FACTORS INFLUENCING THE IMPLEMENTATION OF TECHNOLOGY IN THE MUSIC CLASSROOM

By

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ABSTRACT

The purpose of this study was to examine what factors influence the implementation of technology in the music classroom. Thirty-one Kansas Music Teachers (n=31) completed a web-based survey about technology in the music classroom regarding Technology Implementation, Technology Availability, Teacher Technology Self-Efficacy, Teacher Attitudes Towards the Use of Technology, and Technology Professional Development. This study found Availability of Technology and Technology Professional Development were significant in the prediction of Technology Implementation in the music classroom. Although Technology Self-Efficacy and Attitudes Towards Technology in the Classroom were not found to be significant in the prediction of technology implementation, subject responses pertaining to these factors were unexpectedly consistent, with most subjects reporting high levels of Technology Self-Efficacy and highly positive Attitudes Towards Technology in the Classroom.

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CHAPTER ONE

Introduction

> Do not confine your children to your own learning, for they were born in another time.
>
> -Hebrew Proverb

It has been over a half century since the beginning of the computer age, and new developments and technologies are constantly changing how we view and interact with the world. Computers and the internet, which were once tools of convenience, have now become integral parts of everyday life. E-mail and Social Networking Sites have create an entirely new way communicate, the internet has provided seemingly endless resources, and computers have become small, portable accessories. Students of this generation are immersed in the environment of a digital world.

As technology continues to evolve, it is important for education to follow suit. Preparing students for the future requires embracing the digital world in which students have been raised, and adapting it to enhance their education. In doing so, classrooms can become interactive learning environments that individualize instruction to meet more fully every student's specific needs. Media rich learning environments can replace traditional textbooks and lecture, offering a wider variety of ways in which students can absorb information. The integration of the internet and its many tools into the classroom can connect students to the world in ways imposable to

duplicate through traditional instruction. It is essential that the importance of emerging technologies be recognized and that it be adapted and utilized in order to most effectively educate students.

The responsibility to bridge the gap from traditional education to the digital world, and more fully to take advantage of opportunities to enhance student learning, falls to educators. Therefore, it is important to determine what factors influence the implementation of these technologies into the classroom.

Music Education environments are no exception. While the music classroom is often quite different from the traditional classroom setting, those differences do not negate the benefits of utilizing technology. Technology provides many of the same benefits to the music classroom as it does to the traditional classroom, and in many ways more.

The types and sizes of music classes can vary widely. In the course of a single day, a given music teacher may have seven different classes, varying in size from 10 to 100. This creates unique issues and needs for the music educator. It also provides unique opportunities to utilize technology in a variety of ways. Music-specific technologies can create an interactive learning environment that is uniquely tailored to meet individual student's musical needs. Music software now has the ability to conduct playing tests, supplement music theory education, and allow students of all ages to participate in composition and notation activities. Student learning has moved beyond the traditional classroom and the opportunity to enhance their learning can now take place in new and varied environments. However, recognizing these benefits

of technology in music education is quite different from implementing it. Many of the same issues and barriers that preclude traditional classroom environments from implementing technology hold true in the music classrooms. Furthermore, the unique environment of the music classroom creates additional barriers. The primary goal of this study is to attempt to identify how some of the barriers seen in the general education are observed in music education settings.

Examination of the current literature identified four consistently reoccurring barriers found to influence the implementation of technology in the classroom. The questions this study seeks to address were developed directly from this knowledge. First, how does the Availability of Technology effect the implementation of technology in the music classroom? The number of computers in schools has increased dramatically in the past decade, helping to reduce the effect of this barrier in the traditional classroom. However, has this increase also been seen in the music classroom and does technology availability still have an effect on implementation?

Second, how does a teacher's confidence and comfort with technology effect its implementation in the music classroom? Does the lack of confidence and/or comfort affect the frequency and degree to which technology in implemented?

Third, how do teachers' perceptions and attitudes towards the use of technology effect its implementation in the music classroom? Is a teacher more likely to use technology if they deem it important to student learning? Do negative feelings towards technology diminish the likelihood of use?

Finally, how do technology experiences effect the implementation of technology in the music classroom? How does the teachers' personal use of technology and their technology education relate to how technology in implemented? Does professional development technology increase the likelihood of implementation?

CHAPTER TWO

Review of Literature

This chapter will begin with a brief historical perspective on the development of technology and computer-aided instruction (CAI) and the current uses of technology in the music classroom. This review will be followed by a look at the various effects of the use of technology in the classroom and the factors that influence integration of technology. Focus will be given to the following factors: teacher technology self-efficacy, teacher perceptions of technology, and teacher technology professional development.

Development and Use of Technology in Music Education

In an effort to outline the development of computer-aided instruction and the use of computers in the music classroom, Peters (1992) categorized the history of the development of CAI for music. These final categories were divided into five generations of development, each correlating with a significant technological advancement.

The first generation of development is generally seen as beginning in the 1960s. This period is characterized by the use of large computers in research environments. In 1967, researchers at Stanford University began working on a device to analyze an individual's performance through the use of a computer. Their goal was eventually to use this computer to develop more efficient methodology and create the first example of computer-aided instruction in the music classroom (Kuhn & Allvin,

1967). Two years later, Deihl and Radocy (1969) began to develop other avenues for uses of computers in music education. They proposed not only the use of computers as a guided tutorial to visual and aural skills in music theory, but also as a way for individuals to receive feedback from a performance. At approximately the same time, Lincoln (1969) began to discuss future uses of computers in music and music research, including the use of computers for music notation and sequencing, music information organization and playback, and computer-aided instruction. Those ideas have been far surpassed by modern technologies, but the fundamentals of his ideas are seen in many music classrooms today.

The second generation of CAI in music education came with the emergence of the personal computer. With the development and release of the Apple II in 1977, followed by the IBM personal computer in 1981, a revolution began to occur in personal computing (Weyhrich, 2001). Computers were no longer room-sized machines. Instead, computers were reasonably affordable, manageable, desktop machines. Their availability, ease of use, and ease of programming brought these computers to the forefront of academic computing.

The third generation occurred with the development of the MIDI (Musical Instrument Digital Interface) standard in 1983 (Jones, 2003). During this period, the types and variety of software began to expand. Generally, the educational benefits through the first three generations of music CIA were mostly seen through the use of drill-and-practice software.

Peters' fourth generation of music CAI began with the development of multimedia presentation methods that provided a much wider range of educational programs. This generation is defined by the evolution of CAI software beyond simple drill-and-practice, and into the areas of guided instruction, games, and exploratory and creative software. Webster (2002) also credits this time period for the development of programs to support melodic, rhythmic, and harmonic dictation, error detection, and music composition. During this period, more complex software also began to develop, including programs to assist the development of improvisation skills, automated accompaniment, and the first software that could be adapted to serve individual student needs.

Peters' fifth generation, although only just developing when he identified this period, follows the emergence of the internet into mainstream education. Realizing the importance of this technology in the future of music education (Stell, 1999), individuals have began researching and developing to this end. Bowyer (2000), while researching computer based educational music programs, concluded that the evolution of the music CAI is already emerging on the internet and will continue to grow as high-speed internet becomes more readily available. Chuang (2000), recognizing the need, analyzed the current uses and trends and created a set of standardized rules to most efficiently create web-based CAI.

Currently, CAI in the music classroom is utilizing both fourth and fifth generation CAI. Due to the constantly changing technology environments of the music classrooms, trying to determine the current state of use would be futile, with

results becoming obsolete before they could be disseminated. However, it is possible to outline the primary types of music CAI software and how it has been studied.

Following the 20 years' explosion of the development of music CAI software, Williams and Webster (2005) categorized music CAI software into four distinctive categories currently seen in classrooms: Drill-and-Practice, Flexible Practice, Simulation, and Multimedia. Much of the research on the use of CAI in the music classroom utilizes or examines software from one or more of these categories.

Drill-and-Practice software, the most commonly studied category, is categorized as software that has a primary purpose of reinforcing musical concepts already taught in the classroom or by an instructor. Examples of this type include Music Ace, which works on note reading and basic musical concepts, and Adventures in Musicland, which help to introduce music concepts. Studies into this type of CAI include Willett and Netusil's (1989) study on note learning, and Smith's (2002) study on rhythm reading skills.

Flexible Practice software provides an environment of feedback for individual practice. Some software, such as Practica Musica and Vivace, provide guided practice, while programs like SmartMusic simply provide performance feedback. Studies of this type of CAI can be seen as early as Kuhn and Allvin's 1967 study. More recently, Klee (1998) and Glenn (2000) conducted studies on the use of computer assisted accompaniment, finding that while there were no advantages to student outcomes, the software provided viable alternatives to traditional instruction.

Simulation software provides users with a means of notating ideas and then playing them back, whether through traditional notation software such as Finale, or through less traditional software such as Morton Subotnick's Making Music. Deihl and Radocy (1969), Lincoln (1969), and more recently Nelson (2007) have researched the use of notation software in music education. Schachter's (1999) study utilized the research and designed a Piano Instruction Curriculum based around the use of simulation CAI.

The purpose of Multimedia CAI software is to enhance students' learning experiences through the use of a variety of multimedia. Programs such as Composer Quest introduce young students to composers and musical concepts through interactive visual and audio stimulus. Dobbe (1998) studied not only the effect of multimedia music CAI, but also other multimedia software on music learning, determining that learning enhanced through the use of multimedia shows a positive significant outcome on student learning.

Understanding the primary types and the effects of music CAI in the classroom is important, but the use of technology in the music classroom goes beyond simple predefined software programs. The resourcefulness of music teachers has allowed them to incorporate outside technologies into their lessons. However, many of these uses have not been studied and instead can be seen through other music education professional publications. (Pontiff & Keating, 2003)

Effects of Technology in the Classroom

As technology, especially educational technology, continues to develop and evolve, there must be a discussion of the roles and effects of technology in the classroom. Whether it is used as a tool or as a truly integrated part of education, it is important to determine the effects, either positive or negative, that the use of technology has on student learning.

Technology in the classroom can take on many different roles. The ways in which it is utilized varies as much as the types of classroom in which you find it. Some teachers may use it as a presentation tool or a student information delivery system (Frankel, 2002), while others will integrate it into the classroom as a tool to foster student inquiry (Hopkins, 2002). Potential benefits can be assumed with all of these uses, but what are the most efficient uses of technology for student learning? How do these different uses compare when deciding how best to utilize them? What role should the teacher assume in integration?

