classes and how it is taught and (b) management and infrastructure. Subjects were disappointed to find that in-service training for other content areas was abundant when compared to in-service training for music teachers. On the other hand, Bauer (2003) surveyed whether or not a one-week technology workshop in the United States could be an effective means for the professional development of music teachers in using technology for instruction. Areas of concern were music teachers' knowledge of technology, their degree of comfort with using technology for music learning and would music technology training change the frequency with which teachers use technology for music learning. Results revealed that three areas could be significantly improved in a workshop setting – teacher knowledge, teacher comfort, and frequency of use. Consequently, this approach to technology involvement in music education suggests the need to encompass the use of technology in the music classroom but not neglect the traditional methods of teaching core musical activities such as composing, performing, and audience-listening (Cain, 2004). The professional development of the music teacher, allowing them to learn from each other, as well as from experts will give them the tools necessary to determine how best to use music technology in the classroom.

Ho (2004b), using ethnographic methods, assessed if a five-year introduction of Information Technology (IT) into music lessons would produce the expected shift to a leaner-directed mode of music teaching. The research examined the use of IT to teach music more

effectively than traditional music pedagogy, teachers' views on the effects of the plan on their classroom practices, if IT could help improve teaching practices, and if IT facilities increased students' interest in learning music. Overall, the findings indicated that most music teachers believed the quality of music education depended on the quality of the teacher, not the teachers' use of IT. However, teachers held mixed views on the pedagogical aspects of IT and were concerned about the aesthetic qualities of music when using IT. Students believed that music technology could enhance their quality of learning but were concerned about the availability of equipment and teachers' technological competence. With reference to aesthetics and performance, students generally felt more comfortable with the teacher's voice rather than computer generated demonstrations and non-musical illustrations.

Learning Styles

The proliferation of computers into all areas of instruction, especially music education, has encouraged university instructors to use this instructional tool to enhance the learnability of preservice classroom teachers. Classroom teachers have been given the responsibility of implementing music into their classrooms and research has established that individuals have a preferred way of learning and that learning can be facilitated by matching instructional strategies to particular learning styles. The present study sought to investigate how CAMI software designed for specific learning style preferences would enhance the learning environment in a fundamentals of music course for preserve classroom teachers by developing learner specific software for reading rhythm.

In 1979, The National Association of Secondary School Principals (NASSP) undertook the co-sponsorship of a National Learning Styles Network with St. John's University of New York. A growing interest led to a major conference sponsored by the network in 1981 that

brought together many of the leading persons in the field to discuss and exchange information on student learning style and brain behavior. Shortly after the conference, the NASSP moved to form a national task force on learning styles composed of researchers and practitioners with different backgrounds but interest in the field (Keefe, 1985). The task force defined learning style as:

> The composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment. Learning style is demonstrated in that pattern of behavior and performance by which an individual approaches educational experiences. Its basis lies in the structure of neural organization and personality, which both molds and is molded by human development and the learning experiences of home, school, and society (Keefe & Languis, 1983, p. 3).

In a study, that included two experiments, Berry and Broadbent (1988) investigated the relationship between explicit [selective] and implicit [unselective] processes in the acquisition of complex knowledge. Explicit acquisition of knowledge is characterized as an active process where people seek out the structure of information that is presented to them. In contrast, implicit learning is a passive process where people are exposed to information and acquire knowledge of that information simply through that exposure. Their purpose was twofold—first, to specify some of the variables that control whether performance and explicit knowledge would be associated when people interact with computer-implemented control tasks and second, to clarify the relationships between implicit and explicit modes of learning and implicit and explicit types of knowledge. Results indicated that salience of the relationship between decision and action is a crucial factor in relation to both the distinction between implicit and explicit learning and the distinction between implicit and explicit knowledge. When given a complex task, performance was poorer when subjects employed implicit learning, and better when subjects employed explicit learning.

Sissel Guttormsen Schär, Schluep, Schierz, and Krueger (2000) investigated whether different user-interfaces would encourage two learning modes: (a) explicit and (b) implicit. Five experiments were performed that tested interaction tools, navigation methods and feedback. Results indicated that user-interface had a direct influence on knowledge acquisition. The success of learning a certain task was directly linked to the chosen learning strategy induced by the user-interface. In addition, the desired learning mode, explicit, was accomplished when feedback was delayed until a given action was completed.

Felder (1996) reviewed four learning instruments that identify various learning styles. Instruments investigated were Myers-Briggs Type Indicator (MBTI), which classified students according to psychologist Carl Jung's theory of psychological types-extraverts, introverts, sensors, thinkers, and judgers; Kolb's Learning Style Model, which classified students as having a preference for concrete experience or abstract conceptualization and active experimentation or reflective observation; Herrmann Brain Dominance Instrument (HBDI), which organized students in terms of their relative preferences for thinking in four different modes based on the task-specialized functioning of the physical brain: (a) left brain, cerebral, (b) left brain, limbic, (c) right brain, limbic and 4) right brain, cerebral; and Felder-Silverman Learning Style Model, which cataloged students as sensing learners, visual learners, inductive learners, active learners, and sequential learners. Felder opined that a balance of instruction based on each of the learning style models is most useful if the presentation meets the learning needs of all students.

Park (2000) examined four basic perceptual learning style preferences (auditory, visual, kinesthetic, and tactile) and preferences for group and individual learning among Southeast Asian students as compared to Anglo students enrolled in grades 9^{th} through 12^{th}. Using Joy Reid's 1987 self-reporting Perceptual Learning Styles Questionnaire (PLSQ), it was discovered

that there were no significant ethnic group differences in auditory learning style among Southeast Asian students and Anglo students. There were also no academic achievement level differences among all ethnic groups. Hmong and Vietnamese students exhibited a greater preference for visual learning when compared to Anglo students. In addition, there were no significant differences in visual learning style among high, middle, and low achievers. All ethnic groups showed a major preference for kinesthetic learning. All Southeast Asian students had a major preference for tactile learning when compared to Anglo students. Group learning revealed statistically significant differences among all ethnic groups. Hmong and Vietnamese students exhibited a major preference for group learning when compared to Anglo students, who had a negative preference for it. Individual learning style preferences revealed no statistically significant group differences among all ethnic groups. A study conducted by Ramburuth and McCormick (2001) explored the learning style preferences of Australian students and Asian international students in higher education. Instruments used for the investigation were the Study Process Questionnaire (SPQ) by John Briggs and the PLSQ by Joy Reid. Findings indicated that there were no statistically significant differences between Asian international and Australian students in their overall approaches to learning. Asian international students demonstrated higher use of deep motivation, surface strategies, and achieving strategies. Results of learning style preferences signified that Asian international students had a stronger preference for group and tactile learning, while Australian students had a stronger preference for auditory and individual learning.

Lee, McCool and Napieralski (2000) investigated adult learning preferences among a set of four activities commonly employed in adult educational settings. The settings included lectures, in-class discussion and reflections, group based projects, and individual projects. Using

the Analytic Hierarchy Process (AHP) developed by Thomas Saaty (1980), they discovered that adult graduate students preferred to learn by discussion and reflection, not lecture, and through individual, not group projects. Cohen (2001) examined whether a technology-rich environment that promoted a constructivist approach to learning had a significant effect on the learning styles of freshman high school students. Students were administered a pre-test and a post-test on the Learning Style Inventory (LSI) by Dunn, Dunn, and Price (1989). This instrument obtained a profile of each student in 22 areas, that, when identified as relevant, represented the ways in which an individual prefers to study or concentrate. Six of the variables were selected because of relevancy based on the results of a pilot study: (a) motivation, (b) persistence, (c) responsibility, (d) preference for working alone or with peers, (e) parent motivated, and (f) teacher motivated. Results suggested that a technology-rich environment that promotes collaborative, project-based learning had a positive effect on students' learning style.

Heffler (2001) investigated four different approaches to learning, concrete experience (feeling), reflective observation (watching), abstract conceptualization (thinking) and active experimentation (doing) as identified by David Kolb's LSI. The LSI is a nine-item self-description questionnaire that addressed the four different approaches to learning and/or learning style. The aim of the study was to collect data and present test-retest reliability coefficients for the different learning modes, correlation between different learning modes and age, gender differences in the learning modes, and homogenous groups of students with different learning styles. All reliability coefficients were highly significant. Results among first semester university students indicated that the highest reliability was obtained for the reflective observation mode and the lowest for the abstract conceptualization mode. Correlations revealed that the active-reflective and the reflective-observation were more reliable and more stable than the abstract-

concrete dimension. It was determined that the LSI is a reliable instrument for measuring an individual's learning style.

Ross and Schulz (1999) explored the impact of learning styles on human-computer interaction. Subjects' dominant learning styles were obtained using *The Gregorc Style Delineator* developed by Dr. Anthony F. Gregorc in 1982. This instrument was a self-scoring battery which focused on two types of mediation abilities in adults: (a) perception (abstractness and concreteness) and (b) ordering (sequential and random). Results indicated that patterns of learning did not differ significantly based on subjects' dominant learning style. Scores from pretest to posttest revealed significant gains for Concrete Sequential learners, Concrete Random learners and Abstract Sequential learners; however, Abstract Random learners were at risk for poor performance with certain forms of CAI. It remains essential that the computer continue to be used as a tool for supplementing classroom instruction. Educators should not assume that every student will automatically benefit from computers in the classroom.

Interpersonal contact and guidance are needed to ensure that all students attain their learning potential. Harris, Dwyer, and Leeming (2003) examined the impact of learning style on performance in a Web-based learning environment. Students with different learning styles, as measured by Kolb's LSI were randomly assigned to one of two Web-based training modules. Both were text-based, but only one module contained multimedia enhancements such as animations, drag-and-drop opportunities, and options for connecting to links with further information about a topic. It was determined that neither student learning style nor online course module version had any impact on average test scores. In opposition to other findings, Harris, Dwyer, and Leeming concluded that the designing of programs specifically to meet the learning

styles or preferences for each student may not be necessary to improve his or her performance levels.

Loo (2004) studied the relationships between Kolb's four learning styles and four learning types – diverger, assimilator, converger, and accommodator. It was discovered that among undergraduate students there were weak linkages between learning styles and learning preferences. Large individual differences that existed within each learning style and type indicated that learning style was not a major determinant of learning preferences. Loo recommended that educators should use a variety of learning methods and encourage students to be receptive to different learning methods rather than try to link specific learning methods to specific learning styles. A study by Sloan, Dane, and Giessen (2004) investigated the learning style preferences of elementary preservice teachers. Students were administered the Style Analysis Survey (SASS) by Oxford (1995). The five major categories of the SASS are using physical senses (visual, auditory, hands-on), dealing with people (extroverted vs. introverted), handling possibilities (intuitive vs. concrete-sequential), approaching tasks (closure-oriented vs. open), and dealing with ideas (global vs. analytic). Findings indicated that teachers had a tendency to teach based on their learning styles. Therefore, it was suggested that university instructors should have preservice teachers explore different learning styles so that they can adjust their teaching to accommodate the varied learning styles of elementary school children. Onwegbuzie and Daley (1998) examined whether students with learning styles similar to those of their instructor tended to have higher achievement levels than students who did not. Using the Productivity Environment Preference Survey (Dunn, Dunn, and Price, 1991), they investigated a comprehensive approach to identifying preferences in how adults function, learn, concentrate, and perform during educational or work activities. Findings suggested that students who were

most similar to their instructor with respect to persistence, orientation to peers, auditory preference, and multiple perceptual preferences attained higher levels of achievement.

Theorist Michael Lively (2005) explored the process of adapting undergraduate music theory instructional material for the learning styles of individual students with reference to the abstract task of musical analysis. Kolb's typology of learning styles served as the model to evaluate the ability of music theory instructional material to match the learning styles of individual students. Kolb's learning styles were easily adapted to music theory because several of the processes in musical analysis require abstract conceptualization, reflective observation, concrete experience, and active experimentation. Lively discovered that students who were presented with the combined or integrated instructional sequences that addressed learning styles demonstrated a superior learning outcome from pre-test scores to post-test scores. Dorfman (2006) investigated the influence of individual learning styles, music experience, technology experience, music technology experience, and varied learning conditions on participants' achievement with a music technology task. The learning preference of participants was evaluated using the *Gregorc Style Delineator* (1982), a self-assessment instrument designed to measure dominant learning style characteristics. Participants were taught to operate music notation software using one of two learning conditions to which they were randomly assigned: unguided experimentation, or guided learning using a researcher-designed video tutorial. Finally, participants were asked to complete a timed task with the notation software. Results indicated that there were no significant differences in students' achievement level based on learning style preference and the assigned music technology task. Korenman and Peynircioglu (2007) examined the effects of presentation modality and learning style preference on university musicians and nonmusicians' ability to learn and remember unfamiliar melodies and sentences.

Participants' learning style was assessed using the *Barsch Learning Style Inventory* (BLSI). The BLSI, by Barsch (1980) is a self-administered questionnaire designed to help people identify whether a visual or an auditory method of learning is more effective for them. Results indicated that presentation modality did not make a difference, but learning style preference did. Visual learners learned visually presented items faster and remembered them better when compared to auditory presentation and auditory learners did the reverse.

Strengths and Weaknesses of Learning Style Instruments

It is evident that an abundance of literature, models, and instruments exists for the understanding, measuring, and classifying of learning styles/preferences. However, it is at this point that the problems associated with reliability and validity of the instruments should be discussed. Lemire (1996) investigated the lack of scientific evidence that would support learning style instruments. The instruments investigated were: (a) Learning Preference Inventory, (b) Learning Process Questionnaire, (c) Learning Style Inventory, and (d) Learning Styles and Strategies. Lemire suggested that many factors come into play, such as gender, ethnicity, grade-levels, and age, when attempting to scientifically develop credible validity and reliability data on the many instruments that are available. It was suggested that a variety of instruments designed to measure the same learning style preference should be administered to a designated group of students. If the scores are congruent for each student at a minimum of 75% on each inventory, the instruments will have verified an acceptable level of reliability and validity. Coffield, Moseley, Hall, and Ecclestone (2004a) in a critical review of learning styles, analysis of reliability, validity, and implications for pedagogy, investigated 13 learning style instruments. Instruments used for investigation were: (a) Cognitive Styles Index, (b) Motivational Style

Profile, (c) Dunn and Dunn's model and instruments of learning styles, (d) Approaches and Study Skills Inventory for Students, (e) Gregorc Styles Delineator, (f) Herrmann's Brain Dominance Instrument , (g) Honey and Mumford's Learning Styles Questionnaire, (h) Jackson's Learning Styles Profiler, (i) Kolb's Learning Style Inventory, (j) Myers-Briggs Type Indicator, (k) Riding's Cognitive Styles Analysis, (l) Sternberg's Thinking Styles Inventory, and (m) Vermunt's Inventory of Learning Styles. The authors concluded that in the field of learning styles, there is a lack of theoretical coherence and a common framework (Coffield, et al., 2004a). However, of the 13 instruments studied, the reviewers found that the Cognitive Styles Index (CSI) had the best evidence for reliability and validity and is a suitable tool for researching and reflecting on teaching and learning.

Wintergerst, DeCapua, and Itzen (2001) examined the reliability and validity of Joy Reid's (1984) Perceptual Learning Style Preference Questionnaire (PLSPQ). This instrument is designed to assess the learning style of undergraduate and graduate English as a Second Language (ESL) students. Results showed that specific survey items were not coherent for ESL students, therefore causing a threat to the PLSPQ's reliability and validity. Reid (1990) also implied that the wording of the questions may not have been clear for ESL students but may have been clearer for native speakers of English because of their English language proficiency.

Hawk and Shah (2007) reviewed five learning style instruments (the Kolb Learning Style Indicator, the Gregorc Style Delineator, the Felder–Silverman Index of Learning Styles, the VARK Questionnaire - Visual, Aural, Read/Write, and Kinesthetic, and the Dunn and Dunn Productivity Environmental Preference Survey) in order to describe the learning style modes or dimensions measured in the instruments, find the common measures and the differences, and report on instrument validity and reliability. Findings suggested that coupling learning style

instruments that measure/assess similar dimensions could possibly increase reliability and validity and also give instructors additional information that would be useful in crafting their learning activities.

Teaching towards a specific learning style/preference that favors a students' less preferred learning style may cause the students' discomfort level to be great enough to interfere with their learning. On the other hand, if professors teach exclusively in their students' preferred modes, the students may not develop the mental dexterity they need to reach their potential for achievement in school and as professionals (Felder, 1996). Yet, it is simply not practical to expect instructors to provide programs that accommodate the learning style diversity in their classes. Fleming and Mills (1992) suggested that teaching programs should involve empowering students through knowledge of their own learning styles so students could adjust their learning behaviors to the learning programs they encounter. This is not to say that instructors should not consider learning styles when developing and delivering instructional programs. This argument is substantiated in a report on theories and instruments for identifying student learning styles. Suskie (2002) discussed six models of learning style instruments:

1. Field dependence/field independence (Group Embedded Figures Test)
2. Jungian models (Myers-Briggs Type Indicator, Gregorc Style Delineator, Keirsey Temperament Sorter II, Kolb Learning Style Inventory)
3. Sensory (visual-auditory-kinesthetic) models (several inventories)
4. Social interaction models (Grasha-Reichmann Student Learning Style Scales and Learning Preference Scales)
5. Howard Gardner’s multiple intelligences model (several inventories)
6. John Biggs’ approaches to learning model (Study Process Questionnaire)

Suskie concluded that no one instrument is sufficiently valid. The author suggested that students complete at least two learning style inventories of similar design and compare the results to better identify their preferred learning styles.

Walters, Egert, and Cuddihy (2000) investigated the use of Web-based education which enables educational material to be presented in a variety of media formats such as audio, video clips, textual documents, images, graphs, and diagrams that may be favorable for varying learning styles. Results provided support for the view that student web-based learning can be enhanced through the use of materials that are consistent with a student's particular learning style. However, in determining students' learning style and designing web-based education to fit a particular learning style, the authors cautioned the use of one learning style instrument over another. It was recommended that the coupling of learning style instruments is the most useful method for determining the validity of learning style self-reports and learning style instruments. Similarly, Miller (2005) investigated the use of two learning style instruments, Gregorc Style Delineator (GSD) and Kolb Learning Style Inventory (LSI) while evaluating the effects of learning style on performance when using a computer-based instruction system to teach introductory probability and statistics. Results indicated that there was an effect of learning style when using the GSD; students identified as Concrete Sequential learned significantly less than students identified as Concrete Random. There was no effect according to LSI styles. Despite these findings, there was no significant difference according to performance based on learning style and or preference. It was recommended that creators of CBI make certain that CBI formats are instructionally balanced to prevent student alienation or discrimination.

Classroom Teachers' Attitudes and Perceptions of Music Instruction

Whether or not school districts provide specialized instruction in music, the classroom teacher has a unique and important role in a child's musical development (Winslow, Dallin, & Wiest, 2001). Therefore, it becomes essential that university undergraduate fundamentals and methods courses in music education for preservice classroom teachers provide the necessary tools to make this often times novice music preservice classroom teacher comfortable with musical rudiments that are essential for building positive attitudes toward music and basic musical skills, especially in the primary grades.