Orman (1998) conducted a study comparing student achievement of young instrumentalists when taught through traditional methods and through interactive multimedia presentations. She found that students who learned thorough multimedia presentations scored higher on written and performance assessments. She noted student motivation to use the computer as a possible reason for high achievement. Placek (1974), Pembrook (1986), and Hall (2001) also found that the use of technology in a learning environment could assist in student motivation and increasing student interest.

Willett and Netusil (1989) conducted a similar study, comparing music computer drill instruction and traditional learning methods on note learning. The computer drill instruction group scored significantly higher than did their peers. This method is also a student information delivery system, and the use of individual review and practice and the interest in using computers, again showed an increase in student learning.

While some studies show positive effect of using computer-assisted instruction over traditional instruction, other studies have found them to be of similar effectiveness. In an effort to determine effectiveness of computer-assisted instruction on rhythm reading skills, Smith (2002) found that through both traditional learning and CAI, student achievement increased, with no significant difference between the two methods.

Therrien (1997) had similar results when comparing cooperative learning and computer-aided instruction. Results yielded no significant difference in student outcomes, but did find that students' musical experience significantly improved their scores. Green (2003) echoed these finding after comparing traditional and CAI guitar instruction. Green further noted that, as the ability of the computer to adapt to individual student needs increases, its effectiveness in student learning might be anticipated. These findings are also consistent in non-musical areas as well (Dalton & Hannafin, 1988).

Studies have also shown that the use of technology in student learning can also have negative effects. Dekaney (2003) found that, when comparing direct

classroom instruction to computerized instruction on phonetic pronunciation of English, students receiving direct instruction showed more significant improvements than did those who received computerized instruction or a combination of both. While all groups did show improvement, in this instance, traditional learning methods proved to be more efficient, although similar studies dealing with aspects of language acquisition had contradictory results (Boling, Martin, & Martin, 2002).

However, the effects of the use of technology in the classroom cannot always be determined through student achievement. When using technology as a teaching and planning aid, secondary results can be seen in the classroom. In the development of a software programs to assist elementary school non-music teachers in teaching music, it was found that while there was no significant difference in student learning. The only advantage to the software was that it provided the teacher the opportunity for more instructional tasks and individualized instruction (Parrish, 1997).

In a similar effort to provide instructor assistance and a viable alternative to traditional textbook instruction in a music appreciation course, Bodley (2000) developed and tested a visually and aurally media-rich music listening system for use in the classroom. When there were no significant differences in the student outcomes, the system relieved the instructor of some preparation time and increase overall enjoyment of the learning activity.

The use of technology in the classroom can also provide opportunities for students beyond what are normally available, including the ability for students to experience composition and notation at a younger age (Nelson, 2007). CAI has also

shown to be an effective way to assist in early academic development for both general education (Hitchcock & Noonan, 2000), and for students with special needs (Watson, 2004).

The ways in which technology is integrated also can affect student learning. Cohen (2001) questioned the use of CAI due to the need of differentiated instruction of students. She found that the use of CAI has the possibility to be very effective, provided that the methods of use are correctly aligned with students' needs and abilities. Ross and Schulz (1999) came to a similar conclusion, emphasizing possibilities of use, while stressing the responsibility of the teacher as the instructional leader.

Various studies have shown that there is the possibility for both positive and negative side effects to occur when using technology in the classroom. However, when several studies are amassed, a different perspective is presented. In 2003, a study was released compiling the results of 42 studies on the effect of technology use on various student outcomes (Waxman, Lin, & Michko, 2003). With a combined sample of approximately 7,000 students, the results of the studies were standardized and compiled to determine the effects of teaching and learning with technology on students' cognitive, affective, and behavioral outcomes in the classroom. It was determined that, in general, learning with technology has a small, positive, significant effect on student learning when compared to traditional instruction. However, it was also determined that the use of technology in the classroom had a small negative effect on behavioral outcomes.

Factors Contributing to Integration of Technology

Numerous studies have researched the factors that influence the integration of technology into the general classroom. However, consistency in the limiting factors can vary greatly from study to study. Resulting conclusions range from availability of resources and training, to teacher perceptions and beliefs about technology.

In an early study on the factor of integration of technology in the classroom, Hadley and Sheingold (1993) determined that teachers were more likely to use computers in their classrooms when technology was available, when there was technological support, when there was time available to learn and plan for the use of technology, and when there was support from educational leaders. A decade later, similar results were still found. Boone (2005) determined in a survey of urban school teachers that preparation and planning time, access to technology resources, and technology training were still barriers to teacher technology implementation.

Ball (2006), in looking for factors leading to implementation, conducted a case study on an "exemplary technology-using teacher." In this particular case, he found that professional development, technology support, and available time did not effect this teacher's implementation of technology. Instead, administrative support and student engagement and motivation were factors affecting the implementation of technology.

Rogers (2007) found that teachers were not fully taking advantage of technology available to them, demonstrating that technology availability was not a

significant factor. She also found that sufficient technology training was not made available to the teachers, which may have accounted for this lower implementation.

Rashotte (2004) found that technology integration in the classroom does not necessarily relate to the technology proficiency of the teacher. Through teacher interviews and questionnaires of technologically proficient teachers, she found that while technology was used in the classroom, it was only used to the minimum expectations of the curriculum. In this case, factors attributing to the lack of use included personal limitations, job stability, lack of resources, time training, and curriculum issues.

Green (2005) found that there was a positive correlation between a teacher's attitude towards computers and a teacher's technology self-efficacy. She also found that teacher's attitudes towards computers were not a significant predictor of use of technology.

Conversely, Smith (2006) found that teacher integration related to comfort levels of technology use. Teachers who used technology were more likely to continue to increase integration. Technology skill level does not promote integration unless the teacher is comfortable using technology. Teachers with high level of skills need planning/motivation to accomplish technology goals.

Another study determined that, although teachers had the barriers of limited resources and time, not all teachers were affected by these barriers the same way. (Ertmer, Addison, Lane, Ross, & Woods, 1999) Teachers with higher-level visions of technology in the classroom were more likely to integrate technology and overcome

barriers. Classroom organization was critical to teachers who used computers to support the curriculum.

Brickner (1995) categorized these factors into first- and second-order barriers. First-order barriers are external factors influencing the ability to integrate technology in the classroom. Those factors include, but are not limited to, availability of technology, training, and curriculum. A change in first-order barriers requires no teacher self-evaluation, only just a change in current techniques and practices. Second-order barriers are internal factors, such as beliefs about the use of technology and teacher self-efficacy with technology. A change in second-order barriers requires a reevaluation of personal beliefs and perceptions about technology and its roles in education.

Self-Efficacy and Attitudes Toward Technology in the Classroom

Teacher technology self-efficacy is a research term that has come to describe a teacher's comfort level and confidence with the use of technology. Over the last decade, as factors such as the availability of technology have become lesser issues, more research has been conducted to determine the relationship between teacher technology self-efficacy and the implementation of technology in the classroom.

Throughout the research, a common conclusion is reached: Teacher's technology self-efficacy and their comfort using technology directly influences their likelihood to integrate technology into their classroom. (Liaw, Huang, Chen, 2007; Littrell, Zagumny, M., & Zagumny, L., 2005; Ross, Ertmer, Johnson, 2001)

Green (2005), in an attempt to determine what impacts teacher self-efficacy and attitudes towards computers, determined that the higher a teacher's computer-self efficacy and level of confidence, the less anxious the teacher was about the use of the computers in the classroom. Additionally, Zhao and Frank (2003), while studying the factors affecting technology use in schools, determined a relationship between technology self-efficacy and the likelihood of implementing technology perceived to be complex or difficult to use.

A teacher's technology self-efficacy is primarily influenced by his/her experiences. Many of these influential experiences take place in the collegiate and student-teaching environments, but extend into other aspects of life (Bansavich, 2005). Anderson and Maninger (2007) found that in pre-service teachers, technology self-efficacy, as well as other factors, can show significant increases after completing a college-level technology training course.

During a study investigating a teacher technology training program, Johnson (2006) concluded that personal computer use contributed significantly to computer self-efficacy. Furthermore, he noted a relationship between the factors of use and non-use of computers in the classroom and teacher's self-efficacy. In researching what aspects of professional development affect teacher technology self-efficacy, Watson (2006) found that while technology workshops increase self-efficacy, the greatest increase comes when the workshops have a consistent follow-up. He also noted that external factors have long-term effects on technology self-efficacy.

Developing technology self-efficacy can also be achieved through consistent, guided use. Kennewell and Morgan (2006) found that giving individuals the opportunity to "play" with and explore the computer created a positive effect on the individual's technology self-efficacy.

In a study of a long term professional development program designed to increase technology skills, computer efficacy, and beliefs about technology use, Brinkerhoff (2006) found that while technology self-efficacy increased, there was little to no change in the attitudes towards the use of technology in the classroom. This study shows that while technology self-efficacy and attitudes towards the use of technology both play a role in the overall likelihood of integration, they are generally independent factors.

Another factor that affects the extent to which technology is implemented into the classroom is teacher attitudes towards the integration of technology. While many teachers have the technological skills and ability to integrate, their views about the role of technology affect how it is utilized in the classroom (McConnell, 2006). Some teachers view technology as a presentation tool or information delivery system, while others use technology to enhance higher-order student learning (Hardin, 2006).

The perceptions of teachers regarding the effectiveness of integration have a bearing on the likelihood of teacher's use of technology in the classroom. Understanding the benefits of technology and its relevance to the classroom is a catalyst to changing perceptions (Ertmer, Addison, Lane, Ross, & Woods, 1999).

When teachers recognize the value of student use of computers, integration is more likely to occur (Lee, 2006).

Hutchison (2006) found that teachers introduce new technology into the classroom as they recognize its usefulness in accomplishing student and curricular goals. As the students in this study became more successful with the technology, and the teachers became more comfortable with implementing it, a positive spiral of computer integration occurred in the classroom. She also noted that through this process, teachers often reassessed their roles as teachers, as well as those of the students as learners. Supporting this conclusion, Liaw, Huang, and Chen (2007) determined that the intention to use technology in the classroom is influenced by a combination of the teacher's perception of its usefulness and their technology self-efficacy.

The most common tool used to change teacher perceptions is various types of professional development. Kendall (2005) found that teacher's attitudes towards technology were impacted by professional development activities. Lauro (2005) found that through intensive staff development in technology, teacher perception of technology in education can be altered. Leh (2000), Moulton (2005), and Meltzer (2006) also determined that perceptions of technology in education could be altered through various means of professional development. Non-traditional professional development can also be effective. Klamik (2005) determined that through the use of non-traditional professional development, such as a computer software program, many of the same goals of altering teacher perceptions could be accomplished.

Technology Professional Development

While the true benefits of technology integration still leave a great deal up for debate, the conclusion that can be drawn from the studies above is that benefits do exist. However, to what extent the benefits are able to be utilized lies heavily on the teacher's ability to integrate. While many factors do affect the likelihood of integration, the one overwhelming manipulative factor is that of professional development in technology. With such great emphasis placed on having the skills necessary and the knowledge to integrate, professional development is essential for successful technology integration.

Professional education provides three things that increase the likelihood of teacher integration. First, through continued technology education, teachers become more comfortable and confident with technology, which in turn increases their likelihood of integration (Ceppi-Bussmann, 2006; Johnson, 2006). Second, through continued exposure to technology in an educational environment, more positive perceptions of technology in the classroom are made (Klamik, 2005; Lauro, 2005; Moulton, 2005). Finally, with continued use of technology, a wider range of skills are developed, a greater understanding of how it works is created, and true integration is more likely to take place (Gaither, 2005; Stubbs, 2007; Vitale, 2005).

Formal professional development in technology begins in institutions of higher education. It is in these pre-service settings that development of technology integration skills is first fostered. Bansavich (2005) found that the teachers' self-efficacy towards the use of technology in the classroom is influenced by their pre-

service education. Additionally, he found that student teaching experiences were significant in the individuals' readiness to integrate technology. Goedde (2006) also noted the importance of previous experiences with technology, determining that it is possible to predict student technology competency based on those experiences. In Clausen's (2005) study of first year teachers, he also noted the importance that preservice opportunities played in the likelihood of technology integration by first year teachers.

Several studies have been conducted to determine the most effective preservice technology instruction. Loverro (2006) found a need for more meaningful connections between lecture and technology labs, and a greater awareness of the national education technology standards for teachers. This conclusion was echoed by Sung (2006), who posited that it was the responsibility of the methods teachers to provide more significant transfers between the lecture and technology lab settings. Similarly, Keengwe (2006) and Kesten (2006) found that more specific technology training should be conducted and higher technological expectations should be placed in all courses.

Similar studies have also been conducted to determine the most effective strategies to further develop teachers in successful integration. However, resulting conclusions vary greatly. Reel (2006), in a survey of middle school teachers, concluded that teachers were able to use technology for basic tasks, but were unable to transfer this into the classroom, acknowledging the need to implement meaningful professional development. However, the most successful form in which that

development occurs is debatable. Scot (2005) found that, in a study of various types of professional development, coaching and follow-up are the most important. Boone (2005), however, indicated that coaching had no significant impact on a teacher's level of implementation. Instead, she found that it was time, access to technology, and additional training that impacted the likelihood of implementation.

More personalized development plans have also been proposed as being of further assistance. Scalisi (2005), in a study on the impact of staff development, determined that novice teachers were overwhelmed by the new material, and that more one-on-one communication should occur. She also noted that adaptation during the development experience should occur to make it more meaningful to individuals. However, the lesser influence in the development design might also be important. Weiss (2007) found that the greater the role that the teacher played in their technology professional development plans, the less satisfied they were with their experience, and those with no input were more likely to use the skills and knowledge they gained. Weiss's conclusion was that, while it is important for the teachers to have input on their need, it falls to the instructor to design the more successful professional development experiences.

One of the most comprehensive studies on teacher technology professional development was release by the Apple Computer Company in 2005 (Apple Computer, 2005). This ten year longitudinal study of the stages of teacher implementation in the classroom concluded that successful staff development consists of time for reflection, specific plans for change, and immediate and ongoing follow-

up support. They also concluded that the rate at which implementation is adapted could be increased through the use of mentors.

Summary of Research Findings

Since the 1960s, technology has become an ever-increasing part of music education and research. Many of the developments in music education technology have coincided with major developments in general technology, including the introduction of personal computers, the standardization of MIDI, and the simplification of software programming.

As discussed above, CAI software in the music classroom is divided into four distinct categories: Drill-and-Practice, Flexible Practice, Simulation, and Multimedia. Studies have been conducted on each of these types of software, and while not all studies have yielded positive effects from the use of the various types of software, no studies have demonstrated negative effects from its use.

Several studies were conducted to determine the effects of using technology in the classroom, with varied results. Studies that showed a positive effect of using technology over traditional instruction displayed higher student performance scores and motivation. Other studies showed no difference and negative effects of using technology; however, in general, there was an overall positive effect its use.

There are also immeasurable secondary effects to using technology in the classroom, including allowing more time for individualized instruction and providing varied learning opportunities for a wider age range.

The studies of factors influencing the integration of technology into the classroom are divided into two types: first-order barriers, which include external factors that can be changed through procedural teaching changes, and second-order barriers, which include teacher-centric beliefs and attitudes towards technology. The primary difference between first- and second-order barriers is that for a change to occur in a second-order barrier, the teacher must reevaluate their beliefs and attitudes towards the use of technology in the classroom, while first-order barriers can be overcome through training and planning. The primary first-order barriers include funding, available resources, training, and time. The primary second-order barriers are *Teacher Technology Self-Efficacy, Perceptions of Technology in the Classroom, and Technology Professional Development, which are the focuses of this study*.

An increased technology self-efficacy and teachers' comfort in using technology directly reflects in the likelihood of use of technology in the classroom. The higher the teacher's self-efficacy and comfort with technology, the higher the likelihood of technology implementation. Technology self-efficacy is developed through previous experiences.

The teacher's perception about the purpose of technology in the classroom has a direct effect of the likelihood of implementation. For the teacher to effectively integrate technology, he or she must believe that technology is an effective tool and is important to student success. The way the teacher perceives technology is also reflected in the ways and to what extent it is used in the classroom.

Professional development is the most influential factor of technology integration. It provides the teacher with three areas of growth: increased comfort and confidence with technology, more positive perceptions about the use of technology in the classroom, and a larger arsenal of technology skills to use.

Technology professional development is primarily seen in two arenas: higher education and in-service professional development. At the higher education level, more focus needs to be placed on meaningful transfer of skills from technology classes to other areas of academia. For in-service professional development, the most effective means of development includes personalized, teacher-focused instruction. The teachers should have time for reflection, and consistent follow-up from the professional development providers should occur.

Music classrooms are a unique environment with an extreme of variables and needs. While there are several studies investigating the factors that determine the implementation of technology in the general classroom, there is a void of studies relating specifically to the implementation of technology in the music classroom. Many transfers may be made from the general classroom to the music classroom, however, with these unique environments, it is important to determine how the uniqueness reveals itself.

Purpose

The purpose of this study was to examine what factors influence the implementation of technology in the music classroom. The research questions addressed in this study were:

1. How does the availability of technology influence the use of technology in the music classroom?
2. How does teacher technology self-efficacy influence the use of technology in the music classroom?
3. How do teacher perceptions and attitudes towards technology influence the use of technology in the music classroom?
4. How does technology professional development influence technology use in the music classroom?

Null Hypotheses

For each research question, a general and a music-specific hypothesis was developed. The resulting eight hypotheses are as follows:

1. Availability of technology (Factor 3) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2).
2. Availability of music technology (Factor 4) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2).
3. Teacher technology self-efficacy (Factor 5) does not relate to the degree of implementation of technology in the music classroom

(Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2).

4. Teacher music technology self-efficacy (Factor 6) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2).
5. Teacher perceptions and attitudes towards technology (Factor 7) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2).
6. Teacher perceptions and attitudes towards music technology (Factor 8) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2).
7. Technology professional development (Factor 9) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2).
8. Music technology professional development (Factor 10) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2).

CHAPTER THREE

Method

The purpose of this study was to determine what factors influence the implementation of technology in the music classroom. This was determined through the use of a cross-sectional survey of Midwestern music teachers with the purpose of determining how technology availability, technology self-efficacy, perception of technology, and technology professional development influence the implementation of technology in the music classroom. The results were analyzed to determine the effects of various factors on the use of technology in the music classroom.

Pilot Study

Prior to the formal survey, the author conducted a pilot study to determine the efficiency and effectiveness of the survey design, and to refine data collection procedures, survey instructions, and the survey's design. The pilot study incorporated the survey and instructions in the same manor that will be seen in formal survey. The subjects of the pilot study (N=9) represented approximately 4.5 percent of the formal survey subjects. Subjects were drawn from a graduate level music research class at a large Midwestern University. Data collected from the survey underwent the same analysis that the data from the formal survey underwent. The purpose of the pilot study was to clarify any anomalies in the instructions or survey language.

Subjects were asked to fill out the test instrument and notate any irregularities. Results of the instrument data were analyzed according to the formal study. The

irregularities of the survey were found to be a grammatical error and a need for clarification of how to answer a "select multiple" question. The pilot study also served as the first half of the test for reliability. Results of reliability are addressed later in this chapter.

Participants

Subjects for this study were a stratified-random sampling of 180 Kansas music teachers who were currently teaching at Kansas State High School Athletic Association (KSHSAA) participating schools districts. Subjects were solicited through KSHSAA affiliation. Subjects varied in age, experience, and teaching level.

To obtain a stratified geographical sample, school districts were divided into six regions (districts) as defined by the Kansas Music Educators Association (KMEA), with 30 participants in each region. Each region was further divided to obtain a stratification of grade-level and classes taught. Within each region there were ten elementary general music teachers, four middle school vocal music teachers, four middle school instrumental music teachers, six high school vocal music teachers, and six high school instrumental music teachers.

A stratified-random sampling of 180 participants was obtained through a three-step selection process. First, school districts within each region were alphabetized, the total number of schools at each grade level were summed, and each school was assigned a number within each category. Next, a random number generator was used to place the total number of schools within each region and category into a random sequence. Finally, beginning at the top of the generated list,

music educators assigned to the buildings and categories were selected as a participant and assigned an ID number. If for any reason that candidate was considered invalid, the ID number was reassigned to the next available school on the randomized list.

Candidates were primarily invalidated for a two of reasons. First, due to the way in that candidates were selected, there were several instances where an educator was selected multiple times. This primarily occurred in small school districts where one individual taught multiple grade levels, multiple subjects, or both. These instances included teachers who taught K-12 vocal music and teachers who were their district's only upper-level music teacher. This invalidation occurred seven times. The second type of invalidation occurred due to inability of contact. There were 18 occurrences of email being returned for either invalid email addresses or server complication. Before becoming invalidated, an attempt was made to determine error and resend the email, of which two were successful.