Picerno (1970a) surveyed one-half of the music supervisors in New York State to determine the extent to which the classroom teacher taught music in the elementary schools. After receiving responses from 74% of the music supervisors it was determined that 39% of classroom teachers had some responsibility for teaching music in their classrooms and 71% of the music supervisors favored having the classroom teacher teach music. However, it was the opinion of the music supervisors that classroom teachers were not prepared to teach music. In a follow-up study, Picerno (1970b) surveyed the opinions of classroom teachers to determine what they thought their roles were in elementary music education. Results indicated that 73% taught music in their classrooms even though 62% of the time that was given to music was used by the music specialist. Classroom teachers believed that those musical activities that required special skills, such as teaching theory or music history should be done by the music specialist. Approximately 70% of the classroom teachers felt that they were adequately prepared in college to teach some music, however, 55% strongly recommended that more music education or music method courses should be required for the classroom teacher.

With the passage of Goals 2000: Educate America Act, the arts have been recognized for the first time as a fundamental academic subject (Consortium of National Arts Education Associations, 1994). The national standards for public music education include what every student should be able to do with regards to singing, playing instruments, improvising, understanding relationships between music and other disciplines, and understanding music in relation to history and culture. Attempts to employ these standards have caused a number of complicated and important issues. One of those issues is that public elementary school decision makers have placed the responsibility for teaching the music standards on classroom teachers regardless of time, training, interest, resources, perceived responsibility, and ability (Byo, 1999).

The National Center for Education Statistics (United States Department of Education, 2002) reported that 72% of elementary music instruction was taught by full-time certified music specialists; 20% was taught by part-time certified music specialists; 11% was taught by classroom teachers; 3% was taught by artists-in-residence and 4% was taught by other faculty or volunteers (percentages sum to more than 100% because respondents could select more than one category). Byo (1999) surveyed fourth-grade classroom teachers concerning their comfort level with teaching the national standards for music education and results indicated that classroom teachers were more comfortable implementing "understanding relationships between music and other disciplines" and "understanding music in relation to history and culture." However, teaching according to these two standards did not depend fully on the classroom teacher having an acceptable competency level of music concepts.

Saunders and Baker (1991) reviewed the perceptions of useful music skills and understanding among in-service classroom teachers regardless of whether the concepts were taught in preservice music classes. Respondents indicated that using music to enhance or

supplement other curricular areas as first among useful skills and understandings. Music concepts that in-service classroom teachers perceived as useful were singing, movement, listening, and creative experiences. Saunders and Baker strongly recommended that undergraduate music courses for preservice classroom teachers should include the development of a wide variety of music skills and understandings in conjunction with methods and materials for the integration of music into other subject areas.

Propst (2003) examined the types of musical experiences classroom teachers felt most comfortable with and used most often in their classrooms. Results indicated that singing games, special occasion songs, movement, and the integration of music with other subjects were used most often. Stein (2003) used the Attitude Behavior Scale-Elementary General Music (ABS-EG) by Tunks (1973) to determine whether a university music fundamentals and/or methods course for elementary education majors would cause a change in attitude toward the value of general music in the elementary school. Subjects were pre-tested during the first week of class and post-tested during the final week of class. Results indicated that there was a small but significant effect on the attitudes of preservice elementary education teachers after completing a one-semester course in music fundamentals. Stein recommended that because the elementary music methods class is the last structured involvement with music for preservice classroom teachers, it would be prudent for researchers and instructors to develop effective strategies for building positive attitudes toward elementary general music education.

Need for Study

The present research is motivated by the need to make the university music fundamentals course for preservice classroom teachers optimally conducive to teaching and learning rhythm, given the sixteen-week time constraint of most university courses. This concept is presented

early in textbooks used for undergraduate fundamentals of music courses and is often the most difficult and time-consuming classroom activity (Anderson & Lawrence, 2006; Rozmajzl & Boyer, 2006; Winslow, et al., 2001). The results of classroom student assessment support that learners progressing through an instructional sequence, such as reading and responding to rhythm, glean different amounts of information. One cause of these differing amounts of information may be an individual's learning style as differences in learning styles have been associated with preferences for types and amounts of instructional support (Sales & Carrier, 1987). Although the types and amounts of instructional support may vary, the learner must still acquire the necessary information needed to understand a given concept.

The use of computer-assisted instruction (CAMI) can accommodate the varying learning styles and control the amount of support needed to accomplish musical concepts, such as rhythm. Kulik, Kulik, and Cohen (1980) discovered by summarizing studies completed between 1967 and 1978 that computer-assisted instruction (CAI) and support for varying learning styles, reduced the amount of time needed for classroom instruction and positively affected the attitudes of students toward instruction and learning.

In examining the existing literature on university music preparation programs for classroom teachers, computer-assisted music instruction (CAMI), and learning styles, it is evident that previous research is immense and contains a wealth of information, suggestions and appropriate opportunities for technological implementation in the music classroom on the elementary level, secondary level, and post secondary level in each of the respective areas. However, no prior research has been found that addressed CAMI for the pre-service elementary classroom teacher that incorporates the instruction of rhythm and is designed to accommodate learning style preferences. As music educators, we continually seek new strategies that will be

effective timesaving tools that enhance the learning of university preservice teachers, and promote effective music instruction practices. To this end, the primary research question guiding this investigation was: Is there an effect on preservice classroom teachers' learnability when given rhythm-based computer-assisted software designed for individual learning style preferences?

CHAPTER 3

MATERIALS AND METHODS

Participants

Participants were 82 undergraduate pre-service elementary education and early childhood development majors. Sixty-one participants were enrolled in six sections of a sixteen-week Fundamentals of Music course that is a curriculum requirement for the elementary classroom teacher at Southern University and A & M College. The eight week summer section enrollment included 21participants. Collegiate classifications were 13 sophomores, 32 juniors, 37 seniors and included 78 females and 4 males. Participants took part in the study as a component of course requirements identified in the course syllabus under the headings of "Concepts of Rhythm" and "Classroom Rhythm Skills." None of the participants reported having received structured music instruction experience prior to enrolling in the course. Exemption from oversight was secured from the Louisiana State University Institutional Review Board (see Appendix A) and the Southern University and A & M College Institutional Review Board (see Appendix B). All participants were given consent forms (see Appendix C), which were signed before taking part in the study.

Course Description

"MUSC 327: Fundamentals of Music for Classroom Teachers" was designed to help students acquire an understanding of the fundamentals of music and to prepare prospective teachers with the skills needed to provide musical experiences for elementary school children through singing, listening to music, and playing of melodic and rhythmic instruments. Course objectives included an introduction to and the development of specific and practical methodologies for teaching music skills to elementary school children. Three sections met during

the fall semester of 2007, three during the spring semester of 2008 and one during the summer of 2008. During the fall semester the sections met as follows: (a) sections one and two - 50 minutes three times weekly, and (b) section three - 2 hours and 50 minutes, one time weekly. During the spring semester the sections met as follows: (a) section one - 50 minutes, three times weekly, (b) section two - 1 hour and 20 minutes, two times weekly, and (c) section three - 2 hours and 50 minutes, one time weekly. The summer section met for 1 hour Monday thru Friday for eight weeks. The researcher taught all sections of the course used in this investigation.

The class experience involving textbook *Music Skills for Classroom Teachers* (Winslow, Dallin, & Wiest, 2001), syllabus, course materials, instructional software, activities, and instructor were the same for all sections. The classroom was equipped with a Yamaha Upright piano, a Sony Bass-Reflex 2way Speaker System MegaBass tape player, 2 staffed chalk boards, and classroom instruments. Many instructional activities were provided by the instructor through modeling, lecture, discussion, performance, and demonstration using musical score and sound examples, in-class practice experiences, and performance activities. The students also participated in music classroom activities with the assistance of upper-division music education majors whose principal areas included voice, piano, and instrumental music.

Goals of the Experimental Unit

The musical concepts addressed in the course represented seven elements of music, which were rhythm, melody, harmony, texture, timbre, dynamics, and form. In developing and implementing computer-assisted music instruction addressing participants' learning style preferences, only rhythm was targeted as the focus. Specific instructional objectives for the computer assisted music instruction (CAMI) rhythm software included the following:

1. Participants will be able to demonstrate reading rhythm in music through the use of notes, beats, measures, meter/time signatures with a minimum of 70% accuracy;
2. Participants will be able to demonstrate the use of traditional counting and rhythmic syllables with a minimum of 70% accuracy; and
3. Participants will be able to demonstrate knowledge of rhythm terminology with a minimum of 70% accuracy.

The study of music encompasses terminology in rhythm that may or may not be familiar to the beginning music student. If the vocabulary is familiar, the interpretations may not have the same meaning. Table 1 identifies a complete list of the terms and their definitions as they appeared in the software program and textbook (Winslow, et al., 2001).

Table 1. Definitions of Rhythm Unit CAI Terminology

Term	Definition
Steady Beat	The rhythmic pulse of music.
Unsteady Beat	The absence of a steady rhythmic pulse in a composition.
Accented Beat	The stronger or stressed pulse within a measure.
Unaccented Beat	The weaker or unstressed pulse within a measure.
Rhythm	The element of music that encompasses all aspects of sound organized in time.
Notes	The symbols used to represent the rhythm and pitch of musical sound.
Stem	The vertical line attached to the note head.
Rests	Measured silences
Measures	Groups of accented and unaccented beats that form metric units.

Table 1 (continued).

Term	Definition
Beam	The horizontal bar connecting eighth or sixteenth notes
Bar Line	Vertical lines used to divide measures of music.
Double Bar Line	Two vertical lines placed on the staff to indicate the end of a section or a composition.
Time/Meter Signature	Numbers placed at the beginning of a composition to indicate the meter of the music. The upper number indicates the beats in a measure; the lower number indicates the unit of measurement (quarter note, half note, etc.)
Traditional Counting	A number method used to identify the beats and rhythmic patterns of notes.
And	The syllable used on the second half of the beat.
Rhythmic Syllables	A tool for teaching and internalizing rhythm. These spoken/chanted sounds are used to express rhythmic duration, based on the Kodály approach and are used to isolate the study of rhythm from that of pitch.

Software and Materials

A researcher developed software program was constructed over a 14 month period. The software was designed to teach participants the basic elements of reading rhythm based on their learning style preference with the assistance of technology. Lessons were designed based on research associated with the use of CAMI for teaching music concepts, as well as, methods of

instruction, such as notation, tutorials, familiar folk songs, and drill-and-practice (Netusil &Willett, 1989; Parrish, 1997; Walls, 2000). Likewise, screen design and layout were based on psychological, instructional, and technological aspects of the lessons with regards to developing and maintaining interest in the lessons' contents and activities (Grabinger, 1989). In addition, text and graphic design were developed with due consideration of activities' specifications and avoidance of screen complexity (Dirckinck-Holmfeld & Nielsen, 1992; Grabinger, 1993). Screen presentations included headings, directive cues and spaced paragraphs to indicate the hierarchy of each lesson's content and to break the content into studyable chunks of information (Grabinger, 1993). Similarly, internal feedback was generated by the software program as a means of placing the responsibility of learning on the participant (Grabinger & Pollock, 1989).

The researcher developed software program was constructed to include instructional strategies that addressed the visual, auditory, and tactile/kinesthetic learner (Reid, 1998). Tactile and kinesthetic learning style strategies are very similar. Each learner learns best when physically engaged in a "hands on" activity; therefore participants identified as either tactile or kinesthetic were placed in the same group for this study (Gardner 1993). Materials used for software development included: (a) Authorware Professional 7.0, (b) Finale 2006b, (c) Sony Sound Forge 8.0, (d) TextAloud 2.194, (e) Corel Paint Shop Pro X, (f) Macromedia Flash Professional 8 and, (g) iMovie HD 6. Hardware used for development included: (a) Dell OPTIPLEX GX270 Intel® Pentium® 4 CPU 2.40 GHz, 2.39 GHz, 1.00 GB of RAM using a Windows Operating System, (b) Liquid Crystal Display (LCD) flat screen monitor, (c) 3.5″ floppy drive, (d) 5.0″ CD-ROM QSI CDRW/DVD SBW242U drive, (e) Dell multimedia speakers (A215), (f) Macintosh G5, OS 10.4.6, dual 1.8 GHz Power PC, 1.00 GB RAM , (g) MACKIE HR 824 High Resolution Studio Monitor Speakers, (h) Apple Cinema display, (i)

AKG headphones (K141), (j) Canon ZR40 Digital Camcorder, and (k) Audio Technica condenser stereo microphone (AT822).

Each lesson was designed to address the concepts most associated with the element of rhythm. Therefore, the software program consisted of instruction in steady beat, rhythm notation, measures, bar lines, note values, time signatures, rhythmic syllables, subdivisions of the beat, and recognition of beat and rhythm patterns. Also included in the software program was the manipulation of rhythm patterns within specific time signatures. Rhythm instruction and rhythmic patterns used in the software were based on suggested practices from *Music Skills for Classroom Teachers*, (Winslow, et al., 2001) and sample lesson plans from *Contemporary Music Education*, (Madsen & Kuhn, 1994). Musical selections in the software program included patriotic, folk, recreational and holiday songs. Listening examples and activities for the rhythm unit were selected from: *Share the Music* (Bond, et al., 1995) and *Sing America* (MENC, 1997). The nine sequential lesson topics developed in the software programs included:

Lesson 1: Introduction to Steady Beat

> Participants are given the meaning of steady beat, its relationship to their everyday environment, notation of steady beat, and rhythm (time units that are organized systematically in relation to steady beat). Participants listen to a composition(s) with a strong pulse and are instructed to sway or tap knees in response to the strong pulse.

Lesson 2: Introduction to Note values and Subdivision of Beats

> Participants are presented the symbols that represent rhythm notation and their values (sixteenth note, eighth note, quarter note, dotted quarter note, half note, dotted half note, and whole note). Subdivisions of beats/counts are presented in a hierarchy manner. Music listening examples are provided for aural and visual recognition of rhythm symbols.

Lesson 3: Introduction to Measures, Bar Lines, and Double Bar Lines

> Participants are given the meanings of measures (metric units), bar lines

(vertical lines which divide measures of music), and double bar lines (indicates the end of an exercise or composition) and how these symbols relate to the organization of beat and rhythm. Participants listen to simple rhythm patterns and identify them.

Lesson 4: Introduction to Traditional Counting and Time/Meter Signatures

Participants are introduced to traditional counting using numbers in relation to time/meter signatures (4/4, 3/4, and 2/4). Upper number and lower number are defined. Participants listen to compositions and are asked to identify the compositions time/meter signature.

Lesson 5: Introduction to Spoken Rhythmic Syllables

Participants are introduced to rhythmic syllables as suggested by Winslow, et al, 2001, based on the concepts of Zoltán Kodály. Instruction and activities are provided for both methods of counting (traditional and rhythmic syllables). Also included in this lesson is the introduction to rests (measures of silence).

Lesson 6: Performance of Rhythm Patterns Using Selected Classroom Instruments

Participants experience rhythm patterns in 4/4, 2/4, and 3/4 by playing/listening to them on unpitched percussion instruments. Participants practice counting rhythm patterns using traditional counting/rhythmic syllables as they play/listen.

Lesson 7: Rhythm Exercises using Traditional Counting and Spoken Rhythmic Syllables

Participants practice writing the rhythmic syllables and numbers for notes and rests in 4/4, 2/4, and 3/4 meters. Participants practice tapping/clapping the same rhythm patterns.

Lesson 8: Experiencing Rhythms with Sixteenth Note Patterns

Participants experience rhythms with sixteenth note patterns using traditional counting and rhythmic syllables.

Lesson 9: Review

Comprehensive review of all concepts presented in instructional lessons.

An example of what participants were expected to demonstrate rhythmically upon completion of the software program can be found in Figure 1, which is taken from the last frame of the software. Participants were expected to read rhythm patterns using rhythmic syllables.

These syllables are a tool for internalizing rhythm and expressing duration divorced from pitch. Participants were also expected to identify rhythm patterns using traditional counting, which is a number method used to identify the beats and rhythmic patterns of notes. Participants demonstrated their comprehension by typing in the correct numbers and rhythmic syllables based on time/meter signatures (Winslow, et al, 2001).

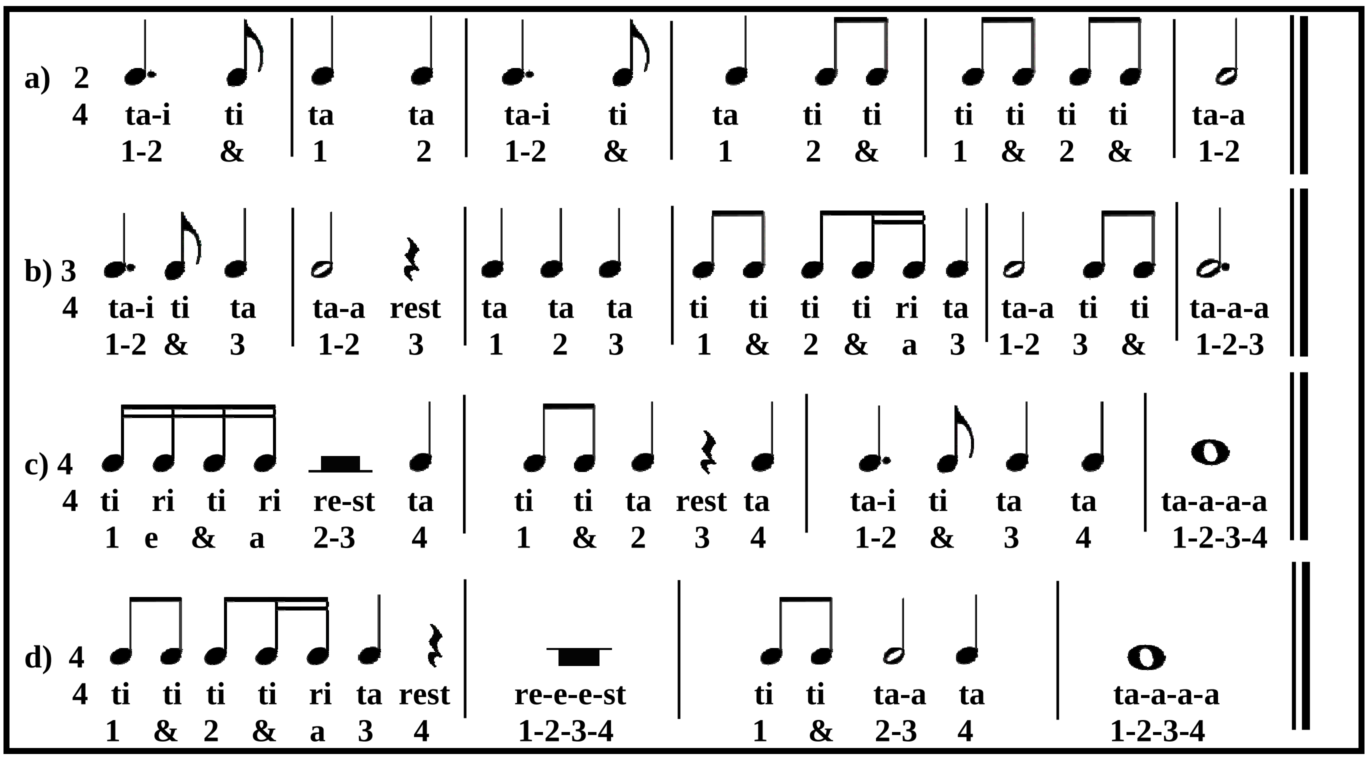

Figure 1. Basic Rhythm Patterns and Spoken Rhythmic Syllables

The researcher developed software program was first constructed to address all learning style preferences – auditory, visual, tactile, and kinesthetic. Separate software programs were then created to address individual learning style preferences. However, because of the similarities between tactile and kinesthetic learning styles, one software program was constructed to address both of these learning styles. This combination can be justified by one of Howard Gardner's forms of intelligences or intellectual strengths known as "bodily-kinesthetic." Gardner (1993) defines bodily-kinesthetic intelligence as the capacity to use your whole body or parts of

your body (i.e., your hands, your fingers, your arms) to solve a problem, make something, or put on some kind of production. Clear examples include people who participate in performing arts—dancing, acting, or music and the athlete's ability to excel in grace, power, speed, accuracy, and teamwork. The study of musical concepts requires that the learner be able to manipulate musical concepts both mentally and physically and also requires the use of the body as a whole or in parts.