Test Instrument

The test instrument for this survey was a modification of the *Technology and Professional Development Survey of Louisiana High School Teachers*. The original survey was developed, based on the author's literature research, to address constructs that impact technology integration, success of professional development, teacher's ability/willingness to change classroom practice, and student achievement. The original survey was developed from multiple sources and original author questions (Harris, 2003).

Modification of the original survey consisted of omission, addition, and modification of questions in order to meet the current needs (Appendix B). Questions omitted were not relevant to the current study due to the specific nature of the original questions. Added questions were created in the same design as the original question, with emphasis placed on technology in the music classroom. Modified questions were only changed to specify the music classroom.

Every individual has unique experiences with technology, and thus unique definitions of technology. An attempt to more strictly define *technology* may limit an individuals interpretation, effecting survey responses. To avoid this possible limitation, the terms *Technology* and *Music Technology*, although biased towards computers, were left ambiguous and open to individual interpretation.

The current instrument (Appendix A) is a 42-question survey consisting of rubrics, scales, checklists, and open-ended questions, divided into six sections: Demographics, Technology Issues, Teacher Attitudes and Confidence, Degree of Implementation of Technology in the Classroom, Technology Education, and Open Ended Questions. The areas that are measured by this survey are:

1. Degree of General Technology Implementation
2. Degree of Music Technology Implementation
3. General Technology Availability
4. Music Technology Availability
5. Teacher General Technology Self-Efficacy
6. Teacher Music Technology Self-Efficacy

7. Teacher Attitudes Towards General Technology in the Classroom
8. Teacher Attitudes Towards Music Technology in the Classroom
9. Teacher General Technology Education/ Professional Development
10. Teacher Music Technology Education/ Professional Development

Validity and Reliability

Items on the current instrument were drawn directly from *Technology and Professional Development Survey of Louisiana High School Teachers*. Items were either left in their original form or were modified to fit the needs of the current research. All modified and created items used similar wording, and response options were identical. Due to the similarities of the surveys and the goal of the data collection, validity of the current test instrument is assumed to be comparable to that of the original test instrument. The content validity of the original instrument was established by requesting an instrument analysis from a panel of four technology experts, qualified individuals who worked in the field of educational technology. The experts were asked to consider the content of the instrument and the appropriateness of each item for measuring the indicated factor. Revisions of the original instrument were made based on responses of these individuals.

A reliability coefficient was established using a test-retest method. Subjects (n=9) of the pilot study were given the test instrument at the beginning of a class period, and then again later that same day. Collected data were coded and analyzed. Answers to questions using Likert scales were considered acceptable if they were within one level of measurement, all others required identical answers. The overall

reliability coefficient was determined to be 0.95. Each individual factor was analyzed for instability (Table 1).

Table 1.

Reliability of Pilot Test Instrument by Question Area

	Questions by Number	Reliability
1	31, 32, 34	0.89
2	33, 35	0.94
3	7a, 9a, 11a, 13a, 15a, 17a, 18a	0.92
4	8a, 10a, 12a, 14a, 16a, 19a	0.89
5	24, 26, 28, 30	1.00
6	25, 27, 29	0.96
7	7b, 9b, 11b, 13b, 15b, 17b, 18b, 20, 22	0.98
8	8b, 10b, 12b, 14b, 16b, 19b, 21, 23	0.93
9	36, 38, 39	0.96
10	37	1.00
Bio	1, 2, 3, 4, 5, 6	0.98
Total		**0.95**

Procedure

Participants were selected through the previously discussed process. Participants were first contacted through their school e-mail address. The first email (Appendix G) contained information regarding the purpose of the study, the rights of the participants, and an individualized link to the test instrument. Each individualized link contained the unique ID number of the participant, enabling the ability to track survey submission. Follow-up emails were sent out on day 8 and day 12 of the testing period. The follow-up emails were a duplicate of the original email, with the addition of an introduction paragraph (Appendix H).

By clicking on the provided link, participants agreed to the information provided in the email, and entered the survey. Directions were provided for each section of the survey as it progressed. After submission of the survey, subjects were provided a confirmation screen, where they were thanked for completion and provided contact information for the researcher. Data were stored remotely and collected at the completion of the data collection period.

CHAPTER FOUR

Results

Description of Data

During the course of the data collection period, 31 of the possible 180 responses were received, for a total response rate of 17.22% (n=31). These responses represented individuals from all six KMEA defined geographical regions of Kansas, as well as all grade levels and subject areas. Participant response rates varied by region from 6.67% in region 5 (n=2) to 25% in region 3 (n=9), with a mean of 5.17 responses per region. Participant response rates by level and subject varied from 8.33% (n=3) of High School Instrumental Teachers to 25% (n=6) of Middle Level Instrumental Teachers, with a mean of response of 18.05% . When comparing general, vocal, and instrumental teachers, general music teachers had a response rate of 16.67% (n=10), vocal teachers had a response rate of 20% (n=12), and instrumental teachers had a response rate of 15% (n=9). When examining response rate by grade level, middle-level teachers had the highest overall response rate with 22.92% (n=11), followed by elementary teachers with 16.67% (n=10) and high school teachers at 13.89% (n=10), an average of 17.83%. Table 2 provides a breakdown.

Table 2.

Response Rate of Participants by Pre-selected Region and Sub-Category

Region	Elementary	Middle School		High School		Region %
		Vocal	Inst.	Vocal	Inst.	
1	00.00(0)	50.00(2)	50.00(2)	33.33(2)	00.00(0)	20.00(6)
2	30.00(3)	25.00(1)	25.00(1)	00.00(0)	00.00(0)	16.67(5)
3	10.00(1)	25.00(1)	75.00(3)	33.33(2)	33.33(2)	25.00(9)
4	30.00(3)	00.00(0)	00.00(0)	33.33(2)	17.33(1)	20.00(6)
5	20.00(2)	00.00(0)	00.00(0)	00.00(0)	00.00(0)	6.67(2)
6	10.00(1)	25.00(1)	00.00(0)	17.33(1)	00.00(0)	10.00(3)
%	16.67(10)	20.83(5)	25.00(6)	19.44(7)	8.33(3)	17.22(31)
		22.92(11)		13.89(10)		

Note: Percentages are based on total possible responses for each category and region.

Due to educators teaching at multiple grade levels, the majority of teachers were not limited to the sub-categories to which they were assigned. Within all but one region (Region 5), subjects reported teaching at multiple grade levels. In Region 1, all but one subject (n=5) reported teaching high school, while only one participant was pre-selected as a high school teacher. In Region 2, all subjects (n=5) reported teaching elementary, while only three were pre-selected in that category. Of the 6 subjects from Region 4, 4 reported teaching at the middle level, however none had been selected as a representative for that level. All 3 subjects from Region 6 reported

teaching at both the elementary and middle levels, and 2 also taught at the high school level, however, each subject represented a different group. In total, of the 31 subjects submitting responses, 67.74% (n=21) reported teaching at the elementary level, 64.52% (n=20) reported teaching at the middle level, and 61.30% (n=19) reported teaching at the high school level (See Table 3).

Table 3.

Breakdown by Percentage of Grade Levels Taught as Reported by Participants

Region	Elementary	Middle School	High School	Total
1	50.00(3)	66.67(4)	83.33(5)	6
2	100.00(5)	80.00(4)	60.00(3)	5
3	33.33(3)	66.67(6)	66.67(6)	9
4	83.33(5)	66.67(4)	50.00(3)	6
5	100.00(2)	0.00(0)	0.00(0)	2
6	100.00(3)	100.00(3)	66.67(2)	3
	67.74(21)	64.52(20)	61.30(19)	31

With the goal of collecting a random stratified sample of Kansas music teachers, 180 participants were randomly selected to represent geographical regions, grade levels, and academic subjects. Participant responses were received from each region and category. On analysis of responses, many teachers taught multiple grade

levels, providing an almost equal (SD=1) representation of grade levels. Although an ideal sampling was not achieved, all geographical regions and grade levels were represented.

Analysis of biographical data revealed that, of the participants that responded, 29.03% (n=9) were male and 70.97% (n=22) were female. Age of the participants were as follows: 45.16% (n=14) of the subjects were 40 years of age or younger, while 45.16% (n=14) of the subjects were 41 years of age or older. Teaching experienced ranged from 1 year to over 30 years, with 38.71% (n=12) having taught from 1 to 10 years, 35.48% (n=11) having taught for 11 to 20 years, and 25.84% (n=8) having taught for 21 or more years (See Table 4).

Table 4.

Participant Gender, Age, and Experience

Gender	N	%	Age	N	%	Experience	N	%
Male	9	29.03	20-30	9	29.03	0-5	8	25.81
Female	22	70.97	31-40	5	16.13	5-10	4	12.90
NR	0	0.00	41-50	9	29.03	11-20	11	35.48
			50 +	5	16.13	21-30	7	22.58
			NR	3	9.70	30 +	1	3.26
						NR	0	0.00

Data Reduction

In order to reduce and refine the independent variables for this study, data reduction was conducted through combining variables and either finding the mean or the summation of responses. Also, some questions were removed from the analysis of data due to inconsistencies with those data.

Reduction of the data of Factor 1, Degree of General Technology Implementation, and Factor 2, Degree of Music Technology Implementation, consisted of obtaining the product of the two variables within each factor. Reduction of data of Factor 3, General Technology Availability, and Factor 4, Music Technology Availability, was achieved through the summation of the "yes" responses to the survey items relating to each factor. Factor 9, Teacher Technology Education, and Factor 10, Teacher Music Technology Education, did not undergo any data reduction because they each consisted of only one question.

Reduction of the data of Factor 5, Teacher General Technology Self-Efficacy, Factor 6, Teacher Music Technology Self-Efficacy, Factor 7, Teacher Attitudes Towards Technology in the Classroom, and Factor 8, Teacher Attitudes Towards Music Technology in the Classroom, was achieved through factor analysis of the corresponding survey items. Items that did not belong to any given components were removed and the mean of the responses within each factor was then used as the independent variable for the given factor.

Factor Analysis

The purpose of factor analysis is to "identify the minimal number of "factors," or dimensions, that are measured by a test" (Johnson & Christensen, 2000). Through the process of factor analysis we are provided evidence as to how questions should be categorized.

A factor analysis was conducted on the 24 survey items associated with Factors 5, 6, 7, and 8. The analysis determined that there were five components with eigenvalues higher than one. (Table 5) Due to the extreme variance between Components 1 and 2, and the substantially smaller variance between Components 2 and 3, It was determined that two factors emerged with 56.03% of the total variance accounted for.

Table 5.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Comp.	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.388	43.285	43.285	10.388	43.285	43.285
2	3.059	12.746	56.030	3.059	12.746	56.030
3	2.498	10.408	66.438	2.498	10.408	66.438
4	1.739	7.245	73.684	1.739	7.245	73.684
5	1.214	5.058	78.742	1.214	5.058	78.742

Extraction Method: Principal Component Analysis.

The factor analysis was performed again with the limitation of two components and the results were analyzed for question correlation. Items that correlated with a component with a factor greater than 0.5 were grouped accordingly (Appendix C). Items correlated in Component 1 were divided into general questions (Factor 5) and music specific questions (Factor 6). The same process was conducted on Component 2 to attain items for Factor 7 and Factor 8.

Based on the Rotated Component Matrix, question 9b, 10b, and 21 were removed due to lack of correlation with either component. Question 28, although correlated with Component 1, was removed because the question being asked varied drastically from the other questions in Component 1. Table 6 provides post-data analysis factor loading of the test instrument. Appendix D summarizes all post data collection survey item modifications.

Table 6.

Factor Loadings of the Survey Instrument Post Data Reduction

Item	Factor 1 – Degree of General Technology Implementation
32	Please select the statement that best describes the frequency of technology use in your classroom.
34	Please select the statement that best describes the level of technology use in your classroom.

Item	Factor 2 – Degree of Music Technology Implementation
33	Please select the statement that best describes the frequency of technology use in your classroom for the purpose of music education.
35	Please select the statement that best describes the level of technology use in your classroom for the purpose of music education.

Item	Factor 3 - General Technology Availability
7a	Computers and other technology for my classroom is sufficiently available.
9a	I have a computer available for use at school.
11a	I have a computer available for instructional use in my classroom.
13a	I have student computers available for instructional use in my classroom.
15a	I have student computers available for instructional use in my school.
17a	I have a computer at home.

Item	Factor 4 – Music Technology Availability
8a	Computers and other technology for the purpose of music education is sufficiently available.
10a	I have a computer with appropriate music software and hardware available for use at school.
12a	I have a computer with appropriate music software and hardware available for instructional use in my classroom.
14a	I have student computers with appropriate music software and hardware available for instructional use in my classroom.
16a	I have student computers with appropriate music software and hardware available for instructional use in my school.
19a	I have a computer at home with music education related software that I use for school related purposes.

Item	Factor 5 – Teacher General Technology Self-Efficacy
20	Using technology enhances student learning.
22	I have many uses for technology in my classroom.
24	I feel confident in my ability to use technology.
26	I expect my technology activities to be successful.
30	My instructional leader talks/communicates with me frequently about integration of technology in my classroom.

Item	Factor 6 – Teacher Music Technology Self-Efficacy
23	I have many uses for music technology in my classroom.
25	I feel confident in my ability to use music technology.
27	I put a lot of effort into implementing technology activities/projects.
29	My instructional leader encourages me to integrate technology into my curriculum.

Item	Factor 7 – Teacher Attitudes Towards Technology in the Classroom
7b	Computers and other technology for my classroom is sufficiently available.
11b	I have a computer available for instructional use in my classroom.
13b	I have student computers available for instructional use in my classroom.
15b	I have student computers available for instructional use in my school.
17b	I have a computer at home.
18b	I use a computer at home for school related purposes.

Item	Factor 8 – Teacher Attitudes Towards Music Technology in the Classroom
8b	Computers and other technology for the purpose of music education is sufficiently available.
12b	I have a computer with appropriate music software and hardware available for instructional use in my classroom.
14b	I have student computers with appropriate music software and hardware available for instructional use in my classroom.

16b	I have student computers with appropriate music software and hardware available for instructional use in my school.
19b	I have a computer at home with music education related software that I use for school related purposes.

Item	Factor 9 –Teacher Technology Education
36	How many hours of technology professional development have you received?

Item	Factor 10 - Teacher Music Technology Education
37	How many hours of music technology focused professional development have you received?

Instrument Reliability

After the completion of data reduction, reliability of the test instrument was determined by testing the internal consistency of the test instrument. Using SPSS, reliability of the 21 Likert-scaled items of the test instrument was attained for each applicable factor, research question, and the test instrument in general.

Factor 1, with an alpha coefficient of 0.53, and Factor 2, with an alpha coefficient of 0.59, had a combined alpha coefficient of 0.82 for the dependant variables. Factor 5, alpha coefficient of 0.69, and Factor 6, alpha coefficient of 0.58,

had a combined alpha coefficient of 0.83 for research question two, Teacher Technology Self-Efficacy. Factor 7, alpha coefficient of 0.81, and Factor 8, alpha coefficient of 0.87, had a combined alpha coefficient of 0.90 for research question three, Teacher Attitudes Towards Technology. Total instrument reliability had an alpha coefficient of 0.89 and a standardized item alpha of 0.91, indicating a high level of reliability of the test instrument. (Appendix E)

Data Analysis

The analysis of data consisted of four multiple-regression analysis models comparing general and music technology implementation with general and music technology factors.

Dependant Variables

The first set of dependant variables for this study consisted of the two variables in Factor 1, the *Degree of General Technology Implementation*. The frequency, mean, and standard deviation of questions 32 and 34 can be seen in Table 7.

Table 7.

Mean Item Responses to Degree of General Technology Implementation (Factor 1)

Item		n	M	SD
32	Please select the statement that best describes the frequency of technology use in your classroom	30	3.17	1.34
34	Please select the statement that best describes the level of technology use in your classroom	30	3.20	0.85

The mean of the frequency of use of technology in the classroom was 3.17, indicating that the average use was between several times a month and several times a week. 35.4% of subjects indicated that they used technology in their classroom a minimum of several times a week, while 51.6% indicated they use technology in the classroom no more than several times a month. 9.7% indicated that they never used technology in their classroom. Table 8 shows the subject responses to the frequency of use.

Table 8.

Breakdown of Frequency of Use of Technology in the Classroom

Frequency of Use Scale	n	%
1-Never	3	9.7
2-Several Times a Semester	7	22.6
3-Several Times a Month	9	29.0
4-Several Times a Week	5	16.1
5-Daily	5	16.1
6-Several Times a Day	1	3.2
No Response	1	3.2

The mean response to the level of use of technology in the classroom was 3.20, which indicated an average level of use between common daily activities, such as email and lesson preparation, and integration of technology into the delivery of lessons. Of the participating subjects, 32.3% indicated that they incorporate technology into their lesson delivery and classroom activities. Of those subjects, 6.5% felt that technology was an integral component for all aspects of teaching and learning. Technology was used in the classroom by 45.2% of subjects in their classroom for activities such as email, common software applications, and lesson preparation, while 19.4% of subjects indicated the use of technology at home or school for basic computer use. (See Table 9.)

Table 9.

Breakdown of Level of Technology Use Scale

Level of Technology Use Scale	n	%
1 - I do not use technology, including the computer, for personal or professional use.	0	0.0
2 - I use technology in my home or classroom, including the computer for e-mail and/or menu driven programs and /or to search the web for teaching preparation.	6	19.4
3 - I use technology in my classroom including computer use for e-mail, for common software applications, and to search the web for teaching preparation.	14	45.2
4 - I integrate technology in the delivery of my lessons, depend on e-mail exchange, and rely on many software applications. I also expect my students to use internet and/or common software applications as class requirements.	8	25.8
5 - I consider technology to be an integral component for all aspects of teaching and learning. My students are immersed in technology in the classes I teach.	2	6.5
No Response	1	3.2

The second set of dependant variables for this study consisted of the two variables in Factor 2, the *Degree of Music Technology Implementation*. The frequency, mean, and standard deviation of questions 33 and 35 can be seen in Table 10.

Table 10.

Mean Item Responses to Degree of Music Technology Implementation (Factor 2)

Item		n	M	SD
33	Please select the statement that best describes the frequency of technology use in your classroom for the purpose of music education	30	3.03	1.33
35	Please select the statement that best describes the level of technology use in your classroom for the purpose of music education	30	2.47	0.90

The mean of the frequency of use of music technology in the classroom was 3.03, indicating that the average use was between several times a month and several times a week. 32.2% of subjects indicated that they used technology in their classroom a minimum of several times a week, while 54.8% indicated they use music technology in the classroom no more than several times a month. 9.7% indicated that

they never used music technology in their classroom. Table 11 shows the subject responses to the frequency of use.

Table 11.

Breakdown of Frequency of Use of Music Technology in the Classroom

Frequency of Music Technology Use Scale	n	%
1 - Never	3	9.7
2 - Several Times a Semester	9	29.0
3 - Several Times a Month	8	25.8
4 - Several Times a Week	5	16.1
5 - Daily	4	12.9
6 - Several Times a Day	1	3.2
No Response	1	3.2

The mean response to the level of use of music technology in the classroom was 3.20, which indicated an average level of use between basic and common daily activities, such as email and lesson preparation. Looking specifically at each question, 12.9% of subjects indicated that they incorporate music technology into their lesson delivery and classroom activities, 71% of subjects indicated that they used music technology in their classroom to some extant in their classroom, and 12.9% indicated they never use music technology (See Table 12).

Table 12.

Breakdown of Level of Music Technology Use in the Classroom

Level of Music Technology Use Scale	n	%
1 - I do not use music technology for personal or professional use.	4	12.9
2 - I use music technology in my home or classroom.	12	38.7
3 - I use music technology in my classroom, including common music software applications.	10	32.3
4 - In integrate music technology in the delivery of my lessons. I also expect my students to use internet and/or common music software applications as class requirements.	4	12.9
5 - I consider music technology to be an integral component of teaching and learning in my classroom. My students are immersed in music technology in the classes I teach.	0	0.0
No Response	1	3.2

Research Question One

The first independent variable for research question one consists of the summation of subjects responses within Factor 3, *General Technology Availability*. The responses to items of Factor 3, which includes questions 7a, 9a, 11a, 13a, 15a, and 17a, can be seen in Table 13.

According to subject responses, 54.8% of subjects felt that technology was sufficiently available. 100% of subjects indicated that they had a computer available for use at school, while only 60% had a computer available for instructional use in their classroom. 93.5% of subjects indicated that there were student computers available for use in their building, while only 41.9% indicated they had student computers available in their classrooms. The cumulative means of responses was 4.50, indicating that subjects reported having an average of four to five of the possible six areas of general technology availability.