In order to provide differential treatment based on participants' learning style preference, adjustments were made to the software program to accommodate specific learning styles. In light of the subject matter being taught, most music listening examples remained in the program as well as some visual, such as notation symbols. All software programs were designed such that participants had to advance through the various parts of the program in a specific and predetermined sequence. Participants could not advance to the next "step" at anytime until the present "step" or task had been completed. To accommodate the various learning styles, software was adjusted in several ways:

1. Software for participants identified as auditory learners included listening samples with automatic sound and voice-overs. Text was provided for musical terms and symbol identification (see Appendix D).
2. Software for participants identified as visual learners included pictorial/icon representations wherever possible and only included necessary information (i.e., musical examples and text, but no voice-overs) and no movement requirements. Visual learners were given a stopwatch icon that allowed for 60 seconds to read the text. Rhythm patterns were played automatically and learners were instructed to

follow rhythm patterns with the assistance of a star that moved with each note (see Appendix E).

3. Software for participants identified as tactile/kinesthetic learners was designed for participant interaction with the computer keyboard. Participants had to physically play the rhythm patterns using the keyboard and click on the instrument names to hear the rhythm patterns played correctly; no voice-overs were used for text (see Appendix F).
4. Software for participants who received All Learning Styles Software was a combination of all of the learning style strategies.

Pretest/Posttest

During the seventh week of the semester, and comparable weeks for the summer session, participants' learning style preferences were determined by the administration of two learning style instruments: (a) Perceptual Learning Style Preference Survey (PLSPS; Reid, 1998) (see Appendix G: copyright permission in Appendix H) and (b) Web-based Diablo Valley College (DVC) Learning Style Survey for College (Jester & Miller, 2000) (see Appendix I). Existing literature questions the reliability and validity of learning style inventories and their use in general. For this reason, researchers have recommended that similar learning style instruments that use multiple statements in determining learning style preference help to improve the reliability and validity of the measurement technique (Reid, 1990; Curry & Curry, 1991). The PLSPS and the DVC were the chosen learning style instruments because they address similar, if not the same, sensory perceptions in a multi-statement format which should result in high reliability and validity. It was decided *a priori* that when large discrepancies occurred, the results of the PLSPS would be used.

The PLSPS was designed and normed for International English as Second Language (ESL) students in intensive English language programs in the United States. However, the survey has been found reliable and valid for native speakers of English if certain items are removed from each learning style category in the scoring sheet (Reid, 1990). The removal of the identified items (see Appendix J) will cause the construct correlation coefficient to rise substantially to about the .70 level (Reid, 1990).

The PLSPS was administered in a classroom located in the DeBose Music Hall on the campus of Southern University. The instrument examined four perceptual learning-style preferences (visual, auditory, tactile, and kinesthetic) and two social learning-style preferences (group and individual). Only the examination of the four perceptual learning-style preferences was used for this study.

The PLSPS required participants to respond to 30 statements on general learning-style preferences and decided to what extent they agreed with each statement by marking their choices on a five-point Likert rating scale ranging from Strongly Agree = 5, Agree = 4, Undecided = 3, Disagree = 2, and Strongly Disagree = 1 (see Appendix J). Numerical values were then added for each learning category and the sum was multiplied by 2. Each learning category had a range of 0 to 50. A preference score that ranged from 38 to 50 within a learning category indicated a strong preference towards that learning style. Scores ranging from 25 to 37 indicated a minor learning style preference. A score of 24 or less was negligible and showed low preference towards that learning style preference. However, because certain items were removed from each learning style category in the scoring sheet to make the survey reliable and valid for native speakers of English, the highest score in a learning category was used to ascertain participants' learning style

preference (see Appendix J). Materials needed for this test included two #2 pencils and a PLSPS designed answer sheet.

The DVC Learning Style Survey for College (Jester & Miller, 2000) is a learning style questionnaire developed at Diablo Valley College by Catherine Jester, a learning disability specialist and adapted for the Web by Suzanne Miller, Instructor of Math and Multimedia. This instrument examines four perceptual learning-style preferences (visual, auditory, tactile, and kinesthetic). The test was designed to determine a student's natural learning style, and has been freely available on the Web since January 1998. Participants were given 32 multiple-choice questions. Using a Likert type scale, students selected their choices of agreement from Often – Sometimes – Seldom. Results of the survey instrument were immediately displayed to the students upon completion of the questions along with a profile of the student's learning style and specific suggestions of how best to study. Over 10,000 students from Diablo Valley College and elsewhere have used it to overcome learning anxiety and improve their educational experiences (Devlin, 2000). Materials needed for this test included computers with online access and printer. The test was administered via computer in a Dell Computer Laboratory housed on the first floor of J. B. Moore Hall (Department of Electrical Engineering Technology), the second floor of T. T. Allain Hall (Department of Mathematics and Computer Science), and the first floor of the Smith-Brown Memorial Union on the campus of Southern University. Different computer laboratories were used because of the varying sizes of each class and the availability of computers. Survey results were printed immediately following the completion of the survey and given to the researcher.

Two content knowledge assessments were administered as pre and posttest assessments: (a) *Music Achievement Test* (MAT) Test 2 -Part 3- Auditory and Visual Discrimination subtest *b*

(Rhythm) (Colwell, 1968) a nationally normed music achievement test and (b) a Researcher Developed Rhythm Test (RDRT); (see Appendix K).

The MAT, normed for grades 4 through 8, was designed to provide an accurate measurement of music achievement. Situation norms were provided for grades 3 through college. Criterion-related validity for the MAT is .92 and reliability for Test 2 is .942 (Colwell, 1970). Subset *b* was selected because it measured a participant's ability to rhythmically read notes. The test was constructed of four-measure phrases and participants were asked to visually and aurally identify rhythm errors that were different from the melody that is heard. The test consisted of 12 items with 16 possible correct answers and each answer was worth two points. The MAT was used for this investigation because it was decided *a priori* that musically untrained preservice elementary education majors demonstrate their knowledge of rhythm at these grade levels upon completion of the rhythm unit in the course.

Participants filled in a blank below every measure in which the notation was rhythmically different from the melody they heard. Four discriminations were made for each question. Materials required for this test included one test answer sheet, one #2 pencil, a stereo cassette player, and the MAT test cassette recording for subtest *b*. The MAT was administered during the seventh week of class in a classroom located in the DeBose Music Hall.

The RDRT was a multiple choice and short answer type document used to evaluate participants' knowledge of basic rhythm. The test addressed note and time signature identification, rhythm terminologies, note writing, and the ability to identify and count aloud patterns for selected rhythm examples using numbers and rhythmic syllables. The pretest was administered via pencil and paper during the seventh week of the semester and comparable weeks for the summer session in a classroom located in the DeBose Music Hall.

After Software Program Lesson 9 was completed, the RDRT posttest was given during the next class meeting via computer using the same computer laboratories and under the same conditions. A recent study by Akdemir and Oguz (2008) found no significant difference in test scores when students were administered a computer based test versus a paper and pencil test. All test responses made use of similar interaction/manipulation procedures that participants experienced during intervention. Test results were scored by the software program, and participants were provided immediate feedback on their assessment. Students printed their final scores and submitted the hard copy to the researcher at the end of the posttest session. The MAT posttest was administered two days after the RDRT posttest using the same conditions as the MAT pretest.

Pilot Study

In order to test the suitability of the PLSPS and the MAT as dependent measures in this study, a pilot study was conducted during the fall semester, 2006. The pilot study was done to assess the feasibility of the PLSPS and the MAT to determine whether there is an effect on preservice classroom teachers' learnability when given rhythm-based computer-assisted software designed for individual learning style preferences (Baker, 1994). Participants in the pilot study were 39 undergraduate preservice elementary education majors enrolled in two sections of a Fundamentals of Music course at Southern University and A & M College. Of the total number, 37 participants were female and 2 were male. They were told that participation in the pilot study was voluntary and that their grades would not be affected by their performance.

Participants were administered the PLSPS (Reid, 1998) during the first week of classes in an effort to determine each subject's preferred learning style. The results of the PLSP were as follows: (a) 8 (21%) were auditory learners, (b) 5 (13%) were visual learners, (c) 6 (15%) were

tactile learners, and (d) 19 (50%) were kinesthetic learners. One participant's results were not identifiable. The DVC was not administered in the pilot study.

Part 3 of the MAT - Auditory and Visual Discrimination subtest *b* (Rhythm) (Colwell, 1968) and the RDRT were administered during the fifth week of classes after students had completed the PLSPS. Of the 39 participants, only 30 (77%) completed the pretests. Nine of the participants withdrew from the course after the PLSPS was administered. The results of the MAT pretest were as follows: 1 scored 70%, 4 scored 50%, 3 scored 40%, 14 scored 30%, 4 scored 20%, and 4 scored 10%. The average score for the test was 31%. The results of the RDRT were as follows: 2 scored 40%, 6 scored 30%, 7 scored 20%, 13 scored 10%, and 2 scored 0%. The average score for the test was 18%. Results of the pilot study indicated that there were diverse learning style preferences that spanned all the learning styles to be investigated in this study. Participants scoring 70% or higher on the MAT and RDRT would participate in the study but data from these participants would not be included in the final data analysis.

Five participants from the same classes were asked to complete the computer-assisted music instruction program for rhythm developed by the researcher and provide general comments about their experiences. This procedure established three open-ended interview questions for explanatory supporting qualitative data collection:

1. How did the instructional activities in the program help you learn and understand rhythm concepts?
2. What made this program challenging for you?
3. What other assistance or instructional material would you find helpful that would enhance this program?

Their comments included: (a) enjoyed presentation of concepts, (b) "as an audio and visual learner, the software was more beneficial than a textbook," (c) "software was very user friendly," (d) "liked immediate feedback," (e) "enjoyed hearing rhythms played on classroom instruments," (f) "liked the detailed presentation of information," (g) "enjoyed being able to interact with the software," and (h) "did not like the use of voice over for text reading."

During the summer of 2007, four preservice elementary education majors enrolled in one section of a Fundamentals of Music course at Southern University and A & M College and identified as having a preferred learning style in one of the specific areas under investigation participated in a pilot study designed to test the implementation of each of the software programs according to assessed learning style and the suitability of the qualitative inquiry procedure. The PLSPS and the DVC were administered to participants to determine their preferred learning style. Learning styles for the four participants were identified as follows: Participant #1 tested as an Auditory Learner on the PLSPS and DVC, Participant #2 tested as a Visual Learner on the PLSPS and DVC, Participant #3 tested as a Tactile/Kinesthetic Learner on the PLSPS and DVC and Participant #4's scores indicated a balance of all learning styles investigated. Participants 1, 2, and 3 were given the software program constructed to match their preferred learning style for review. Participant #4 was given the software program designed for all learning style preferences. The students took approximately 10 days to review the software and on the twelfth day, after receiving the software program, they were interviewed by the researcher who was also the instructor for the summer course. The interviews occurred in a piano studio with questions and answers recorded on an RCA RP3503 cassette tape recorder equipped with an external microphone and a Samsung SCL610 Digital Camcorder. Also available in the piano studio was a Dell computer with the following specifications: OPTIPLEX GX270 Intel® Pentium® 4 CPU

2.40 GHz, 2.39 GHz, 1.00 GB of RAM using a Windows Operating System with a Liquid Crystal Display (LCD) flat screen monitor, 3.5″ floppy drive, 5.0″ CD-ROM QSI CDRW/DVD SBW242U drive (Figure 2). The computer was made available so that if participants made reference to a particular lesson, activity, or screen, the researcher and student could view the software for any comments that would need clarification.

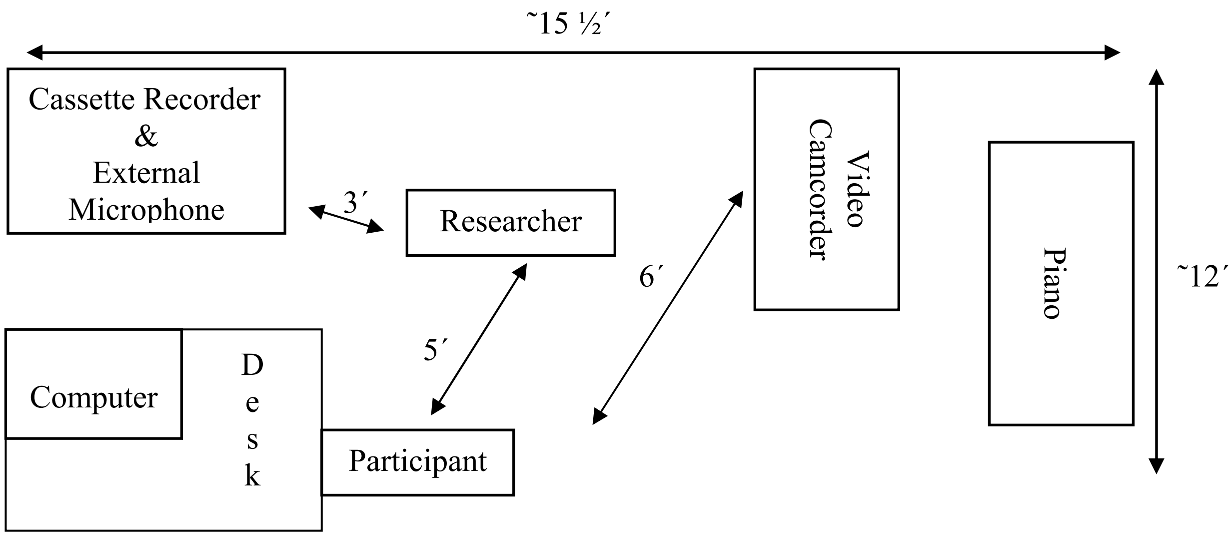

Figure 2. Diagram of interview room.

The primary question for the qualitative inquiry was:

1. What are participants' perceptions and attitudes toward rhythm-based computer assisted music instruction designed for individual learning style preferences?

Three secondary questions were derived from the primary research question and they were:

1. How did the instructional activities in the program help you learn and understand rhythm concepts?
2. What made this program challenging for you?
3. What other assistance or instructional material would you find helpful that would enhance this program?

Responses to the interview questions by participants were as follows:

Participant #1 – Auditory

Question 1: Participant stated that the software was well suited for computer-assisted instruction. Participant also stated that the most useful design of the software program was the ability to review lessons as needed and being forced to answer questions or perform activities correctly. The participant further stated that the format of instruction allowed the student to understand the concepts of rhythm. The participant also indicated that the software was an excellent choice for rhythm instruction for individuals without prior music experiences.

Question 2: Participant stated that no component of the software was challenging because of the ability to review concepts and/or instructions as needed and that all instructions were very clear and concise.

Question 3: Participant stated that the software program was sufficient for independent learning. The participant did not observe that some visual and tactile/kinesthetic learning processes were missing from the software design. Participant stated that the only thing not included in the software that could have possibly helped in the learning and understanding of rhythm concepts was the software's ability to present the information in a different manner. However, the participant indicated that the ability to review lessons as needed would circumvent this deficiency in the software.

Participant # 2 – Visual

Question 1: Participant indicated that the software was extremely helpful for learning and understanding rhythm concepts. The participant thought that all lessons and directions were detailed and were presented better than an in-class lecture. The participant noted that different colors of text and graphic animations were enjoyable. Participant also stated that the most useful

design of the software program was having the ability to review lessons as needed and being forced to answer questions or perform activities correctly.

Question 2: Participant stated that the software was less challenging because of the ability to review concepts and/or instructions as needed and that all instructions were very clear and concise.

Question 3: Participant suggested that the software program presented all necessary instructions and information to assist with the learning and understanding of rhythm concepts and was extremely pleased with the drill and practice presentation of the software. The participant did not observe that some auditory and tactile/kinesthetic learning processes were missing from this software design. However, the participant indicated that the use of software in conjunction with the textbook allowed for more experiences in reading rhythm during an 8-week summer session in which the instructor must cover the basic fundamentals of music in a short period of time.

Participant #3 – Tactile/ Kinesthetic

Questions 1: Participant expressed that all instructional activities were very detailed and helpful. All instruction processes provided sufficient information so that all rhythm activities could be completed with ease.

Questions 2: Participant suggested that the most challenging part of the software was being unable to complete any part of the rhythm exercises incorrectly. The participant indicated that having the ability to review lessons if needed was advantageous for clarity and understanding. The participant thought that this component was necessary because some students may experience attention deficiencies and having the ability to review as often as needed would circumvent the deficiency.

Questions 3: The participant indicated that the software program presented all necessary instructions and information to assist with the learning and understanding of rhythm concepts. The participant was unaware that some auditory and visual learning processes were missing from this software design and expressed that the design appeared tailored especially for their way of learning.

Participant #4 – All Learning Styles

Questions 1: This participant indicated that the design of this software program was favorable for learning because of the ability to interact with all activities, and read and hear all instructions. Participant stated that having the varying instructional methods and opportunities provided by the software program to grasp rhythm concepts to be most beneficial.

Questions 2: Participant expressed that the most challenging part of the software and/or lessons was identifying the time/meter signatures while listening to a familiar song. However, after continued discussion with the interviewer, it was discovered that this participant was focusing on and trying to identify rhythm patterns and not move to and/or listen for the steady beat. Participant admitted that they should have reviewed the first three lessons that targeted steady beat, measures, and time/meter signatures.

Questions 3: Participant indicated that the software program was sufficient and additional assistance or instructional material was unnecessary. The participant reiterated that the activities that were challenging could have been completed with little or no difficulty if they had reviewed the lesson targeted to that particular rhythm concept.

Analyses of the pilot study data indicated: (a) the PLSPS and MAT were adequate for obtaining leaning style preferences, and (b) the software was adequate for rhythm instruction

based on learning style preferences. The pilot study did not indicate that changes should be made to the software program or the learning style inventories.

Procedures and Materials

The purpose of this study was to measure the effect of rhythm based computer-assisted music instruction (CAMI) authored in accordance with empirical findings of effective software design and developed for individual learning style preferences, on the learning of preservice elementary education majors. The method used to investigate the research question was a two phase model (Quantitative + Qualitative). However, the principal method of investigation was quantitative in nature. An explanatory qualitative design was used to help explain or elaborate on the quantitative results (Creswell, 2005). The premise for this mixed method approach is not to replace either of these approaches but rather to draw from the strengths and minimize the weaknesses of both in single research studies and across studies (Johnson & Onwuegbuzie, 2004). Quantitative data collection occurred before conducting interviews and included pre and posttest scores from the MAT and RDRT. Interview questions were developed from a pilot study that took place during the fall of 2006.

Quantitative Analyses

The PLSPS and the DVC were administered during the seventh week of classes for the fall semesters and comparable weeks for the summer session. The PLSPS was administered via pencil and paper in the DeBose Music Hall. The DVC was given in one of three computer laboratories designated for use based on the number of participants in each course. After participants (N = 82) completed both learning style instruments, results were compiled and individuals were assigned to specific learning style categories for the purpose of assigning software programs. Learning style categories and assigned software programs were as follows:

auditory (*n* = 13), visual (*n* = 13) and kinesthetic/tactile (*n* = 17). A stratified randomly selected group (11 auditory, 10 visual, and 18 tactile/kinesthetic) was assigned CAMI software that addressed all learning style strategies (*n* = 39) to complete the unit on rhythm.

The CAMI rhythm unit was designed to accommodate nine class periods at a length of approximately fifty minutes each. Participants received CAMI in the Dell Computer Laboratories housed on the first floor of J. B. Moore Hall (Department of Electrical Engineering Technology), the second floor of T. T. Allain Hall (Department of Mathematics and Computer Science) and the Smith-Brown Memorial Student Union Computer laboratory housed on the first floor of the Student Union on the campus of Southern University. The three laboratories accommodate varying numbers of students and was selected based on student enrollment in each of the three sections of the course. J. B. Moore Hall and T. T. Allain Hall was located approximately two blocks from the university's music department (DeBose Hall). The Smith-Brown Memorial Student Union Computer lab was approximately one block from the music department. Each computer laboratory consisted of approximately15 to 38 Dell computers with the following specifications: OPTIPLEX GX270 Intel® Pentium® 4 CPU 2.40GHz, 2.39GHz, 1.00 GB of RAM using a Windows Operating System with a Liquid Crystal Display (LCD) flat screen monitor, 3.5″ floppy drive, 5.0″ CD-ROM QSI CDRW/DVD SBW242U drive. Each laboratory had three black and white centralized printers, two scanners, and one copier. T. T. Allain Hall had one station for the visually impaired, but it was not used for this investigation. Because of the nature of this intervention and the limited number of available headphones in the computer laboratory, participants were required to supply their own headphones. However, a few headphones were available for students who may have forgotten to bring them to class or were financially unable to purchase them. Participants reported to the various departments or

buildings during their regularly scheduled class times. While participants were allowed to use the required textbook for the course as instructional support outside of scheduled class periods, software programs for the study remained with the researcher after the conclusion of each class period.

Independent Variables

The PLSPS learning style inventories were calculated using the scoring sheet (see Appendix E) provided by the author (Reid, 1998). Each participant's major learning style preference was determined by the highest score received in a learning preference category. After participants completed the computer based DVC learning style instrument, the last page, which provided learning style preference, was printed and given to the researcher. Results were entered into a Microsoft Excel spreadsheet. Although the names of the participants were collected for the purpose of recording data, each student was assigned a code number that represented the results based on a specific learning style. Code numbers assigned were: auditory – 1, visual – 2 and tactile/kinesthetic – 3. All codes were entered into SPSS 12.0.1for analyses.

Dependent Variables

Participants' pre and posttest mean scores on the MAT and the RDRT served as dependent measures. The data were entered by the researcher into a Microsoft Excel spreadsheet then transferred and matched to coded learning style preferences in an SPSS data set. SPSS 12.0.1 was used for analyses.

Qualitative Analyses

Participants for qualitative analyses were identified by the use of *purposeful sampling*. Purposeful sampling consists of the selection of a small number of participants from a particular population or culture with regards to explicit criteria determined by the nature of the research

question (Creswell, 2005). Participants from each learning style preference group (auditory, visual, and tactile/kinesthetic) with the highest and lowest scores on the posttests were selected. Three course sections from fall 2007 yielded 8 participants (4 highest scores and 4 lowest scores). Two course sections from spring 2008 yielded 8 participants (4 highest scores and 4 lowest scores) and 1 section from summer 2008 yielded 7 participants (3 highest scores and 4 lowest scores). The summer session gave way to only 7 participants because there was no participant in the category identified as "highest tactile/kinesthetic." This selection process yielded participants (n = 23) who took part in one-on-one interviews with a set of predetermined open-ended questions that solicited facts, as well as opinions (Creswell, 2005 & Yin, 2003).

Opened-ended interview questions were constructed from pilot study inquiries that yielded open-ended responses. These open-ended responses generated overlapping themes among the participants. This procedure allowed for successful coding of themes that would gather more information about the phenomenon being investigated (Creswell, 2005). Data from the quantitative analysis, highest and lowest posttest scores (MAT + RDRT) were used to alleviate researcher bias in selecting interviewees. Using procedures from both the quantitative and qualitative traditions, justification of participants' learnability or the lack thereof was refined. Participants were allowed to view selected screens from the program designed to support their learning preference in an effort to gather content rich information. The questions were as follows:

1. How did the instructional activities in the program help you learn and understand rhythm concepts?
2. What made this program challenging for you?

3. What other assistance or instructional material would you find helpful that would enhance this program?

After posttests scores were tabulated, interviewees were identified and asked to schedule individual interview times. The interview process was video and audio taped to facilitate accuracy in data collection. Interviews were held in the same location and under the same conditions as the pilot study (see Figure 2, p. 59). Each participant responded to the same set of questions, thus enhancing the comparability of responses and reducing the investigator's personal views and biases.

CHAPTER 4

RESULTS

The purpose of this study was to examine the effect of rhythm based computer-assisted music instruction (CAMI) authored in accordance with empirical findings of effective software design and developed for individual learning style preferences (auditory, visual, and tactile/kinesthetic), on the learning of preservice elementary education majors. The participants were students enrolled in six sections of a Fundamentals of Music course over a period of one year. The course is a curriculum requirement for all elementary education majors at Southern University and A & M College.

A total of 82 students participated in the study. Forty-three of the participants (13 auditory, 13 visual, and 17 tactile/kinesthetic) completed software programs designed to meet their individual learning style preference. A stratified randomly selected group (11 auditory, 10 visual, and 18 tactile/kinesthetic) was assigned CAMI software that addressed all learning style strategies (n = 39) to complete the unit on rhythm. Two self reporting learning style instruments were used to identify participants' learning style preference, the Perceptual Learning Styles Preference Survey (PLSPS) and the Diablo Valley College (DVC) Learning Style Survey for College. It was decided *a priori* that when large discrepancies occurred, the results of the PLSPS would be used. Learning style preference results were equivalent 46 out of 82 times (56%). Additionally, all participants completed the Music Achievement Test (MAT) and the Researcher Developed Rhythm Test (RDRT) as pretests and posttests (see Appendix L for raw data).

A repeated measures multivariate analysis of variance (MANOVA) was conducted to determine the effect of the three types of learning style strategies (auditory, visual, and tactile/kinesthetic) and two treatments (learner specific and all learning styles) on the two

dependent variables (MAT and RDRT). These data were analyzed using SPSS 12.0.1. An *a priori* alpha level of .05 was selected for multivariate analysis within the study. Wilks' $\lambda = .06$, F $(2, 75) = 559.58$, $p < .0001$ revealed significant differences between the dependent measures. Therefore, the univariate F tests were examined.

A three-way repeated measures ANOVA was calculated on the MAT (see Appendix M for Grand Means Table with Standard Deviations). The Summary Table can be found in Table 2. Significant differences were found from pretest to posttest, F $(1, 76) = 94.42$, $p < .0001$. The MAT pretest mean was 29.99 ($SD = 17.56$) and MAT posttest mean was 51.60 ($SD = 22.33$), indicating a significant increase in skill level over the course of treatment for all participants. There were no significant differences with regards to treatment or learning style strategies, nor were there any significant interactions.

Table 2. Three-Way Repeated Measures ANOVA Summary Table: MAT

Source	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.	Partial Eta Squared
Treatment (T)	108.81	1	108.81	.17	.68	.002
Styles (S)	512.60	2	256.30	.40	.67	.010
T * S	385.75	2	192.88	.30	.74	.008
Error	49166.86	76	646.93			
Pre/Post (PP)	18316.50	1	18316.50	94.42	.00	.554
PP * T	.13	1	.13	.001	.98	.000
PP * S	273.08	2	136.54	.70	.50	.018
PP * T * S	285.06	2	142.53	.74	.48	.019
Error	14743.27	76	193.99			

A three-way repeated measures ANOVA was calculated on the RDRT (see Appendix N for Grand Means Table with Standard Deviations). The Summary Table can be found in Table 3. There was a significant differences due to the main effect of styles F (1, 76) = 3.05, *p* = .05. There was no significant difference due to the main effect of treatment, and there was no significant interaction between the two. Overall significant differences were found within subjects from pretest to posttest, *F* (1, 76) = 965.84, *p* < .0001.

Table 3. Three-Way Repeated Measures ANOVA Summary Table: RDRT

Source	Type III Sum Squares	*df*	Mean Square	*F*	Sig.	Partial Eta Squared
Treatment (T)	3.13	1	3.13	.02	.90	.000
Styles (S)	1294.72	2	647.36	3.05	.05	.074
T * S	159.45	2	79.72	.38	.69	.010
Error	16152.89	76	212.54			
Pre/Post (PP)	127644.45	1	127644.45	965.84	.00	.927
PP * T	515.02	1	515.02	3.90	.05	.049
PP * S	1140.06	2	570.03	4.31	.02	.102
PP * T * S	245.44	2	122.72	.93	.40	.024
Error	10044.06	76	132.16			

The three-way repeated measures ANOVA revealed a significant two-way interaction between pre/posttest and treatment, *F* (1, 76) = 3.9, *p* = .05 (see Table 3). Mean scores for RDRT treatment types are graphically displayed in Figure 3. RDRT pretest mean for individual treatment type was 14.91 (*SD* = 13.67) and all learning styles treatment was 11.00 (*SD* = 7.39). RDRT posttest means for individual treatment type was 68.34 (*SD* = 16.51) and all learning

styles treatment was 71.69 (*SD* = 14.17). While both groups made significant gains due to treatment from pretest to posttest, the gain was greater for the participants who used All Learning Styles software (approximately 60 points gain) than for those who used Individualized Learning Styles software (approximately 53 points gain).

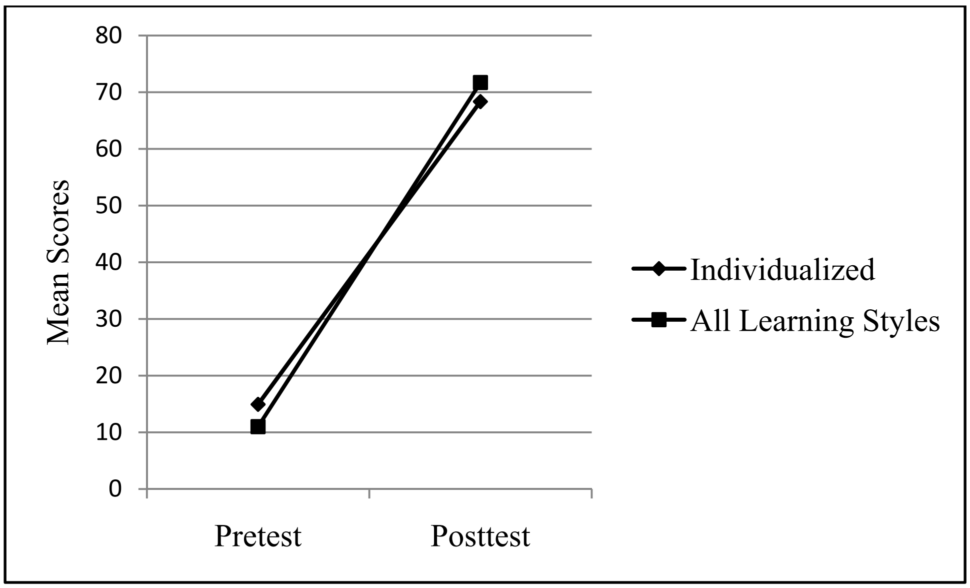

Figure 3. RDRT Pretest and Posttest Means by Treatment

The three-way repeated measures ANOVA also revealed a significant two-way interaction between styles and pre/posttest, F (2, 76) = 4.31, p = .02 (see Table 3). Mean scores for RDRT learning style preferences are graphically displayed in Figure 4. RDRT pretest mean for auditory was 12.90 (*SD* = 15.00), visual mean was 13.31 (*SD* = 11.18), and tactile/kinesthetic mean was 12.66 (*SD* = 8.15). RDRT posttest mean for auditory was 75.32 (*SD* = 15.62), visual mean was 71.82 (*SD* = 15.08), and tactile/kinesthetic mean was 62.91 (*SD* = 13.57). While all participants made large gains over the course of the treatment, tactile/kinesthetic learners gained noticeably less (approximately 50 points gain) in comparison to the aural and visual learners (approximately 62 points and 59 points gain, respectively). The most noteworthy quantitative

findings were the improved test scores from pretest to posttest among all groups. However, tactile/kinesthetic participants' gains were not as great as the others.

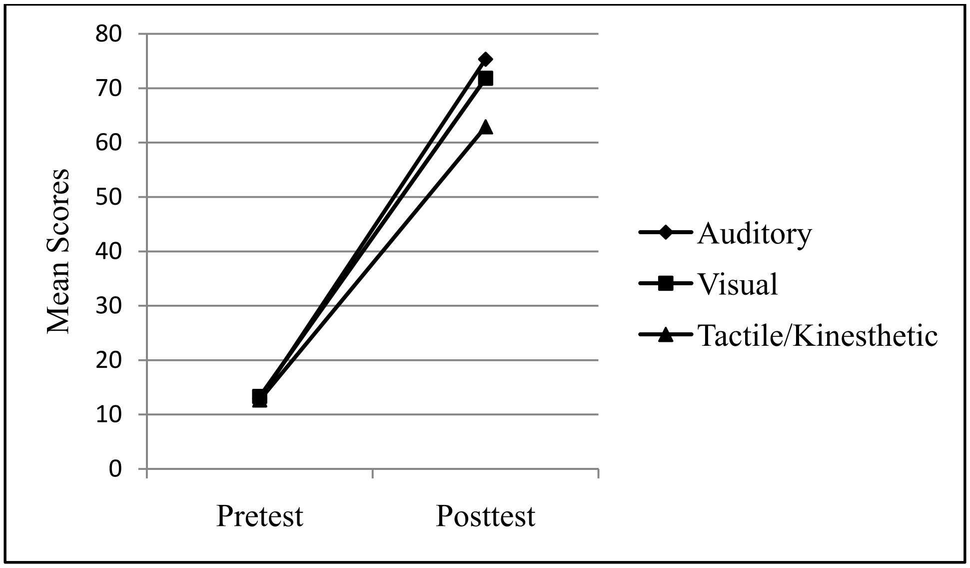

Figure 4. RDRT Pretest and Posttest Means Learning Style Preferences

To fulfill the qualitative component of this study, participants representing the lowest and highest scores on the MAT and RDRT posttest (*n* = 23) were interviewed to refine the findings of the quantitative data results. These participants were selected from their assigned software programs. Three course sections from fall 2007 yielded 8 participants (2 auditory, 2 visual, 2 tactile/kinesthetic, and 2 all learning styles). Two course sections from spring 2008 yielded 8 participants (2 auditory, 2 visual, 2 tactile/kinesthetic, and 2 all learning styles) and 1 section from summer 2008 yielded 7 participants (2 auditory, 2 visual, 1 tactile/kinesthetic, and 2 all learning styles). Only 7 participants were identified during the summer 2008 session because there was no participant in the category identified as "highest tactile/kinesthetic."

To explore the possible explanations for these findings, the analyses focused on the following open-ended questions:

1. How did the instructional activities in the program help you learn and understand rhythm concepts?
2. What made this program challenging for you?
3. What other assistance or instructional material would you find helpful that would enhance this program?

Word processing files of transcribed interviews were imported into a software program designed to assist in the coding, evaluation and analysis of the qualitative data (ATLAS.ti, 2008). Themes were identified using the code hierarchy output and compared among the participants. Only those themes occurring five or more times were considered common themes in the interviews and were used for assessment. Nineteen participants expressed that the Rhythm-Based Computer-Assisted Music Instruction (CAMI) software/program was "sufficient for learning" and nine participants indicated that the instructional material, "recognizing rhythm symbols, understanding note values and organization of rhythm patterns within meter signatures" was necessary for success in reading rhythms. Ten participants indicated the rhythm-based CAMI software/program was "difficult" for them at first because of their lack of knowledge about rhythm concepts, but appreciated the ability to "review" concepts at their convenience within the allotted class time. Among the 23 participants, 13 stated that the "interactivity" of the software/program enhanced their learning and 5 indicated that the "visual and animated affects" enhanced their learning. All participants (*n* = 23) indicated that the software/program "satisfied their learning of rhythm concepts" but expressed the desire for "more instruction time" preferably "having the ability to use the software/program outside of a fixed class time in conjunction with the course textbook.

The first question of the interview directed participants to provide information concerning their learning and understanding of rhythm concepts based on the instructional activities presented in the rhythm-based CAMI software/program. Participant #10 (Visual) responded with the following:

> … it helped me to understand how to relate time signatures to measures, how to count within the measures using the different time signatures. Those were things that I did not know and the program was very good in teaching and explaining those concepts to me.

Participant #11 (Tactile/Kinesthetic):

> … it made it easier, especially for a person who didn't know very much about music. The program allowed me to have some visual as well as hands on instruction while I was learning. All of this kept me constantly engaged in each lesson.

Participant #12 (All Learning Styles):

> It helped me a whole lot. This was my first time learning anything about rhythm and if it had not been for the instruction of the program, I would have had a lot of trouble. Also, being able to go back and review certain lessons as I needed to was very helpful. I did not have to wait for classroom instruction two days later.

Participant #20 (All Learning Styles):

> I think it was a good program and I think that you could use it for any level of instruction. The software broke everything down and it helped me out because I was struggling with the rhythm concepts and it helped me a lot in my understanding. It was easy to follow and understand.

Participant #22 (Visual):

> Well, because I'm a visual person, I need to be able to see what they are talking about. So being able to sit at the computer and see the notes, their names and values, the rhythm patterns – it was easier for me to understand when compared to just reading in a textbook. I can read my book at home, but actually seeing it on the computer - I was able to make a connection.

Two key elements of these responses, representative of a majority of the responses to this question, are noteworthy. First, the responses solidify the results of the posttest scores. The increase in participants' scores, from pretest to posttest, indicated that the rhythm-based CAMI software/program was sufficient for learning regardless of learning style preference and the type of treatment received. Second, participants felt more engaged with their learning and appreciated the opportunity to self-pace during each lesson.

A follow-up question directed participants to describe any components of the rhythm-based CAMI software/program that may have been challenging for them. Their responses varied and more often than not, the participants blamed themselves for the challenges that occurred by not taking advantage of the options to review components of the rhythm-based CAMI software/program. Participant #14 (Visual) stated, "… everything was easy to get and if I didn't understand, I could always go back and review." Participant #19 (Tactile/Kinesthetic) indicated, "… it was not that challenging. The most difficult part was showing what you have learned; if you did not pay attention to the instructional screens, you really realized it at that point." On the other hand, Participant #23 (All Learning Styles) indicated, "… the only thing that might have been challenging was the input of the information. During the lessons, I did not like being forced

to stay on a task until I got the answer correct." Likewise, other participants responded as follows:

Participant #1 (Auditory):

> Nothing was too challenging in the lessons, I just didn't go back and review any of them. Everything was presented very well in each lesson; I just did not take the time to review anything that I was unsure of.