Table 13.

Item Responses to General Technology Availability (Factor 3)

Item		n	Yes	%	No	%
7a	Computers and other technology for my classroom is sufficiently available.	31	17	54.8	14	45.2
9a	I have a computer available for use at school.	31	31	100.0	0	0.0
11a	I have a computer available for instructional use in my classroom.	30	18	60.0	12	40.0
13a	I have student computers available for instructional use in my classroom.	31	13	41.9	18	58.1
15a	I have student computers available for instructional use in my school.	31	29	93.5	2	6.5
17a	I have a computer at home.	31	31	100.0	0	0.0

	n	M	SD
Cumulative Means of Responses	30	4.50	1.17

The second independent variable for Research Question One consists of the summation of subjects responses within Factor 4, *Music Technology Availability*. The responses to items of Factor 4, which includes questions 8a, 10a, 12a, 14a, 16a, and 19a, can be seen in Table 14.

According to subject responses, 38.7% of subjects felt that music technology was sufficiently available. 51.6% of subjects indicated that they had a computer with appropriate music software and hardware available for use at school, while only 35.5% had a computer with appropriate music software and hardware available for instructional use in their classroom. 16.1% of subjects indicated that there were student computers with appropriate music software and hardware available for use in their classroom, along with 16.1% with appropriate music software and hardware unavailable in their building. 50% of subjects indicated they had a computer with appropriate music software and hardware at home. The cumulative means of responses was 2.07, indicating that the average availability of technology in general was just over two of the six possible.

Table 14.

Item Responses to Music Technology Availability (Factor 4)

Item		n	Yes	%	No	%
8a	Computers and other technology for the purpose of music education is sufficiently available.	31	12	38.7	19	61.3
10a	I have a computer with appropriate music software and hardware available for use at school.	31	16	51.6	15	48.4
12a	I have a computer with appropriate music software and hardware available for instructional use in my classroom.	31	11	35.5	20	64.5
14a	I have student computers with appropriate music software and hardware available for instructional use in my classroom.	31	5	16.1	26	83.9
16a	I have student computers with appropriate music software and hardware available for instructional use in my school.	31	5	16.1	26	83.9
19a	I have a computer at home with music education related software that I use for school related purposes.	30	15	50.0	15	50.0

Cumulative Means of Responses	n	M	SD
	31	2.07	1.82

Research Question Two

The first independent variable for Research Question Two is the mean of subject responses to items of Factor 5, *Teacher General Technology Self-Efficacy*. The responses to items of Factor 5, which includes questions 24, 26, and 30, can be seen in Table 15.

Table 15.

Mean Item Responses to Teacher General Technology Self-Efficacy (Factor 5)

Item		n	M	SD
24	I feel confident in my ability to use technology.	30	4.60	0.97
26	I expect my technology activities to be successful.	30	4.77	0.90
30	My instructional leader talks/communicates with me frequently about integration of technology in my classroom.	31	3.00	1.03
	Mean of Factor 5	31	4.10	0.76

With a mean of 4.60, subjects tended to agree that they felt confident in their ability to use technology. Subjects also tended to agree that they expected their technology activities to be successful (M=4.77). Subjects also tended to disagree that their instructional leaders communicate with them frequently about technology in the

classroom. However, based on a mean of 4.10 for Factor 5, average subject responses indicate generally positive technology self-efficacy.

The second independent variable for Research Question Two is the mean of subject responses to the items of Factor 6, *Teacher Music Technology Self-Efficacy*. The responses to the items of Factor 6, which include question 25, 27, and 29, can be seen in Table 16.

Table 16.

Mean Item Responses to Teacher Music Technology Self-Efficacy (Factor 6)

Item		n	M	SD
25	I feel confident in my ability to use music technology.	31	4.52	1.09
27	I put a lot of effort into implementing technology activities/projects.	30	3.67	1.24
29	My instructional leader encourages me to integrate technology into my curriculum.	31	3.97	1.20
	Mean of Factor 6	31	4.04	0.87

Subjects indicated that they tended to agree that they felt confident in their ability to use music technology (M=4.52). However, with a mean of 3.67, subject average responses fall between “tend to agree” and "tend to disagree" that they put a lot of effort into implementing technology activities. Subjects also tended to agree

that their instructional leader encourages them to integrate technology into their curriculum (M=3.97). Based on a mean of 4.04 for Factor 6, average subject responses indicate generally positive music technology self-efficacy.

Research Question Three

The first independent variable for Research Question Three is the mean of subject responses to the items of Factor 7, *Teacher Attitudes Towards General Technology in the Music Classroom*. The responses to the items of Factor 7, which includes questions 7b, 11b, 13b, 15b, 17b, and 18b, can be seen in Table 17.

Table 17.

Mean Item Responses to Teacher Attitudes Towards General Technology in the Classroom (Factor 7)

Item		N	M	SD
7b	Computers and other technology for my classroom is sufficiently available.	30	4.43	0.90
11b	I have a computer available for instructional use in my classroom.	29	4.76	0.83
13b	I have student computers available for instructional use in my classroom.	31	4.23	1.31
15b	I have student computers available for instructional use in my school.	31	4.77	0.99
17b	I have a computer at home.	31	5.61	0.99
18b	I use a computer at home for school related purposes.	31	5.16	1.37
	Mean of Factor 7	31	4.84	0.80

On the importance of computers and other technology being sufficiently available for their classroom, subjects indicated that it was somewhat to very important (M=4.43). They also found it somewhat to very important to have a computer available for instructional use in their classroom (M=4.76), to have student computers available for instructional use in their classroom (M=4.23), and to have

student computers available for instructional use in their school (M=4.77). Subjects also indicated that they believed it was very important to essential that they had a computer at home (M=5.61) and that they used a computer at home for school related purposes (M=5.16). The mean of items in Factor 7 is 4.84, indicating that in general, subjects believed that technology is somewhat to very important.

The second independent variable for Research Question Three is the mean of the subject responses to the items in Factor 8, *Teacher Attitudes Towards Music Technology in the Classroom*. Responses to the items in Factor 8, which includes questions 8b, 12b, 14b, 16b, and 19b, can be seen in Table 18.

Subjects indicated that they believed that sufficient availability of computers and other technology for the purpose of music education was somewhat to very important (M=4.58). Subjects also believed that it is somewhat to very important to have a computer with appropriate music software and hardware available of instructional use (M=4.72), to have student computers with appropriate music software and hardware for instructional use (M=4.38, and to have student computers with appropriate music software and hardware available in their school (M=4.17). Subjects also indicated that they believed it was somewhat to very important to have a computer at home with music education related software to use for school related purposes (M=4.80). The mean of items in Factor 8 is 4.48, indicating that, in general, subjects believed that music technology is somewhat to very important.

Table 18.

Mean Item Responses to Teacher Attitudes Towards Music Technology in the Classroom (Factor 8)

Item		N	M	SD
8b	Computers and other technology for the purpose of music education is sufficiently available.	31	4.58	0.81
12b	I have a computer with appropriate music software and hardware available for instructional use in my classroom.	29	4.72	0.96
14b	I have student computers with appropriate music software and hardware available for instructional use in my classroom.	29	4.38	1.21
16b	I have student computers with appropriate music software and hardware available for instructional use in my school.	30	4.17	1.18
19b	I have a computer at home with music education related software that I use for school related purposes.	30	4.80	1.38
	Mean of Factor 8	31	4.48	0.93

Research Question Four

The first independent variable for research question four is the question belonging to Factor 9, *Teacher General Technology Education/ Professional Development*. Subject responses indicated that, in regards to technology professional

development, 19.35% (n=6) of subjects had 0 hours, 45.16% (n=14) had between 1 and 10 hours, and 19.35% (n=6) had between 11 and 20 hours, and 16.13% (n=5) had 21 or more hours of technology professional development (See Table 19).

Table 19.

Frequency of Number of Hours of General Technology Education (Factor 9)

Number of Hours	n	%
0	6	19.35
1-10	14	45.16
11-20	6	19.35
21 +	5	16.13

Subjects were asked to describe the ways in which they received additional technology instruction. Their responses fell into three groupings: School provided in-services and workshops (66%), Graduate Hours (8%), and Self Taught/Tutorials (66%). Those who referenced Self-Taught/Tutorials specifically referenced applications required to perform in their teaching position.

The second independent variable for Research Question Four is the question belonging to Factor 10, *Teacher Music Technology Education/ Professional Development*. Subject responses indicated that, in regards to music technology professional development, 45.16% (n=17) of subjects had none, 25.81% (n=8) had

between 1 and 10 hours, and 16.13% (n=5) had between 11 and 20 hours, and 3.23% (n=1) had 21 or more hours of music technology professional development. No subjects reported more than 25 hours of music technology professional development (See Table 20).

Table 20.

Frequency of Number of Hours of Music Technology Education (Factor 10)

Number of Hours	N	%
0	17	45.16
1-10	8	25.81
11-20	5	16.13
21 +	1	3.23

Subject responses to the descriptions of music technology training fell into three categories: Conventions and Workshops (29%), Graduate School (14%), and Self Taught/Tutorials (57%). Those who referenced Conventions and Workshops specify identified the Kansas Music Educators Association Conference. Of those who referenced Self-Taught/Tutorials, all identified specific software programs or the internet, but only half identified music-specific software programs.

Multiple Regressions

To determine the relationships between the various factors influencing the implementation of technology in the music classroom, four multiple regression analysis Models were conducted. Model One examined general technology influences on general technology implementation (Factor 1), Model Two examined music technology influences on music technology implementation (Factor 2), Model Three examined music technology influences on general technology implementation (Factor 1), and Model Four examined general technology influences on music technology implementation (Factor 2).

Model One

Model One is the examination of Factor 1--Degree of General Technology Implementation, as the Dependant Variable, and the Independent Variables of Factor 3--General Technology Availability, Factor 5--Teacher General Technology Self-Efficacy, Factor 7--Teacher Attitudes towards Technology in the Classroom, and Factor 9--Teacher Technology Education. The resulting regression correlation coefficient was significantly different from zero, $R = .726$, $R^2 = .527$, Adjusted $R^2 = .452$, $F = 6.968$, $p \leq .01$ (Table 21).

Table 21.