Participant #6 (Visual):

> I did not go back to previous lessons for any additional help or understanding. I thought that I understood everything. So, I guess that it was my fault that I didn't do so well on the test, not the software itself.

Participant #4 (All Learning Styles):

> I guess when the lady was clapping; I was watching her hands and not the notes. That made it a lot more difficult. I should have been paying attention to the notes and listening to her clap her hands, but being able to review certain lessons was a big plus!

Participant #7 (Tactile/Kinesthetic):

> As I progressed along in the software I realized that I needed to learn how everything related to everything else. As I went through each lesson, I compartmentalized the information and did not pay attention to how it may all fit together. This caused the last few activities to be challenging for me. However, after reviewing some of the lessons, I was able to put it all together.

As a whole, participants expressed that the rhythm-based CAMI software/program comprised the necessary information and resources for successful understanding and enhanced learning of rhythm concepts. However, many criticized themselves for ignoring the review

benefits of the software. A few participants articulated that they did not appreciate being forced to master the lessons, but were pleased to discover that the ends justified the means – improved posttest scores.

Finally, subjects were asked to offer suggestions that would enhance the presentation or instructional value of the software/program. Many participants were satisfied with the software/program presentation and instructional value. However, they expressed a desire to use the course textbook in conjunction with the software/program. Participant #12 (All Learning Styles) indicated "… [I would like to have taken] the program home for practice and review, but still have in class instruction concerning the rhythm concepts." Participant #13 (Auditory) suggested, "… if so, I don't know what it would be. The software design was sufficient for me." Participant #19 (Tactile/Kinesthetic) denoted, "I would suggest using the textbook in conjunction with the software while we are in the computer lab." Other responses to this query were as follows:

Participant #9 (Auditory):

> The program was very helpful. I believe that the program should be used in conjunction with the textbook during class instruction. We should also be able to take the software with us after class so that we could use it with the textbook for studying and reviewing away from class.

Participant #10 (Visual):

> … I think the program was well put together. I remember thinking to my self, what should I bring to class to possibly assist me with learning about rhythm? I did not have to bring anything but myself, you thought of everything. Everything that was needed to run the program, understand the information that was presented – it all was there. I would

recommend the program for anyone who wants to learn about rhythm concepts. Matter of fact, I have suggested to other students who need your class, to hurry up and take it. I truly enjoyed learning some music concepts with the aid of the computer. I felt that I was in control of my learning.

Participant #17 (Auditory):

> Overall the rhythm lessons were very good and self explanatory. You just had to go back and review so you could be comfortable with it. You could not just go through it that day and come back the next day and expect to know it. You would have to take what you have learned the previous day and apply it the next day.

Summary

This comparative study of the effect of rhythm based computer-assisted music instruction designed for individual learning style preferences on the learning of preservice elementary education majors found significant gains from pretest to posttest on both dependent measures. Treatment type and learning styles had no effect on scores from the MAT. This was not the case on the RDRT. Software designed for all learning styles resulted in greater gains than learner specific software on the RDRT. Additionally, visual and auditory learners made greater gains than tactile/kinesthetic learners. The qualitative analyses provided possible explanations for increased scores from pretest to posttest regardless of instructional treatment received. The following is an amalgamation of themes that were gleaned from the interview process (n = 23):

- 82% (5 auditory; 5 visual; 4 tactile/kinesthetic; 5 all learning styles) of the participants agreed that the rhythm-based CAMI software/program was sufficient for learning

- 39% (2 auditory; 2 visual; 3 tactile/kinesthetic; 2 all learning styles) of the participants agreed that the software/program contained instructional material necessary for understanding and reading rhythm
- 43% (3 auditory; 2 visual; 2 tactile/kinesthetic; 3 all learning styles) of the participants indicated that they had some difficulty with the software/program (user ineptitude)
- 43% (3 auditory; 3 visual; 2 tactile/kinesthetic; 2 all learning styles) of the participants appreciated the ability to review selected lessons
- 57% (0 auditory; 3 visual; 6 tactile/kinesthetic; 4 all learning styles) of the participants indicated that they benefited from the interactivity of the software/program
- 28% (3 auditory; 1 visual; 1 tactile/kinesthetic; 0 all learning styles) of the participants indicated that they valued the use of graphics and animation in screen presentations
- 100% (6 auditory; 6 visual; 5 tactile/kinesthetic; 6 all learning styles) of the participants desired to use the software/program in conjunction with course textbook outside of allotted class time

Overall, the qualitative assessment indicated no differences in participants' attitudes towards CAMI and suggested that transfer of learning occurred, as evidenced by improved posttest scores among all groups and positive attitudinal responses. The interview process revealed a combination of themes that indicated a strong acceptance of the software programs and their applications. Participants enjoyed having the freedom to review concepts as often as desired and felt that technology was a reliable and convenient means to learn about music (Ho, 2000a). The software presentations demanded that participants respond in a timely manner and provide specific responses that demonstrated acquired knowledge. Additionally, the software programs caused participants to be exposed to varied presentations of learning; qualities that are

often not established in basic lecture and group instruction. These attributes coupled with animations, audio presentations, and enhanced graphics may have greatly enhanced leaner outcomes.

CHAPTER 5

DISCUSSION

The purpose of the present investigation was to examine the effect of researcher developed rhythm based computer-assisted music instruction (CAMI) authored in accordance with empirical findings of effective software design and developed for individual learning style preferences (auditory, visual, and tactile/kinesthetic), on the learning of preservice elementary education majors. Rhythm-based CAMI software was developed by the researcher to encompass the concepts most associated with the element of rhythm. The software program consisted of instruction in steady beat, rhythm notation, measures, bar lines, note values, time signatures, rhythmic syllables, subdivisions of the beat, and recognition of beat and rhythm patterns. Also included was the manipulation of rhythm patterns within specific time signatures.

The results of this study indicated that CAMI designed for learning style preferences had a significant effect on learner outcomes. This finding coincides with the research of Harris, Dwyer, and Leeming (2003). This study revealed that learning style preferences significantly effected participants' performance on Web-based training modules. Additionally, Korenman and Peynircioglu (2007) examined the effects of presentation modality and learning style preference on university musicians and nonmusicians. Results revealed that presentation modality did not make a difference, but learning style preference did. Visual learners learned visually presented items more rapidly and remembered them better when compared to auditory presentation and auditory learners did the reverse.

In the present study, rhythm based CAMI designed for individual learning style preferences (auditory, visual, and tactile/kinesthetic) did significantly factor into improved posttest scores; however, audio and visual learners performed better than tactile/kinesthetic

learners. Similarly, the gains were greater for those who used the software designed for all learning styles. There could be a number of explanations for this. First, it should be noted that the education culture in American classrooms has forced students to learn using multiple approaches. It might be that some skills are better learned from a different learning style approach than one's preferred style or that some complex skills require multiple approaches than a single one.

This idea is supported by the findings of Loo, (2004). Loo recommended that instructional material be presented using a variety of learning methods. However, the ability of the participants to review and self-pace their learning, as evidenced by the qualitative findings of this study, did significantly improve posttest scores by 42% on the MAT and 80% on the RDRT. This supports previous research that discovered that students prefer the freedom to review concepts as often as desired (Walls, 1994). Additionally, participants who received CAMI designed for all learning styles, regardless of their learning preferences, demonstrated enhanced learner outcomes from pretest to posttest. Lively (2005) also discovered that students who were administered the combined or integrated instructional sequences that addressed learning styles demonstrated an enhanced learning outcome from pre-test scores to post-test scores. These findings are supported by Cohen (2001) and Loo (2004) in which results recommended that collaborative learning that is technology-rich and addresses a variety of learning methods/styles positively affects learner outcomes. Likewise, the results of Miller (2005) indicated that creators of CBI formats must ensure that the formats appeal to all learning styles.

A second explanation as to why individualized treatment was not superior to the all styles learning treatment could be that students' true learning style was not accurately identified by the two learning style inventories used in the present study. Students may not have been able to

accurately articulate their learning style preferences on the inventories. Slightly more than half of the participants were identified as having the same learning style on both inventories. As has been suggested by others (Hawk & Shah, 2007; Lemire, 1996) the measuring of learning styles is an inexact science. In the present study, some participants in the individualized treatment may have been using the incorrect software program. This lends support to current educational practices that encourage teachers to present content using many learning style strategies.

One predictable result of the present study might be that participants made greater gains on the RDRT than on the MAT. The modules were deigned to teach the skills assessed on the RDRT, but not the MAT. Error detection skills, such as those assessed on the MAT, necessitate prerequisite skills similar to those taught in the software modules. It was clear that transfers were made by the fact that all participants, regardless of learning style or treatment, made gains on the MAT from pretest to posttest; however, the gains were not as great as for the RDRT. It is important that software designers decide *a priori* the specific skills that will be assessed and make sure those skills are addressed in software presentation lessons.

The literature reviewed for this study indicated that CAI is a remarkable tool for the individualization of instruction (Atkinson & Wilson, 1968) and positively affects the attitudes of students toward instruction (Kulik, Kulik, & Cohen, 1980). Qualitative analyses revealed that participants enjoyed interaction components and the freedom to review concepts as often as desired (Walls, 1994). Participants' knowledge acquisition, as evidenced by overall improved posttest scores, and comments such as "I enjoyed it," "everything that I needed to learn rhythm concepts was well presented," and " I liked having the ability to review as often as I needed," may have been based on previous research findings that were adhered to in the authoring of the software programs, such as user-interface with regards to interaction tools, navigation methods

and feedback (Sissel Guttormsen Schär, Schluep, Schierz, and Krueger, 2000) and organization of screen design (Grabinger, 1993). Hannafin and Hopper (1989) recommended that CAI screen design should focus on key aspects of the lesson, develop and maintain interest in the lesson content and activities, promote deep processing of important information, promote engagement between the learner and lesson content, and facilitate lesson navigation. Additionally, graphic design, text density, and audio of the software programs were designed based on the findings of Grabinger, 1989; Morrison, Ross, O'Dell, Schultz, & Higginbotham-Wheat, 1989; and Truman & Truman, 2006. Their findings revealed that when the above mentioned elements are taken into consideration when developing CAI, it may positively affect learner outcomes.

The software design for this study achieved the above recommendations and was evidenced by participants' comments such as:

> … I think the program was well put together. Everything that was needed to run the program, understand the information that was presented – it all was there. I truly enjoyed learning some music concepts with the aid of the computer. I felt that I was in control of my learning.
>
> Overall the rhythm lessons were very good and self explanatory. You just had to go back and review so you could be comfortable with it. You would have to take what you have learned the previous day and apply it the next day.
>
> … it helped me to understand how to relate time signatures to measures, how to count within the measures using the different time signatures. Those were things that I did not know and the program was very good in teaching and explaining those concepts to me. The program allowed me to have some visual as well as hands on instruction while I was learning. All of this kept me constantly engaged in each lesson.

The above cited sample of responses obtained via interviews provided possible explanation increased scores from pretest to posttest regardless of instructional treatment received.

Additionally, interview questions gleaned exceptional attitudinal responses related to the computer program. Several participants asked if they could have a copy of the program, would the program be available for purchase, and would the researcher develop other programs to assist them with the remaining units in the course syllabus. Responses to the question, "How did the instructional activities in the program help you learn and understand rhythm concepts?" revealed a zealous acceptance of the program.

The software programs used for the present study were all designed for the acquisition of reading rhythm. Various adjustments were made to the software programs so that they were learning style specific. Participants could not proceed to the next screens if previous lessons/activities were not mastered. Placek (1974) opined that the use of drill and practice, tutoring, and gaming in a CAI lesson designed for teaching rhythm to be beneficial for non-musicians. The results of the present study coincide with the findings of Hofstetter (1978, 1979, & 1980) in which students made significant learning gains after using computer-based music instruction programs that were competency-based.

The use of CAMI was not found to be an effective timesaving tool in the classroom as described by Parrish (1997). If participants were allowed to take the software and use as assigned material at their leisure, classroom time could possibly be used for more instruction in the aesthetic aspects of music (Netusil, et al., 1989). However, this researcher believes that this too could cause problems, especially if participants do not have access to hardware that is sufficient for running the software programs. The methodology of this study was not conducive to this measurement. Participants received treatment outside of their assigned building for a period of

nine class sessions. Suggestions were often made by the participants that the software programs should be made available outside of scheduled class times and in conjunction with the class text. These suggestions may prove to enhance the results of this study and coincide with the findings of Parrish, that CAMI is an effective timesaving tool in the classroom.

Limitations of the Study

The limitations of this study restrict the generalizability of the results. The first concern of the limitations was the accessible population. The accessible population was 96 Southern University and A & M College undergraduate elementary education majors enrolled in a Fundamentals of Music course over a period of two semesters and one summer session. Therefore, generalizations of the findings are exclusive to this population. Increasing the population size may strengthen the findings and discover factors for future research. Secondly, the sample size was restricted by boundaries placed on qualifying scores on MAT and RDRT pretest. Participants scoring 70% or higher on the MAT and RDRT participated in the study but data from these participants were not included in the final data analysis. Scores of 70% or higher were indicative of prior music knowledge, therefore restricting the effectiveness of the treatment and reduced the sample size to $N = 82$.

Additionally, the learning style preference findings were limited to the results of two learning style instruments: (a) the Perceptual Learning Styles Preference Survey and (b) the Diablo Valley College Learning Style Survey for College. The results of participants' learning style preferences would therefore not be similar to those accrued from other instruments of this type. According to Keefe and Languis (1983) and Felder (1996), ascertaining the learning styles of students can be achieved by employing varied learning style instruments. Lemire (1996) posited that a variety of instruments designed to measure the same learning style preference

should be administered to a designated group of students. If the scores are congruent for each student at a minimum of 75% on each inventory, the instruments will have verified an acceptably level of reliability and validity.

Although gender and ethnicity were not factors for this study, findings were limited to primarily female participants (96% female and 4% male) and African American participants (99% African American and 1% Anglo American). It would be interesting to investigate how the findings of this study would compare to those of a similar study with a more diverse gender and ethnic population.

Computer Laboratory availability was problematic in that participants were relocated from DeBose Music Hall, their regularly scheduled building for class, because of an insufficient number of computers. Therefore, computer laboratories located in the Smith-Brown Memorial Union, T. T. Allain Hall, and J. B. Moore Hall were conducive for accessible functional hardware. In an ideal situation, if a software application of this type were to be used on a regular basis, a more accessible computer laboratory would be desirable. Especially one located within the music building.

Although treatment behavior was not an investigated factor, the researcher observed manifestations of frustration (e. g., slamming hands on the arm rests of chairs, fidgeting, and folding of arms). This frustration was further documented during interviews. Such responses as, "…once I typed in an answer I could not go back and change it. That was very frustrating," and "…I did not like being forced to stay on a task until got the answers correct," were indicative of frustration with tasks during treatment. However, it was decided *a priori* to have the software program function in this manner. This researcher recommends that future instructional software

development would be wise to adhere to this form of instruction in seeking positive learner outcomes.

Implications for Future Research

Results of this study suggest that research is needed that examines the use of multiple learning style instruments to assist with the consistency of participants' learning preference. The findings of this study question the use of only two learning style instruments, the PLSPS and the DVC, which found no effect. Walters, Egert, and Cuddihy (2000) and Hawk and Shah (2007) recommended that coupling of learning style instruments be used to ascertain participants' learning preferences and improve the reliability and validity of the results. If their observations are valid, then the results of this study might not appear robust. Corresponding scores on the PLSPS and the DVC occurred 46 out of 82 times (56%). Future research should investigate the use of varied and multiple learning style instruments to obtain reliable and valid results of participants' learning style and or preference (Felder, 1996; Keefe & Languis, 1983). Also, future studies should consider which learning style preferences are matched most often. This could possibly lead to a greater understanding of how most students learn; affording the possibility of enhanced instruction.

As evidenced by this study, computer-based instruction that appeals to all learning styles seemed to enhance learnability and test outcomes. Future research that employs the development of CAMI should ensure that the formats appeal to all learning styles simultaneously. "By doing this, researchers can prevent student alienation, or worse, a new form of student discrimination" (Miller, 2005, p. 305).

To further enhance the explored elements of the present study, it would be novel to investigate the effects of learner outcomes if participants are administered treatments associated

with learning styles that vary from their assessed learning style preferences; for example, giving an auditory participant a software program written for a visual learner. After reviewing the literature for this study, no studies were found that investigated this independent measure. Therefore, a follow-up study of this type is warranted.

Overall, design interactivity, animation, screen layout, feedback, and audio in the computer programs were sufficient. This may be attributed to the sophistication of current authoring programs. Nonetheless, instruction was impeded on several occasions because of computers “freezing” or locking up. A rationale for this problem may have been the limitations of random access memory (RAM) and micro-processing power available on computers in laboratories used campus-wide. Suggestions for improved or enhanced computer laboratories may not be essential for all disciplines or degree programs on university campuses but are absolutely critical for music education software programs because these software programs use the fullest multimedia capabilities and resources of computers.

The element of music used in the creation of learner specific CAMI for this study was rhythm. Creators of CAMI software have the aid of increasingly sophisticated technologies to assist in the development of computer-based software. These new technologies may increase the suitability of using computer aided instruction that serves as a tool to present and enhance academic achievement equivalent to traditional instruction. Future research should investigate the development of learner specific CAMI that addresses other elements of music (e.g., melody, timbre, dynamics, etc.). This type of research would provide empirical support for the use of computer software in conjunction with classroom music instruction. This is supported by the findings of Hofstetter (1978), which revealed that when participants were taught using a

traditional learning sequence in conjunction with computer-based software there was a trend of higher achievement scores.

The availability of the software for use is another interesting variable to consider for future research. In this study the software was only provided for the participants during specified class periods. Participants suggested that the software be made available for use at their leisure. For example, Participant #1 stated, "…the software was very well put together. In hindsight, if I had the software to use at my leisure, instead of in a blocked fifty-minute lesson, I probably would have done better on the test," and Participant #11 indicated, "[I would like to have been able] to take the software program home for practice and review." For these reasons, it would be interesting to investigate participants' academic achievement if they had been allowed to use the software programs outside of scheduled class periods.

Summary

CAMI designed for specific learning style preferences did have a significant effect on achievement; however, the gain was significantly different from the gain achieved by those who used the software designed for all learning styles (these participants' gain was much greater). It was enlightening to discover that tactile/kinesthetic learners' gains were not as great, considering the nature of the art of music. As Gardner (1993) states, the study of musical concepts requires that the learner be able to manipulate musical concepts both mentally and physically and also requires the use of the body as a whole or in parts. These findings may suggest that the nature of the art encompasses all modalities of learning style preferences. Music, regardless of the concept being taught, possesses a medium that allows for a presentation of learning style balance. Instruction in musical concepts involves sound (auditory), notation (visual), and the manipulation of those concepts (tactile/kinesthetic). The use of the computer allows for this

presentation to be individualized. This type of individualized instruction causes the student to respond in a timely manner and demonstrate acquired and proficient knowledge. The ability of computer-based instruction to provide immediate feedback on progress and test results is another plausible reason to continue its use. Students often indicated heightened satisfaction when they immediately knew that a task had been mastered and that testing results were favorable. Again, the immediacy of a well designed computer program can not only satisfy the student, but assist the instructor in completing course requirements in a timely manner. Many times the amount of material to be covered is extensive and university instructors must explore other possibilities of instruction transmittal. Therefore, it is of utmost importance that time saving tools be incorporated in the instruction process and afford the student the best opportunity to learn and succeed academically. It is my aspiration that future research continues to study the use of this remarkable tool – the computer.

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APPENDIX A

INSTITUTIONAL REVIEW BOARD (IRB) EXEMPTION FROM OVERSIGHT: LOUISIANA STATE UNIVERSITY

IRB #: E3696 **LSU Proposal #:**_______________ **Revised:** 5/7/2007

LSU INSTITUTIONAL REVIEW BOARD (IRB) for HUMAN RESEARCH SUBJECT PROTECTION

5788692 FAX 6792
Office:203 B-1 David Boyd Hall

APPLICATION FOR EXEMPTION FROM INSTITUTIONAL OVERSIGHT

Unless they are qualified as meeting the specific criteria for exemption from Institutional Review Board (IRB) oversight, ALL LSU research/projects using living humans as subjects, or samples or data obtained from humans, directly or indirectly, with or without their consent, must be approved or exempted in advance by the LSU IRB. This Form helps the PI determine if a project may be exempted, and is used to request an exemption.

Instructions: Complete this form.

Exemption Applicant: If it appears that your study qualifies for exemption send:

(A) Two copies of this completed form,
(B) a brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts A & B),
(C) copies of all instruments to be used. If this proposal is part of a grant proposal include a copy of the proposal and all recruitment material.
(D) the consent form that you will use in the study. A Waiver of Written Informed Consent is attached and must be completed only if you do not intend to have a signed consent form.
(E) Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project (including students who are involved with testing or handling data) at http://cme.cancer.gov/clinicaltrials/learning/humanparticipant-protections.asp. (Unless already on file with the IRB.)

to: ONE screening committee member (listed at the end of this form)in the most closely related department/discipline or to IRB office.

If exemption seems likely, submit it. If not, submit regular IRB application. Help is available from Dr. Robert Mathews, 578-8692, irb@lsu.edu or any screening committee member.

Principal Investigator Judy Arnette Guilbeaux-James **Student?** Yes Y/N

Ph: (225) 275-6304, (225)771-3300, (225) 921-9258 **E-mail** jguilb3@lsu.edu **Dept/Unit** Music Education

If Student, name supervising professor Dr. Evelyn K. Orman Ph: 578-9270

Mailing Address 3559 White Sands Drive Baton Rouge, LA 70814-5257 Ph: (225) 275-6304

Project Title: The Effect of Rhythm-Based Computer-Assisted Music Instruction Designed for Individual Learning Style Preferences on the Learning of Preservice Elementary Education Majors

Agency expected to fund project N/A

Subject pool (e.g. Psychology Students) Elementary Classroom Teachers

Circle any **"vulnerable populations" to be used:** (children < 18; the mentally impaired, pregnant women, the aged, other). Projects with incarcerated persons cannot be exempted.
I certify my responses are accurate and complete. If the project scope or design is later changed I will resubmit for review. I will obtain written approval from the Authorized Representative of all nonLSU institutions in which the study is conducted.

PI Signature Judy Annette Sillemon James **Date** 04/03/07 (no per signatures)

= =

Screening Committee Action: Exempted X Not Exempted ___ Category/Paragraph ___

Reviewer S. Kim MacGregor Signature S. Kim MacGregor Date 8/22/07

Part A: DETERMINATION OF "RESEARCH" and POTENTIAL FOR RISK

This section determines whether the project meets the Department of Health and Human Services (HSS) definition of research involving human subjects, and if not, whether it nevertheless presents more than "minimal risk" to human subjects that makes IRB review prudent and necessary.

1. **Is the project involving human subjects a systematic investigation, including research, development, testing, or evaluation, designed to develop or contribute to generalizable knowledge?**

(Note some instructional development and service programs will include a "research" component that may fall within HSS' definition of human subject research).

X YES

NO

Study Exempted By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Exemption Expires: 08-21-2010

2. **Does the project present physical, psychological, social or legal risks to the participants reasonably expected to exceed those risks normally experienced in daily life or in routine diagnostic physical or psychological examination or testing?** You must consider the consequences if individual data inadvertently become public.

YES Stop. This research cannot be exempted--**submit application for IRB review.**

X NO Continue to see if research can be exempted from IRB oversight

3. **Are any of your participants incarcerated?**

YES Stop. This research cannot be exempted--**submit application for IRB review.**

X NO Continue to see if research can be exempted from IRB oversight.

4. **Are you obtaining any health information from a health care provider that contains any of the identifiers listed below?**

A. Names

B. Address: street address, city, county, precinct, ZIP code, and their equivalent geocodes. Exception for ZIP codes: The initial three digits of the ZIP Code may be used, if according to current publicly available data from the Bureau of the Census: (1) The geographic unit formed by combining all ZIP codes with the same three initial digits contains more than 20,000 people; and (2) the initial three digits of a ZIP code for all such geographic units containing 20,000 or fewer people is changed to '000'. (Note: The 17 currently restricted 3-digit ZIP codes to be replaced with '000' include: 036, 059, 063, 102, 203, 556, 692, 790, 821, 823, 830, 831, 878, 879, 884, 890, and 893.)

C. Dates related to individuals

i. Birth date

ii. Admission date

iii. Discharge date

iv. Date of death

v. And all ages over 89 and all elements of dates (including year) indicative of such age. Such ages and elements may be aggregated into a single category of age 90 or older.

D. Telephone numbers;

E. Fax numbers;

F. Electronic mail addresses;

G. Social security numbers;

H. Medical record numbers; (including prescription numbers and clinical trial numbers)

I. Health plan beneficiary numbers;

J. Account numbers;

K. Certificate/license numbers;

L. Vehicle identifiers and serial numbers including license plate numbers;

M. Device identifiers and serial numbers;

N. Web Universal Resource Locators (URLs);

O. Internet Protocol (IP) address numbers;

P. Biometric identifiers, including finger and voice prints;

Q. Full face photographic images and any comparable images; and

R. Any other unique identifying number, characteristic, or code; except a code used for re-identification purposes; and

S. The facility does not have actual knowledge that the information could be used alone or in combination with other information to identify an individual who is the subject of the information.

YES Stop. This research cannot be exempted--**submit application for IRB review.**

X NO Continue to see if research can be exempted from IRB oversight.

Part B: EXEMPTION CRITERIA FOR RESEARCH PROJECTS

Research is exemptible when all research methods are one or more of the following five categories. Check statements that apply to your study:

X **1. In education setting, research to evaluate normal educational practices.**

X **2. For research not involving vulnerable people [prisoner, fetus, pregnancy, children, or mentally impaired]: observe public behavior (including participatory observation), or do interviews or surveys or educational tests:**

The research must also comply with one of the following: either that

X **a)** the **participants cannot be identified**, directly or statistically;

or that

X **b)** the **responses/observations could not harm participants if made public**;

or that

X **c) federal statute(s) completely protect all participants' confidentiality;**

or that

---

3. For research not involving vulnerable people [prisoner, fetus, pregnancy, children, or mentally impaired]: observe public behavior (including participatory observation), or do interviews or surveys or educational tests:

. **all respondents are elected, appointed, or candidates for public officials.**

X **4. Uses only existing data, documents, records, or specimens properly obtained.**

The research must also comply with one of the following:

either that:

X a) subjects cannot be identified in the research data directly or statistically, and no-one can trace back from research data to identify a participant;

or that

b) the sources are publicly available

---

5. **Research or demonstration service/care programs, e.g. health care delivery.**

The research must also comply with <u>all</u> of the following:

a) It is directly **conducted or approved by the head of a US Govt. department** or agency.

<u>and that</u>

b) **it concerns only issues under usual administrative control** (48 Fed Reg 9268-9), e.g., regulations, eligibility, services, or delivery systems;

<u>and that</u>

c) **its research/evaluation methods are also exempt from IRB review.**

---

6. **For research not involving vulnerable volunteers [see "2 & 3" above], do food**

r

ED/LIBRARIES/INFO SCI
Ms. Phillips (LSU Libraries) 5786552
Dr. Landin* (Kinesiol) 5782916
Dr. MacGregor (ELRC) 578-2150
Dr. Gansle (Curric & I) 5787213
Dr. Ann Trousdale* (Curric & I) 578-2330

(* = IRB member)

research subjects, obtain informed consent if appropriate, and **must conform to the Ethical Principles and Guidelines for the Protection of Human Subjects (Belmont Report), 45 CFR 46, and LSU Guide to Informed Consent**; (Available from OSP or http://www.lsu.edu/irb)

HUMAN SUBJECTS SCREENING COMMITTEE MEMBERS can assist & review:

COLLEGE OF ARTS AND SCIENCES:
Dr. Noell * (Psych) 5784119
Dr. Geiselman * (Psych) 7632695
Dr. Beggs (Socio) 5781119
Dr. Honeycutt(Comm.Stu.) 5786676
Dr. Dixit (Comm Sc./Dis) 5783938
Dr. Copeland* (Psych) 578-4117

MASS COMMUN/SOC WK/AG:
Dr. Nelson (Mass C) 5786686
Dr. Keenan* (Hum Ecol) 5781708
Dr. Osborne (Mass C) 578-9296
Dr. Timothy F. Page (Soc Wk) 578-1358

APPENDIX B

INSTITUTIONAL REVIEW BOARD (IRB) EXEMPTION FROM OVERSIGHT SOUTHERN UNIVERSITY and A & M COLLEGE

INCORPORATED 1880 RELOCATED 1914
SOUTHERN UNIVERSITY And Agricultural & Mechanical College

Office of Research
and Strategic Initiatives
Post Office Box 9272
(225) 771-3890 (voice)
(225) 771-5231 (fax)

**Institutional Review Board (IRB)
for the Protection of Human Subjects**

Federal Wide Assurance # 00002518 **IRB Registration # 00002445**

Initial Approval Form for Exempt Research

Investigator(s): Judy James Unit: College of Arts and Humanities – Music

Project Title: The Effect of Rhythm-Based Computer-Assisted Music Instruction Designed for Individual Learning Style Preferences on the Learning of Preservice Elementary Education Majors

Project Number: SU-BR IRB 2007 – 31E

I certify that the above research project was reviewed and approved by the Southern University – Baton Rouge (SU-BR) IRB for the Protection of Human Subjects in accordance with the Code of Federal Regulations, Title 45 Public Welfare Part 46 Protection of Human Subjects, on September 10, 2007 and was determined to be exempt from this policy – Research Category Title 45 CRF 46.101(b)(2). However, before any changes to approved proposed protocols (e.g., subject selection or category, consent, risks, benefits, procedures, subject anonymity and confidentiality, etc.), the principal investigator is to present the proposed changes to the Chairperson of the SU-BR IRB for the Protection of Human Subjects for review and approval prior to implementation of these changes.

Signature: Sandra C. Brown Date: 9/10/07

Name: Sandra C. Brown, DNS
School of Nursing
Southern University – Baton Rouge
Baton Rouge LA 70813

sandrabrown@suson.subr.edu
(V) 771-5145 / (F) 771-2349

We certify that this institution applies Title 45 CRF 46 subparts A, B, C, and D to all research involving human subjects regardless of the source of support.

Chairperson of the SU-BR Institutional Research Oversight Committee

Signature: [signature] Date: 9/10/2007

Name: Jimmy D. Lindsey, Ph.D.
(V) 771-3950 / (F) 771-5652

jimmy_lindsey@cxs.subr.edu

Authorized Institutional Official

Signature: [signature] Date: 9/10/07

Name: Michael A. Stubblefield, Ph.D.
Office of Research and Strategic Initiatives

(V) 771-3890 / (F) 771-5231

Baton Rouge, Louisiana 70813-9272
"A People's Institution Serving the State, the Nation, and the World."

APPENDIX C

PARTICIPANT CONSENT FORM

Consent Form

1. Study Title:	The Effect of Rhythm-Based Computer-Assisted Music Instruction Designed for Individual Learning Style Preferences on the Learning of Preservice Elementary Education Majors
2. Performance Site:	Southern University and Agricultural & Mechanical College
3. Investigator:	The following investigator is available for questions about this study: M-F 1:00 p.m. – 4:30 p.m. Judy Arnette Guilbeaux-James (225) 771-3300 / (225) 275-6304 / (225) 921-9258 Southern University and A & M College
4. Purpose of the Study:	The purpose of this study is to measure the effect of rhythm based computer-assisted music instruction designed for individual learning style preferences on the learning of preservice elementary education majors.
5. Subject Inclusion:	Preservice Elementary Education Majors between the ages of 18 and 30 currently enrolled in Fundamentals of Music (MUSC 327)
6. Numbers of Subjects:	Estimated to be 100.
7. Study Procedures:	Subjects will individually complete two 10-20 minute Learning Style Instruments, two rhythm based tests, and receive computer-assisted instruction in rhythm for a period of approximately 9-12 days.
8. Benefits:	Possibility of enhanced learning.
9. Risks:	There are no anticipated risks for participants.
10. Right to Refuse:	Subjects may choose not to participate or to withdraw from the study at any time without penalty or loss of any benefit to which they might otherwise be entitled.
11. Privacy:	Results of the 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.
12. Signatures:	

The study has been discussed with me an all my questions have been answered. I may direct additional questions regarding study specifics to the investigator. If I have any question about subjects' rights or other concerns, I can contact **Robert C. Mathews, Institutional Review Board, Louisiana State University – Baton Rouge, LA (225) 578-8692 or Jimmy D. Lindsey, Institutional Research Oversight Committee, Southern University – Baton Rouge, LA 70813, (225) 771-3950**. I agree to participate in the study described above and acknowledge the investigators' obligations to provide me with a signed copy of this consent form.

Name: ______________________________

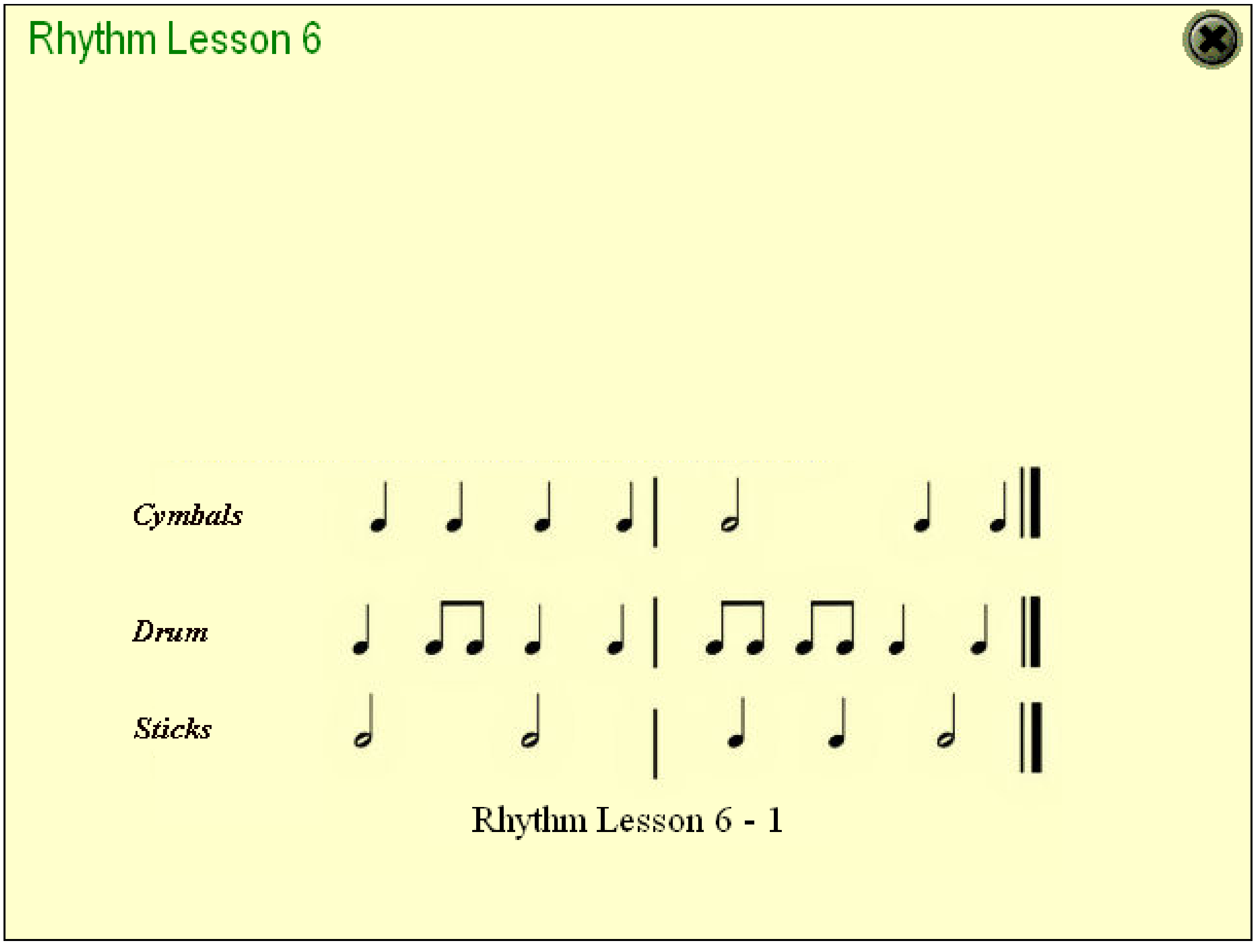
Signature: ______________________________

Date: ______________________________

Study Exempted By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Exemption Expires: 08-21-2010

APPENDIX D

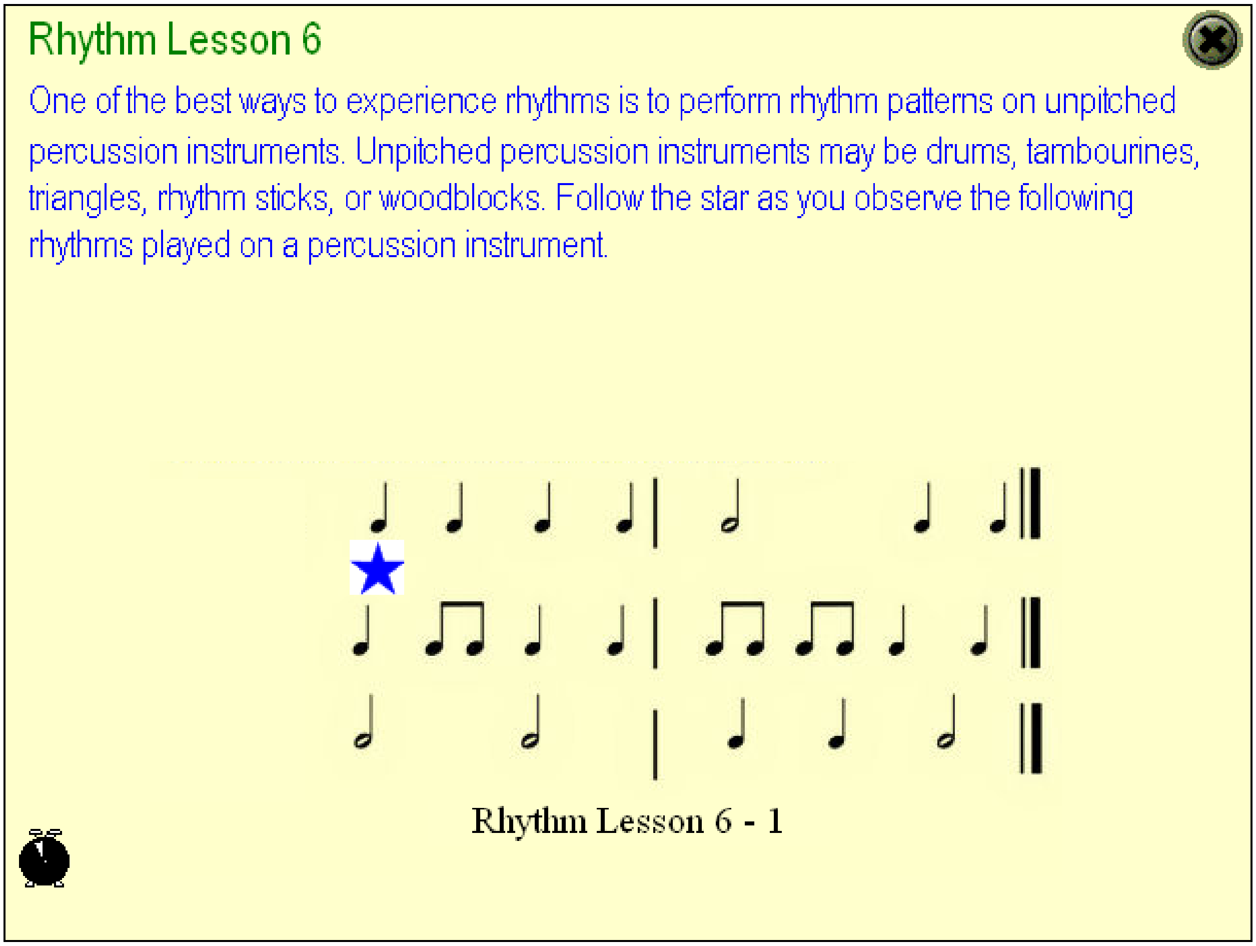
AUDITORY PRESENTATION SCREEN



Instructions were read by voice-overs. Individual rhythms were automatically played two times on the appropriate instruments.