Standardized Regression ANOVA Matrix for Model One

Model	SS	df	MS	F	Sig.
Regression	601.680	4	150.420	6.968	.001[a]
Residual	539.686	25	21.587		
Total	1141.367	29			

a. Predictors: (Constant), Factor 3, Factor 5, Factor 7, Factor 9

DV: Factor 1; R = .726, R^2 = .527, Adjusted R^2 = .452

Of the independent variables examined, only those that had a significant regression coefficient, $p \leq .05$, were relevant to the prediction of the dependent variable. The results of Model One show that the two factors relevant to the prediction of Factor 1--Degree of General Technology Implementation, are Factor 3--General Technology Availability (p = .004), and Factor 9--Teacher Technology Education (p = .042). (Table 22)

Table 22.

Standardized Multiple Regression Coefficients Matrix for Model One

Model	B	SE	β	*t*	Sig
Constant	-20.192	7.559		-2.671	.013
Factor 3	2.444	0.768	.438	3.181	.004*
Factor 5	1.283	1.310	.153	0.979	.337
Factor 7	2.186	1.186	.283	1.843	.077
Factor 9	0.146	0.068	.321	2.142	.042*

Model Two

Model Two is the examination of Factor 2--Degree of Music Technology Implementation, as the Dependant Variables, and the Independent Variables of Factor 4--Music Technology Availability, Factor 6--Teacher Music Technology Self-Efficacy, Factor 8--Teacher Attitudes Towards Music Technology in the Classroom, and Factor 10--Teacher Music Technology Education. The resulting regression correlation coefficient was significantly different from zero, $R = .797$, $R^2 = .635$, Adjusted $R^2 = .576$, $F = 10.862$, $p \leq .01$. (Table 23)

Table 23.

Standardized Regression ANOVA Matrix for Model Two

Model	SS	df	MS	F	Sig.
Regression	507.811	4	126.953	10.862	.000[a]
Residual	292.189	25	11.688		
Total	800.000	29			

a. Predictors: (Constant), Factor 4, Factor 6, Factor 8, Factor 10

DV: Factor 2; R = .779, R^2 = .635, Adjusted R^2 = .576

The results of Model Two show that only one factor is relevant to the prediction of Factor 2--Degree of Music Technology Implementation: Factor 10--Teacher Music Technology Education (p = .002). (Table 24)

Table 24.

Standardized Multiple Regression Coefficients Matrix for Model Two

Model	B	SE	β	*t*	Sig
Constant	-3.797	3.529		-1.076	.292
Factor 4	.448	.465	.158	.964	.344
Factor 6	1.561	1.004	.261	1.554	.133
Factor 8	.610	.861	.109	.708	.485
Factor 10	.337	.109	.515	3.463	.002*

Model Three

Multiple Regression Analysis Three is the examination of Factor 1--Degree of General Technology Implementation, as the Dependant Variable, and the Independent Variables of Factor 4--Music Technology Availability, Factor 6--Teacher Music Technology Self-Efficacy, Factor 8--Teacher Attitudes Towards Music Technology in the Classroom, and Factor 10--Teacher Music Technology Education. The resulting regression correlation coefficient was significantly different from zero, R = .674, R^2 = .454, Adjusted R^2 = .367, F = 5.205, $p \leq .01$. (Table 25)

Table 25.

Standardized Regression ANOVA Matrix for Model Three

Model	SS	df	MS	F	Sig.
Regression	518.622	4	129.655	5.205	.003[a]
Residual	622.745	25	24.910		
Total	1141.367	29			

a. Predictors: (Constant), Factor 4, Factor 6, Factor 8, Factor 10

DV: Factor 1; R = .674, R^2 = .454, Adjusted R^2 = .367

The results of Model Three show that only one factor is relevant to the prediction of Factor 1--Degree of General Technology Implementation: Factor 10--Teacher Music Technology Education (p = .016). (Table 26)

Table 26.

Standardized Multiple Regression Coefficients Matrix for Model Three

Model	B	SE	β	*t*	Sig
Constant	-3.101	5.152		-0.602	0.553
Factor 4	-0.108	0.679	-0.032	-0.159	0.875
Factor 6	2.607	1.466	0.365	1.778	0.088
Factor 8	0.297	1.257	0.044	0.236	0.815
Factor 10	0.412	0.159	0.471	2.591	0.016*

Model Four

Multiple Regression Analysis Four is the examination of Factor 2--Degree of Music Technology Implementation, as the Dependant Variable, and the Independent Variables of Factor 3--General Technology Availability, Factor 5--Teacher General Technology Self-Efficacy, Factor 7--Teacher Attitudes towards Technology in the Classroom, and Factor 9--Teacher Technology Education. The resulting regression correlation coefficient was significantly different from zero, $R = .714$, $R^2 = .510$, Adjusted $R^2 = .432$, $F = 6.514$, $p \leq .01$. (Table 27)

Table 27.

Standardized Regression ANOVA Matrix for Model Four

Model	SS	df	MS	F	Sig.
Regression	408.284	4	102.071	6.514	.001[a]
Residual	391.716	25	15.669		
Total	800.000	29			

a. Predictors: (Constant), Factor 3, Factor 5, Factor 7, Factor 9

DV: Factor 1; R = .714, R^2 = .510, Adjusted R^2 = .432

The results of Model Four show that only one factor is relevant to the prediction of Factor 2, Degree of Music Technology Implementation, Factor 3, General Technology Availability (p = .003). (Table 28)

Table 28.

Standardized Multiple Regression Coefficients Matrix for Model Four

Model	B	SE	β	*t*	Sig
Constant	-21.076	6.440		-3.273	0.003
Factor 3	2.145	0.655	0.459	3.277	0.003*
Factor 5	1.981	1.116	0.281	1.775	0.088
Factor 7	1.794	1.011	0.277	1.776	0.088
Factor 9	0.060	0.058	0.158	1.038	0.309

Null Hypothesis 1

In Model One and Model Four, Factor 3--Availability of Technology was found to be significant in the prediction of implementation of general ($p = .004$) and music ($p = .003$) technology in the music classroom. Thus, Null Hypothesis 1, Availability of technology (Factor 3) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2), was rejected.

Null Hypothesis 2

In Model Two and Model Three, Factor 4--Availability of Music Technology, was found to not be significant in the prediction of implementation of general ($p = .875$) and music ($p = .344$) technology in the music classroom. Thus, Null Hypothesis 2, Availability of music technology (Factor 4) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2), was accepted.

Null Hypothesis 3

In Model One and Model Four, Factor 5--Teacher General Technology Self-Efficacy was found to not be significant in the prediction of implementation of general ($p = .337$) and music ($p = .088$) technology in the music classroom. Thus, Null Hypothesis 3, Teacher technology self-efficacy (Factor 5) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the

degree of implementation of music technology in the music classroom (Factor 2), was accepted.

Null Hypothesis 4

In Model Two and Model Three, Factor 6--Teacher Music Technology Self-Efficacy, was found to not be significant in the prediction of implementation of general ($p = .088$) and music ($p = .133$) technology in the music classroom. Thus, Null Hypothesis 4, Teacher music technology self-efficacy (Factor 6) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2), was accepted.

Null Hypothesis 5

In Model One and Model Four, Factor 7--Teacher Attitudes Towards Technology in the Music Classroom, was found to not be significant in the prediction of implementation of general ($p = .077$) and music ($p = .088$) technology in the music classroom. Thus, Null Hypothesis 5--Teacher perceptions and attitudes towards technology (Factor 7) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2), was accepted.

Null Hypothesis 6

In Model Two and Model Three, Factor 8--Teacher Attitudes Towards Music Technology in the Classroom, was found to not be significant in the prediction of implementation of general ($p = .815$) and music ($p = .485$) technology in the music

classroom. Thus, Null Hypothesis 6--Teacher perceptions and attitudes towards music technology (Factor 8) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2), was accepted.

Null Hypothesis 7

In Model One, Factor 9--Teacher Technology Education was found to be significant in the prediction of implementation of general technology in the music classroom ($p = .042$). In Model Four, Factor 9 was found to not be significant in the prediction of the implementation of music technology in the music classroom. ($p = .088$) Thus, Null Hypothesis 7--Technology professional development (Factor 9) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2), was rejected.

Null Hypothesis 8

In Model Two and Model Three, Factor 10--Teacher Music Technology Education, was found to be significant in the prediction of implementation of general ($p = .016$) and music ($p = .002$) technology in the music classroom. Thus, Null Hypothesis 8--Music technology professional development (Factor 10) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2), was rejected.

Qualitative Data

Additional information was collected through three open ended questions included in the survey instrument. Responses to each question were categorized to determine themes.

Question One

The responses to the first question (n = 22), How do you use technology, music or not, in your classroom, can be categorized three general ways: Presentation, Teacher Software Use, and Student Software Use. The use of technology as a Presentation tool included the use of computers, projectors, and SmartBoards, to play music, navigate websites, and display other various instructional tools. Teacher Software Use included the use of various software and internet applications to perform tasks required in teaching, such as grades and attendance, and tasks to enhance teaching, such as the use of music notation, sequencing, recording, and playback software. Student Software Use included the use of software programs and websites to enhance student learning. Examples given included the use of music notation software, websites for learning about instruments and composers, and SmartMusic for rehearsal and performance.

Question Two

The responses to Question Two (n = 22), How do you think technology should be used in the teaching and learning of music, ranged for “very little” to “for almost anything”. Student composition, research, listening, practice, and performance

were all mentioned as ways participants thought technology should be included in the music classroom.

Question Three

The responses to question three (n = 16), Is there anything else you would like to mention about your teaching experiences with computers, revolved around three primary complaints: time, money, and training. All responses to this question contained at least one of these complaints; many respondents mentioned multiple complaints. In addition to the complaints, several respondents acknowledged that "students are very in tune to computers", and "I really do not feel that confident but wish I did!"

Summary

This study examined the relationship between eight independent variables and the dependent variables of Degree of General Technology Implementation and Degree of Music Technology Implementation. 17.22% (n = 31) of selected participants responded to the survey, representing teachers from all regions and subject sub-divisions. Based on the results of the statistical analysis conducted on those responses, null hypotheses Two, Three, Four, Five, and Six were accepted, indicating that these variables have no statistical significance in the prediction of the degree of technology implementation. Hypotheses One, Seven, and Eight, were found to be statistically significant predictors of the degree of technology implementation. Factor 3, General Technology Availability, Factor 9, Teacher Technology Education, and Factor 10, Teacher Music Technology Education, are the three independent

variables found to be related to degree of technology implementation. These findings are discussed in Chapter Five.