APPENDIX E

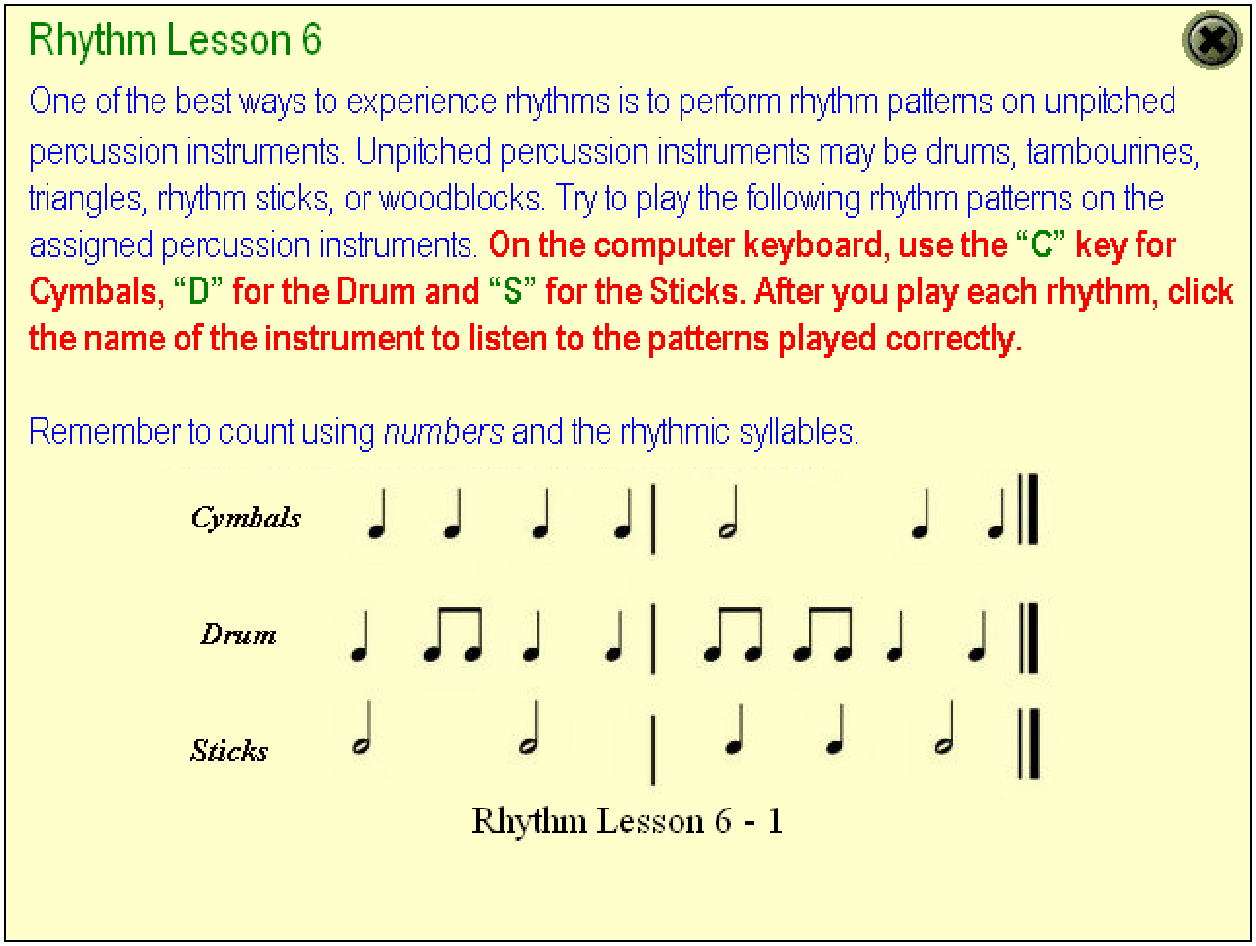
VISUAL PRESENTATION SCREEN



A 60-second stopwatch set the parameters for reading the instructions. Rhythms were automatically performed and the participant was guided through each rhythm pattern by following a moving blue star.

APPENDIX F

TACTILE/KINESTHETIC PRESENTATION SCREEN



Participants read instructions at their own pace and used the computer keyboard to control all activities.

APPENDIX G

PERCEPTUAL LEARNING STYLE PREFERENCE QUESTIONNAIRE

by

Joy Reid

Name: ___________________________________ Date: _______________

Age: ___________________________________ Major: ______________

Classification: ____________________________

Directions

People learn in many different ways. For example, some people learn primarily with their eyes (visual learners) or with the ears (auditory learners); some people prefer to learn by experience and/or by "hands-on" tasks (kinesthetic or tactile learners); some people learn better when they work alone while others prefer to learn in groups.

This questionnaire has been designed to help you identify the way(s) you learn best--the way(s) you *prefer* to learn.

Decide whether you agree or disagree with each statement. For example, if you strongly agree, mark:

SA Strongly agree	**A** Agree	**U** Undecided	**D** Disagree	**SD** Strongly Disagree
X				

Please respond to each statement quickly, without too much thought. Try not to change your responses after you choose them. Please answer all the questions. Please use a pen to mark your choices.

PERCEPTUAL LEARNING STYLE PREFERENCE QUESTIONNAIRE

Item	SA	A	U	D	SD
1. When the teacher tells me the instructions I understand better.					
2. I prefer to learn by doing something in class.					
3. I get more work done when I work with others.					
4. I learn more when I study with a group.					
5. In class, I learn best when I work with others.					
6. I learn better by reading what the teacher writes on the chalkboard.					
7. When someone tells me how to do something in class, I learn it better.					
8. When I do things in class, I learn better.					
9. I remember things I have heard in class better than things I have read.					
10. When I read instructions, I remember them better.					
11. I learn more when I can make a model of something.					
12. I understand better when I read instructions.					
13. When I study alone, I remember things better.					
14. I learn more when I make something for a class project.					
15. I enjoy learning in class by doing experiments.					
16. I learn better when I make drawings as I study.					

17. I learn better in class when the teacher gives a lecture.					
Item	**SA**	**A**	**U**	**D**	**SD**
18. When I work alone, I learn better.					
19. I understand things better in class when I participate in role-playing.					
20. I learn better in class when I listen to someone.					
21. I enjoy working on an assignment with two or three classmates.					
22. When I build something, I remember what I have learned better.					
23. I prefer to study with others.					
24. I learn better by reading than by listening to someone.					
25. I enjoy making something for a class project.					
26. I learn best in class when I can participate in related activities.					
27. In class, I work better when I work alone.					
28. I prefer working on projects by myself.					
29. I learn more by reading textbooks than by listening to lectures.					
30. I prefer to work by myself					

APPENDIX H

PERMSSION TO USE AND REPRINT COPYRIGHT-PROTECTED MATERIAL

From: JUDY JAMES [mailto:JUDY_JAMES@cxs.subr.edu]
Sent: Tue 4/17/2007 7:18 AM
To: Joy Maurine Reid
Subject: Permission Request

April 17, 2007

Joy M. Reid
Professor
Department of English
University of Wyoming
201 Hoyt Hall
Laramie, WY 82071

Dear Professor Reid,

I am a Ph. D. candidate at Louisiana State University, researching the effect of rhythm based computer-assisted music instruction designed for individual learning style preferences within the context of a music fundamentals course. I am writing to request permission to reprint and use your survey, *Perceptual Learning Style Preference*, as part of my research and include the survey in its entirety as an appendix in my doctoral dissertation, titled *The Effect of Rhythm-Based Computer-Assisted Music Instruction Designed for Individual Learning Style Preferences on the Learning of Preservice Elementary Education Majors*.

I look forward to your response and welcome any questions, comments or requests that you may have.

Sincerely,

Judy A. Guilbeaux-James

From: Joy Maurine Reid [JReid@uwyo.edu]
Sent: Fri 4/20/2007 3:45 PM
To: JUDY JAMES
Subject: RE: Permission Request

Dear Judy Guilbeaux-James,

Thank you for writing me for permission to use my Perceptual Learning Styles Preference Survey (PLSPS).

Please consider this email as my formal permission to use the PLSPS with your dissertation research.

One caveat: as you probably know, the target audience for my survey was international ESL students in intensive English language programs in the U.S. The survey has been normed for that population. If you use the survey on another population, the results may be unreliable and invalid. At most, you will want to re-norm the survey on your target audience (see my "Dirty Laundry" article in the Forum section of the *TESOL Quarterly* in 1990 for my norming processes). At least, if you are publishing your results, you will need to indicate that the survey was not normed for your population.

You might be interested to know that my first edited anthology is out of print, so I have regained the copyright. Neil Anderson at BYU has had the entire book on the WWW. So everyone can access it, for free, at:

http://linguistics.byu.edu/classes/ling677na/learningstylesbook.pdf

If you intend to do statistical analysis on your data, and if you intend to do any comparisons with my original data, I need to tell you about the re-scaling I did on my original data. Although the students answered the survey on a 1-5 scale (strongly disagree to strongly agree), my statistics mentor suggested that we rescale to 0-4 for ease of doing the statistical analysis. If you decide to rescale, that will not change the trends of your results, only the numbers. If you decide not to, and you want to compare your data with mine, you need to know that the trends might be similar, but your numbers will be higher.

Thanks again for writing. I'd be happy to hear about the results of your research, so stay in touch, please. And I hope that your students find the information as helpful as mine have.

Joy Reid

APPENDIX I

DIABLO VALLEY COLLEGE LEARNING STYLE SURVEY

DVC Online

Introduction to the DVC Learning Style Survey for College

Written by: **Catherine Jester**, Learning Disability Specialist© Copyright 2000
For Educational Uses Only
Adapted for the Web by: **Suzanne Miller**, Instructor, Math and Multimedia
© Copyright 2000 http://www.metamath.com/lsweb/dvclearn.htm

The Online Learning Styles Site

This DVC online guide is designed to help you become a more successful student. It includes a Learning Style Survey that will help you identify your learning style. It also includes learning strategies that will help you study in a productive manner, one that matches your unique learning style.

You may read about learning styles below or proceed now to the **Learning Styles Survey.** After you have completed the survey, your scores will be calculated automatically and reported on a webpage. Your preferred learning style will be identified together with suggested learning strategies. There is also a page describing all four **Learning Styles and Strategies.**

Introduction to Learning Styles

Are you having trouble learning new information in a college class? You may want to learn more about your unique learning style. Your learning style is the way you prefer to learn. It doesn't have anything to do with how intelligent you are or what skills you have learned. It has to do with how your brain works most efficiently to learn new information. Your learning style has been with you since you were born.

There's no such thing as a "good" learning style or a "bad" learning style. Success comes with many different learning styles. There is no "right" approach to learning. We all have our own particular way of learning new information. The important thing is to be aware of the nature of your learning style. If you are aware of how your brain best learns, you have a better chance of studying in a way that will pay off when it's time to take that dreaded exam.

Visual, Auditory, or Tactile/ Kinesthetic Learner.

To get you started thinking about your learning style, think about the way in which you remember a phone number. Do you see, in your mind's eye, how the numbers look on the phone? Or can you "see" the number on that piece of paper, picturing it exactly as you wrote it down? You might be a Visual Learner. Or, perhaps you can "hear" the number in the way that someone recited it to you. In this case, you might be an Auditory Learner. If you "let your fingers do the walking" on the phone, i.e. your fingers dial the number without looking at the phone, you may be a Tactile/ Kinesthetic Learner.

This way of looking at learning style uses the different channels of perception (seeing, hearing, touching/moving) as its model. This is a somewhat simplistic view of a very complicated subject (the human brain). However, looking at learning style from a perceptual point of view is a useful place to begin.

Match Your Learning Style and Strategies

While there is no "good" or "bad" learning style, there can be a good or bad match between the way you best learn and the way a particular course is taught. Suppose you are a Visual Learner enrolled in a traditional lecture course. You feel that the instructor drones on for hours and you can't pay attention or stay interested in the class. There's a mismatch here between your learning style and the instructional environment of the class. As soon as you understand this mismatch, you can find ways to adapt your style to ensure your success in the class. You might start tape recording the lectures so that you don't have to worry about missing important information. You might decide to draw diagrams that illustrate the ideas being presented in lecture. You might go to the Media Center and check out a video to help provide some additional information on course material you're not sure about. What you're doing is developing learning strategies that work for you because they are based on your knowledge of your own learning style.

To find your unique learning style, take the **Learning Styles Survey** now.

Or read a description of the **Four Learning Styles** and associated learning strategies.

A Learning Style Survey for College

Written by Catherine Jester
Learning Disability Specialist
Diablo Valley College

Please enter your

First Name:

Last Name:

Age:

Sex: ☐ Male ☐ Female

Click on the most appropriate button after each statement.
Use the Tab key to move to the next question.

1. I would rather read material in a textbook than listen to a lecture.	☐ Often	☐ Sometimes	☐ Seldom
2. I benefit from studying with a partner or study group.	☐ Often	☐ Sometimes	☐ Seldom
3. In my spare time, I like to do projects that involve using my hands (e.g. painting, constructing, using tools, etc.).	☐ Often	☐ Sometimes	☐ Seldom
4. I find graphs and diagrams useful in clarifying concepts.	☐ Often	☐ Sometimes	☐ Seldom
5. I benefit more from lab classes than lecture classes.	☐ Often	☐ Sometimes	☐ Seldom
6. I find it useful to read out loud when reading a textbook.	☐ Often	☐ Sometimes	☐ Seldom
7. Reviewing information on flashcards helps me remember it.	☐ Often	☐ Sometimes	☐ Seldom
8. I like solving mazes or jigsaw puzzles.	☐ Often	☐ Sometimes	☐ Seldom
9. I can find the mistakes in my written work.	☐ Often	☐ Sometimes	☐ Seldom

10. I find myself talking out loud when studying by myself.	☐ Often ☐ Sometimes ☐ Seldom
11. As a child, I liked to engage in physical activities during my free time.	☐ Often ☐ Sometimes ☐ Seldom
12. I would rather listen to a book on tape than read it	☐ Often ☐ Sometimes ☐ Seldom
13. I like solving crossword or word search puzzles.	☐ Often ☐ Sometimes ☐ Seldom
14. I tend to doodle" during lecture by drawing on my notebook pages.	☐ Often ☐ Sometimes ☐ Seldom
15. When trying to remember a phone number, I "let my fingers do the walking," i.e. my fingers seem to remember the number on their own.	☐ Often ☐ Sometimes ☐ Seldom
16. As a child, I liked to read books during my free time.	☐ Often ☐ Sometimes ☐ Seldom
17. I would rather listen to a lecture than read the material in a book.	☐ Often ☐ Sometimes ☐ Seldom
18. I can use a map effectively to get myself to a new location.	☐ Often ☐ Sometimes ☐ Seldom
19. As a child, I liked to listen to stories told to me, or stories on tape, record player, or radio.	☐ Often ☐ Sometimes ☐ Seldom
20. When learning a new skill, I would rather watch someone demonstrate the skill than listen to someone tell me how to do it.	☐ Often ☐ Sometimes ☐ Seldom
21. When trying to remember a phone number, I can "see" the number sequence in my head, or I "see" the way the numbers look on the phone.	☐ Often ☐ Sometimes ☐ Seldom
22. When trying to remember how to spell a word, I spell the letters with my finger in the air or on a table top.	☐ Often ☐ Sometimes ☐ Seldom
23. If I have to learn how to assemble something, I would rather look at a diagram than listen to someone tell me how to put it together.	☐ Often ☐ Sometimes ☐ Seldom

24. When trying to remember how to spell a word, I write down the word using alternative spellings until I see the spelling sequence I think is correct.	Often Sometimes Seldom
25. When trying to remember a phone number, I "hear" the number sequence in my head in the way someone told me the number, or in the way I previously recited the number out loud.	Often Sometimes Seldom
26. I like "hands on" learning better than learning from lecture or textbook.	Often Sometimes Seldom
27. I would rather have written directions than oral directions.	Often Sometimes Seldom
28. When trying to remember how to spell a word, I say the letters or sounds out loud until I think I've got the spelling right.	Often Sometimes Seldom
29. I learn better by doing than observing.	Often Sometimes Seldom
30. As a child, I liked to play with puzzles in my free time.	Often Sometimes Seldom
31. When taking a test, I can "see" the answer in my head as it appeared in my notes or textbook when I studied.	Often Sometimes Seldom
32. I learn best when physical activity is involved.	Often Sometimes Seldom

Submit your answers | Reset Answers

APPENDIX J

SCORING SHEET

Visual

6 _____

10 _____ *

12 _____

24 _____

29 _____ *

Total _____ × 2 = _____
(Score)

Tactile

11 _____

14 _____ *

16 _____ *

22 _____

25 _____

Total _____ × 2 = _____
(Score)

Auditory

1 _____ *

7 _____

9 _____ *

17 _____

20 _____

Total _____ × 2 = _____
(Score)

Kinesthetic

2 _____ *

8 _____

15 _____ *

19 _____

26 _____

Total _____ × 2 = _____
(Score)

Note. An asterisk indicates pairs that will be eliminated from the questionnaire/scoring sheet when using this survey for native speakers of English.

APPENDIX K

RESEARCHER DEVELOPED TEST

Name: ____

Date: ____

Part I – Select the best possible answer for the questions below. For questions 1-10, use a scantron sheet. All remaining answers should be written on the test.

1. A dot after any note increases its value by:

a. 2 beats
b. 1 beat
c. ½ of the note's original value
d. 3 beats

2. Bar lines divide the staff into measures.

a. True
b. False

3. The measure marks off a grouping of beats, each with a fixed number that coincides with the:

a. key signature
b. time/meter signature
c. number of lines and spaces
d. dynamic markings

4. Music always has rhythm:

a. True
b. False

5. Rests indicate:

a. strong and weak pulses
b. rate of speed
c. measured silence
d. unmeasured silence

6. Rhythm refers to the arrangement of

a. long and short sounds.
b. fast and slow tempos.
c. strong and weak pulse.
d. high and low pitches.

7. A unit of length that represents the regular pulsation of the music is called:

a. the meter.
b. the syncopation.
c. the beat.
d. the accent.

8. ________________ denotes fixed time patterns within which musical events occur.

a. Tempo
b. Meter
c. Range
d. Syncopation

9. Which of the following songs exemplifies a $\mathbf{\substack{2 \\ 4}}$ time signature?

a. *The Star-Spangled Banner*
b. *America the Beautiful*
c. *America* ("My Country 'Tis of Thee")
d. *Yankee Doodle*

10. The patriotic song *America the Beautiful* is an example of:

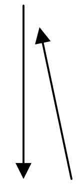
a. $\mathbf{\substack{3 \\ 4}}$ meter

b. $\mathbf{\substack{4 \\ 4}}$ meter

c. $\mathbf{\substack{2 \\ 4}}$ meter

d. $\mathbf{\substack{6 \\ 8}}$ meter

11. Identify the following *conductor's beat* pattern:



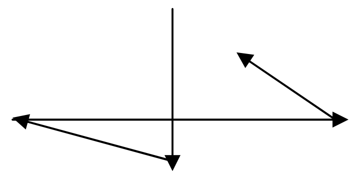
a. **4/4**

b. **2/4**

c. **3/4**

d. **6/8**

12. Identify the following *conductor's beat* pattern:



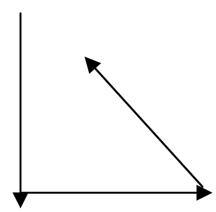
a. **4/4**

b. **2/4**

c. **3/4**

d. **6/8**

13. Identify the following *conductor's beat* pattern:



a. **4/4**

b. **2/4**

c. **3/4**

d. **6/8**

Part II

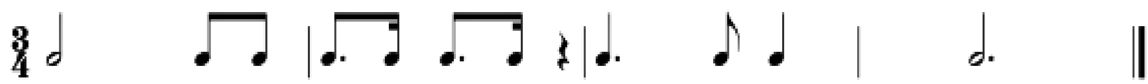
Draw the following notes and include their values in $\frac{\mathbf{4}}{\mathbf{4}}$ meter.

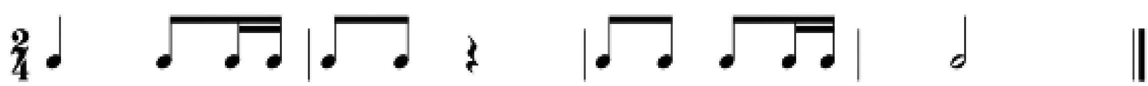
	Symbol	**Value**
1. Quarter Note -	________	________
2. Dotted half note -	________	________
3. Sixteenth note -	________	________
4. Half note -	________	________
5. Whole note -	________	________
6. Eighth note -	________	________
7. Dotted quarter note -	________	________
8. Dotted eighth note -	________	________

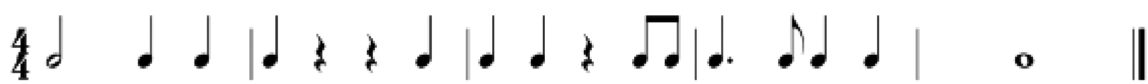
Part III – Reading rhythm

Identify the counting patterns for the rhythms below using **numbers** and **rhythmic syllables**.
Write your answers below each rhythm pattern.

1.


2.


3.


4.


5.


APPENDIX L

DEMOGRAPHICS AND RAW DATA

Participant	Age	Classification	PLSP Score	DVC Score	MAT Pretest	RDRT Pretest	CAMI Assigned	MAT Posttest	RDRT Posttest
1	21	Senior	Auditory	Visual	69%	23%	Auditory	94%	86%
2	20	Junior	Auditory	Visual	19%	10%	Auditory	31%	80%
3	22	Junior	Auditory	Visual	62%	67%	Auditory	50%	60%
4	24	Sophomore	Auditory	Visual	19%	11%	Auditory	19%	45%
5	31	Junior	Auditory	Visual	19%	10%	Auditory	88%	77%
6	22	Senior	Auditory	Auditory	50%	0%	Auditory	63%	51%
7	25	Junior	Auditory	Visual	13%	0%	Auditory	31%	56%
8	21	Senior	Auditory	Visual	31%	16%	Auditory	19%	45%
9	21	Senior	Auditory	Visual	63%	44%	Auditory	50%	93%
10	30	Senior	Auditory	Visual	31%	10%	Auditory	56%	98%
11	21	Senior	Auditory	Auditory	25%	0%	Auditory	69%	71%
12	20	Junior	Auditory	Auditory	31%	15%	Auditory	69%	90%
13	27	Senior	Auditory	Auditory	13%	28%	Auditory	12%	65%
14	23	Junior	Auditory	Visual	31%	19%	All Learning Styles	31%	70%
15	30	Senior	Auditory	Auditory	13%	10%	All Learning Styles	38%	65%
16	25	Senior	Auditory	Visual	19%	14%	All Learning Styles	63%	86%
17	20	Junior	Auditory	Visual	13%	10%	All Learning Styles	25%	70%
18	21	Junior	Auditory	Visual	50%	23%	All Learning Styles	69%	78%
19	31	Senior	Auditory	Auditory	19%	0%	All Learning Styles	69%	78%
20	24	Senior	Auditory	Auditory	19%	29%	All Learning Styles	69%	85%
21	23	Senior	Auditory	Auditory	68%	29%	All Learning Styles	75%	75%
22	19	Sophomore	Auditory	Auditory	19%	10%	All Learning Styles	62%	84%
23	26	Senior	Auditory	Auditory	25%	10%	All Learning Styles	31%	99%
24	20	Junior	Auditory	Auditory	13%	0%	All Learning Styles	38%	91%

Participant	Age	Classification	PLSP Score	DVC Score	MAT Pretest	RDRT Pretest	CAMI Assigned	MAT Posttest	RDRT Posttest
25	23	Junior	Visual	Visual	44%	16%	Visual	44%	85%
26	22	Sophomore	Visual	Visual	13%	10%	Visual	31%	86%
27	20	Junior	Visual	Visual	19%	13%	Visual	94%	83%
28	20	Junior	Visual	Visual	31%	13%	Visual	88%	87%
29	26	Junior	Visual	Visual	44%	10%	Visual	50%	46%
30	23	Senior	Visual	Visual	25%	12%	Visual	31%	64%
31	21	Senior	Visual	Visual	31%	10%	Visual	25%	33%
32	20	Sophomore	Visual	Visual	25%	10%	Visual	25%	57%
33	22	Senior	Visual	Visual	44%	14%	Visual	56%	81%
34	24	Senior	Visual	Visual	19%	47%	Visual	50%	71%
35	26	Sophomore	Visual	Visual	25%	13%	Visual	44%	51%
36	23	Senior	Visual	Visual	44%	10%	Visual	38%	63%
37	18	Sophomore	Visual	Visual	19%	10%	Visual	56%	92%
38	21	Junior	Visual	Visual	25%	0%	All Learning Styles	50%	46%
39	27	Junior	Visual	Visual	50%	18%	All Learning Styles	0%	62%
40	20	Junior	Visual	Visual	0%	0%	All Learning Styles	69%	79%
41	21	Junior	Visual	Tactile/Kinesthetic	19%	0%	All Learning Styles	50%	72%
42	22	Junior	Visual	Visual	25%	34%	All Learning Styles	50%	67%
43	23	Sophomore	Visual	Visual	38%	19%	All Learning Styles	81%	93%
44	20	Junior	Visual	Visual	25%	11%	All Learning Styles	31%	74%
45	20	Junior	Visual	Visual	19%	10%	All Learning Styles	75%	69%
46	27	Senior	Visual	Visual	19%	10%	All Learning Styles	81%	75%
47	23	Senior	Visual	Visual	38%	11%	All Learning Styles	81%	81%
48	22	Junior	Tactile/Kinesthetic	Tactile/Kinesthetic	19%	25%	Tactile/Kinesthetic	94%	84%
49	21	Junior	Tactile/Kinesthetic	Visual	38%	0%	Tactile/Kinesthetic	69%	68%
50	24	Senior	Tactile/Kinesthetic	Auditory	31%	0%	Tactile/Kinesthetic	13%	31%

Participant	Age	Classification	PLSP Score	DVC Score	MAT Pretest	RDRT Pretest	CAMI Assigned	MAT Posttest	RDRT Posttest
51	23	Senior	Tactile/Kinesthetic	Visual	38%	0%	Tactile/Kinesthetic	50%	59%
52	22	Sophomore	Tactile/Kinesthetic	Tactile/Kinesthetic	0%	10%	Tactile/Kinesthetic	56%	70%
53	30	Senior	Tactile/Kinesthetic	Visual	50%	22%	Tactile/Kinesthetic	50%	54%
54	19	Junior	Tactile/Kinesthetic	Tactile/Kinesthetic	69%	11%	Tactile/Kinesthetic	56%	83%
55	22	Senior	Tactile/Kinesthetic	Visual	69%	0%	Tactile/Kinesthetic	75%	64%
56	19	Sophomore	Tactile/Kinesthetic	Visual	0%	20%	Tactile/Kinesthetic	63%	59%
57	19	Sophomore	Tactile/Kinesthetic	Auditory	19%	10%	Tactile/Kinesthetic	31%	57%
58	22	Senior	Tactile/Kinesthetic	Auditory	0%	10%	Tactile/Kinesthetic	69%	52%
59	22	Senior	Tactile/Kinesthetic	Visual	31%	12%	Tactile/Kinesthetic	50%	53%
60	21	Senior	Tactile/Kinesthetic	Tactile/Kinesthetic	25%	11%	Tactile/Kinesthetic	25%	76%
61	23	Senior	Tactile/Kinesthetic	Tactile/Kinesthetic	44%	10%	Tactile/Kinesthetic	25%	48%
62	22	Senior	Tactile/Kinesthetic	Visual	19%	10%	Tactile/Kinesthetic	63%	58%
63	19	Sophomore	Tactile/Kinesthetic	Tactile/Kinesthetic	25%	13%	Tactile/Kinesthetic	50%	79%
64	20	Junior	Tactile/Kinesthetic	Tactile/Kinesthetic	38%	11%	Tactile/Kinesthetic	63%	70%
65	22	Senior	Tactile/Kinesthetic	Auditory	69%	38%	All Learning Styles	63%	75%
66	21	Junior	Tactile/Kinesthetic	Tactile/Kinesthetic	44%	0%	All Learning Styles	81%	88%
67	29	Senior	Tactile/Kinesthetic	Auditory	25%	10%	All Learning Styles	25%	53%
68	24	Senior	Tactile/Kinesthetic	Tactile/Kinesthetic	19%	10%	All Learning Styles	56%	46%
69	23	Senior	Tactile/Kinesthetic	Tactile/Kinesthetic	19%	10%	All Learning Styles	31%	77%
70	20	Junior	Tactile/Kinesthetic	Visual	44%	13%	All Learning Styles	25%	79%
71	21	Senior	Tactile/Kinesthetic	Visual	13%	11%	All Learning Styles	63%	66%
72	20	Sophomore	Tactile/Kinesthetic	Visual	25%	0%	All Learning Styles	69%	58%
73	20	Junior	Tactile/Kinesthetic	Tactile/Kinesthetic	19%	10%	All Learning Styles	69%	60%
74	21	Junior	Tactile/Kinesthetic	Tactile/Kinesthetic	56%	12%	All Learning Styles	25%	61%
75	19	Sophomore	Tactile/Kinesthetic	Auditory	31%	10%	All Learning Styles	31%	76%
76	24	Senior	Tactile/Kinesthetic	Tactile/Kinesthetic	25%	10%	All Learning Styles	13%	33%
77	24	Senior	Tactile/Kinesthetic	Auditory	25%	10%	All Learning Styles	31%	73%
78	23	Senior	Tactile/Kinesthetic	Visual	0%	10%	All Learning Styles	19%	46%

Participant	Age	Classification	PLSP Score	DVC Score	MAT Pretest	RDRT Pretest	CAMI Assigned	MAT Posttest	RDRT Posttest
79	20	Junior	Tactile/Kinesthetic	Tactile/Kinesthetic	25%	13%	All Learning Styles	48%	67%
80	20	Junior	Tactile/Kinesthetic	Tactile/Kinesthetic	0%	10%	All Learning Styles	69%	63%
81	20	Junior	Tactile/Kinesthetic	Tactile/Kinesthetic	25%	23%	All Learning Styles	75%	63%
82	20	Junior	Tactile/Kinesthetic	Tactile/Kinesthetic	63%	18%	All Learning Styles	75%	53%

APPENDIX M

GRAND MEANS TABLE OF MUSIC ACHIEVEMENT TEST (MAT)

Descriptive Statistics

	Treatment Type	Learning Styles	Mean	Std. Deviation	N
Music Achievement Test Pretest	Individualized	Auditory	30.46	20.032	13
		Visual	30.85	17.762	13
		T/K	26.24	12.528	17
		Total	28.91	16.413	43
	All Learning Styles	Auditory	35.45	14.390	11
		Visual	30.80	25.793	10
		T/K	26.11	17.095	18
		Total	29.95	18.940	39
	Total	Auditory	32.75	17.489	24
		Visual	30.83	21.077	23
		T/K	26.17	14.831	35
		Total	29.40	17.557	82
Music Achievement Test Posttest	Individualized	Auditory	50.08	26.450	13
		Visual	49.08	21.727	13
		T/K	53.06	20.437	17
		Total	50.95	22.293	43
	All Learning Styles	Auditory	52.36	19.643	11
		Visual	56.80	26.389	10
		T/K	48.22	22.885	18
		Total	51.59	22.660	39
	Total	Auditory	51.13	23.111	24
		Visual	52.43	23.616	23
		T/K	50.57	21.551	35
		Total	51.26	22.331	82

APPENDIX N

GRAND MEANS TABLE OF RESEARCHER DEVELPED RHYTHM TEST (RDRT)

Descriptive Statistics

	Treatment Type	Learning Styles	Mean	Std. Deviation	N
Researcher Developed Rhythm Pretest	Individualized	Auditory	15.15	17.416	13
		Visual	15.92	13.363	13
		T/K	13.65	11.241	17
		Total	14.79	13.667	43
	All Learning Styles	Auditory	10.64	11.893	11
		Visual	10.70	7.072	10
		T/K	11.67	3.447	18
		Total	11.13	7.392	39
	Total	Auditory	13.08	15.001	24
		Visual	13.65	11.175	23
		T/K	12.63	8.150	35
		Total	13.05	11.219	82
Researcher Developed Rhythm Posttest	Individualized	Auditory	70.54	18.365	13
		Visual	71.85	17.334	13
		T/K	62.65	13.766	17
		Total	67.81	16.509	43
	All Learning Styles	Auditory	80.09	10.084	11
		Visual	71.80	12.444	10
		T/K	63.17	13.785	18
		Total	70.15	14.173	39
	Total	Auditory	74.92	15.615	24
		Visual	71.83	15.075	23
		T/K	62.91	13.574	35
		Total	68.93	15.393	82

VITA

A native of Opelousas, Louisiana, and a 1975 graduate of Opelousas Senior High School at the age of 16, Judy Arnette Guilbeaux-James began her study of the piano at four years of age under the tutelage of her grandmother, the late Berdie B. T. I. Aaron, a graduate of Willy College. Judy’s skills were further developed by Patricia Jackson-Lewis, graduate of Southern University, the late Frank Hanley, Professor of Piano, University of Southwestern Louisiana (University of Louisiana at Lafayette), and Frank E. White, Professor of Piano, Southern University and A & M College. While attending Southern University, Judy was the recipient of the Tourgee DeBose Piano Festival Award (1977).

Judy entered Southern University in 1975 and completed her studies in 1979 with a Bachelor of Music Education degree (Piano Principal). She began her public school music teaching career in 1980 as a Fine Arts Teacher in the Houston Independent School District (HISD). While in Houston, Texas, she was an Instructor of Piano for the Houston Community College, Organist for University Christian Church, and received the Master of Education degree (Administration and Supervision) in 1986 from Texas Southern University. In 1987, she relocated in Arlington, Texas, where she began employment as a Music Specialist, Career Ladder Level II, in the Arlington Independent School District (AISD). After returning to her home state in 1990, employment as a music teacher was held in the following school systems: West Feliciana Parish and East Baton Rouge Parish (1990-1995). At this same period she served as organist for St. Michael’s Episcopal Church-Baton Rouge, Louisiana and Private Piano Teacher for the Southern University DeBose Preparatory Music Program. In the fall of 1995, Judy became a university employee at her Alma Mater, Southern University, in the Department

of Visual and Performing Arts (College of Arts & Humanities), succeeding Professor Helen M. Gist.

Judy's areas of specialization include: Texas Institute for Arts in Education, Internship in Mid-Management, HISD Department of Technology, and AISD Kodály Workshops. Her professional presentations include Kodály Workshops for Professors Myrtle E. David (Southern University) and Professor Helen M. Gist (Southern University and Park Forest Elementary School), and a Music Education Technology Workshop for the 2001 DeBose National Piano Competition Foundation, Incorporated Music Festival at Southern University. In January of 2005, Judy and her Major Professor, Evelyn K. Orman (Louisiana State University), presented a study entitled *The Effect of Background Computer Screen Color on Aural Interval Identification* in Tampa, Florida for the Florida Music Educators Association – "Research Perspective in Music Education" - SDMENC/FMEA Poster Session.

Judy's professional organizations and honors include: Louisiana Music Educators Association, Music Educators National Conference, Phi Delta Kappa Fraternity, Inc., Mu Phi Epsilon Fraternity, Inc., Alpha Kappa Alpha Sorority, Inc., National Honor Society, Outstanding Young Women of America, Distinguished Service Award - Silver Anniversary - DeBose National Piano Competition, Inc., Outstanding Chapter Growth (Southern University MENC Chapter #574), and Cover Photo Lincoln Center Institute Report. Judy will graduate from Louisiana State University in 2009 with a Doctor of Philosophy degree in music education and continue her work at Southern University and A & M College as Assistant Professor of Music Education in the College of Arts & Humanities while serving as the education liaison from the Department of Music for the College of Education.