CHAPTER FIVE

Discussion

Summary

The purpose of this study was to examine what factors influence the implementation of technology in the music classroom. Existing research was reviewed and four primary factors influencing the implementation of technology were identified: Technology Availability, Teacher Technology Self-Efficacy, Teacher Attitudes and Perceptions Towards the Use of Technology in the Classroom, and Technology Education. A survey instrument was adapted to examine these factors from the music education prospective and attempt to determine what factors can be significant in the prediction of the level of technology implementation. The survey instrument was disseminated and data were collected during July 2008.

Collected data underwent data reduction in the form of factor analysis and reduction calculations. (See Appendix C.) Data were placed in four multiple regression models to determine their ability to predict implementation of technology in the music classroom. The four regression models produced consistent results, finding that the Availability of Technology and Technology Professional Development were significant predictors of implementation of technology in the music classroom. Teacher Technology Self-Efficacy and Teacher Attitudes Towards Technology in the Classroom were not found to be significant predictors, but subject responses were consistently highly rated.

Research Questions

The purpose of this study was to examine what factors influence the integration of technology in the music classroom. Throughout the literature, four factors constantly showed a relationship to using technology in the classroom, Availability, Self-Efficacy and Confidence, Perceptions and Attitudes, and Professional Development and Education. To examine how these four factors related to the use of technology in the music classroom, this study addressed the following research questions:

1. How does the availability of technology influence the degree of use of technology in the music classroom?
2. How does teacher technology self-efficacy influence the use of technology in the music classroom?
3. How do teacher perceptions and attitudes towards technology influence the use of technology in the music classroom?
4. How does technology professional development influence technology use in the music classroom?

Question One

How does the availability of technology influence the degree of use of technology in the music classroom?

Previous studies have identified the availability of technology as factor in the degree of use of technology in the classroom. Hadley and Sheingold (1993) and

Boone (2005) both found that the availability of technology directly related to the likelihood of use, a finding consistent throughout the literature. There were no studies that determined that the availability of technology was not a factor in the likelihood of technology use in the classroom. To date, there have been no studies specifically addressing how the availability of technology in the music classroom relates to the implementation of technology in the music classroom. Research Question One looked to fill that void.

Null Hypothesis 1--Availability of General Technology (Factor 3) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2)--was rejected since all regression models showed it to be significant in the prediction of both general and music technology implementation, demonstrating a positive coloration between the availability of technology and the degree of implementation. However, Null Hypothesis 2--Availability of Music Technology (Factor 4) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2)--was accepted, since no regression model found it to be a significant predictor in the use of technology in the music classroom.

The primary distinction between these two hypotheses is the availability of general technology as opposed to music technology. Results of this study found that general technology availability was a significant predictor of implementation of technology in the music classroom, which is consistent with the findings of previous

studies. However, the availability of music technology was found not to be a significant predictor of technology implementation in the music classroom, a deviation from previous findings.

A possible explanation for the deviation could be in the implementation of music technology. Almost all music technology extends from a base of general technology. Without that general technology in place, the implementation of music technology is extremely difficult. Thus, there is a flaw in Hypothesis 2 since the availability of music technology is highly dependant on the availability of general technology. Hypothesis 2 is only relevant in the condition that general technology is already in place.

With the exclusion of Hypothesis 2, Research Question One--the availability of general technology--is found to be a significant predictor of both general and music technology in the music classroom. While this finding aligns itself with similar studies, the important difference is that the availability of general technology was a significant predictor in the implementation of music technology in the music classroom.

Similar to the reason that Hypothesis 2 was found to be a fallacy, the relationship between general technology availability and music technology implementations may rely on the general technology base on which the music technology is built. If the general technology is there, it is likely that it will be adapted for used as a music technology.

Question Two

How does teacher technology self-efficacy influence the use of technology in the music classroom?

Teacher Technology Self-Efficacy is a term used throughout the literature to describe a teacher's comfort level and confidence in the use of technology. Research consistently found a strong correlation between Teacher Technology Self-Efficacy and the implementation of technology in the classroom. (Liaw, Huang, Chen, 2007; Littrell, Zagumny, M., & Zagummny, L., 2005; Ross, Ertmer, Johnson, 2001) However, the results of this study obtained a different conclusion.

Hypothesis 3--Teacher Technology Self-Efficacy (Factor 5) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2)--was accepted, since no regression models found it to be a significant predictor of implementation. Hypothesis 4--Teacher Music Technology Self-Efficacy (Factor 6) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2)--was also accepted since no regression models found it to be a significant predictor of implementation.

Examination of the raw data for Factor 5 showed that, with mean responses of all questions having a mean of 4.1 on a scale of 6 and a mean standard deviation of 0.76 , there was a generally positive Teacher Technology Self-Efficacy with little variation. An examination of the raw data for Factor 6 revealed similar findings, with a mean of 4.04 on a scale of 6 and a mean standard deviation of 0.87. Thus, the

explanation for the deviation in the findings of this study compared to previous studies may be a result of the lack of variation in subject responses to these particular questions.

The findings of this research question showed that subjects had a consistently positive Teacher Technology Self-Efficacy, which is a notable result. However, due to the lack of variation in the subject responses to the survey questions, data analysis was unable to make a determination as to the ability of Technology Self-Efficacy to be a significant predictor of implementation of technology in the music classroom.

Question Three

How do teacher perceptions and attitudes towards technology influence the use of technology in the music classroom?

Teacher perceptions of and attitudes towards the use of technology in the classroom has also been found to relate to their implementation of technology. Hardin (2006), Lee (2006), and McConnell (2006) all found that how a teacher views the purpose and possibilities of technology has an effect on how that technology is implemented. The results from the current study again deviated from the previous findings.

Hypothesis 5--Teacher perceptions and attitudes towards technology (Factor 7), does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2)--was accepted since no regression models found it to be a significant predictor of implementation. Hypothesis 6--Teacher perceptions and

attitudes towards music technology (Factor 8) does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2)--and was also accepted since no regression models found it to be a significant predictor of implementation.

An examination of the raw data for Factor 7 found that the mean ranking of the importance of various general technologies was 4.84 of 6 with a standard deviation of 0.80. A similar examination of Factor 8 found the mean ranking of the importance of various music technologies was 4.48 out of 6 with a standard deviation of 0.93. In general, subjects had a positive perception and attitude towards both general and music technology

Similar to Research Question Two, the explanation for the deviation from previous findings may be the lack of variation within the question. So, while teacher perceptions and attitudes towards general and music technology were positive, the current study did not find it to be a significant predictor of technology implementation.

Question Four

How does technology professional development influence technology use in the music classroom?

Technology Professional Development can be the most effectively modified factor in the regards to influencing the implementation of technology in the

classroom. Through technology professional development, Technology Self-Efficacy increases (Ceppi-Bussmann, 2006) and more positive perceptions and attitudes are developed. (Klamik, 2005) Previous research has found Technology Professional Development to be related to the implementation of technology in the classroom, and this study obtained similar results.

Hypothesis 7--Technology Professional Development (Factor 9), does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2)--and was rejected since Model One found Technology Professional Development to be a significant indicator of general technology implementation. However, Model Four determined Technology Professional Development was not a significant predictor of implementation of music technology in the music classroom. Hypothesis 8--Music Technology Professional Development (Factor 10), does not relate to the degree of implementation of technology in the music classroom (Factor 1) or the degree of implementation of music technology in the music classroom (Factor 2)--and was also rejected, since all models found it to be a significant predictor of implementation of technology.

The single deviation, General Technology Professional Development, is not a significant predictor of music technology implementation, and can be explained through the examination of the differences between general technology professional development and music technology professional development. While music technology professional development relies on the understanding of general

technology before using music technologies, general technology professional development does not generally address music technology.

Conclusions

This study found that two of the predefined factors that influence implementation of technology in the general classroom--Availability of Technology and Technology Professional Development--were found to be significant in the prediction of technology implementation in the music classroom. The other two factors examined--Technology Self-Efficacy and Attitudes Towards Technology in the Classroom--were not found to be significant in the prediction of technology implementation. However, subject responses pertaining to these factors were unexpectedly consistent, with most subjects reporting high levels of Technology Self-Efficacy and highly positive Attitudes Towards Technology in the Classroom. Therefore, based on the conclusion that Availability of Technology and Technology Professional Development are both significant in the prediction of the degree of implementation of technology in the music classroom, there now exists a research based rational for the increase of Technology Availability and Technology Professional Development as a means of raising the level of technology implementation in the music classroom.

The consistency seen in the responses to these technology implementation factors might indicate a discrepancy within the survey instrument or a discrepancy within the subject pool. Considering this consistency was not apparent in the pilot study, the latter discrepancy would seem to be more likely. In further examination of

the subject pool, the method of participant recruitment, and the method of data collection, participant similarities began to appear.

When looking at individual survey items, it was found that all study participants had a computer available for use at school (Item 9a) as well as having a computer at home. (Item 17a) In addition, the mean responses of Items 17b and 18b indicated that the participants believed that having a computer at home and using it for school related purposes was in the range of very important to essential. However, participant recruitment took place though emails sent to the participants school email address. Since this recruitment took place during summer break, only those participants who checked their school email would have had the opportunity to participate. The timing and method of participant recruitment may have significantly affected responses on these items.

The resulting general description of the participants would be of individuals who have easy computer access and believe it to be very important to essential. These individuals also appear to be proficient in basic computer skills, email, and the internet. These traits, found consistently throughout the participants, would suggest individuals with high levels of Technology Self-Efficacy and more positive Attitudes towards Technology in the Classroom. Although these factors were not found to be statistically relevant in the prediction of technology implementation in the classroom, it is important that it is recognized how they might have effected the results, especially in terms of type of individual who would respond to an internet- based survey on technology. An assumption might be made that individuals who lack

Technology Self-Efficacy or have negative Attitudes Towards Technology in the Classroom may not respond to the survey, putting a bias towards the type of individual study attracted.

In an effort to determine how four specific factors influence the implementation of technology in the music classroom, this study found that when music teachers have higher levels of Technology Self-Efficacy and positive views Towards Technology in the Classroom, then the likelihood of implementation of technology in the music classroom can be predicted by the Availability of Technology and Teacher Technology Professional Development.

Limitations

Invitation for participation in the study was sent to participant's school email addresses. Since data collection occurred during the summer break, participation was limited to those individuals who had access to the internet and school email outside of the school setting, resulting in a smaller participation rate and sample size than might have occurred during the school year. Although an ideal sampling was not achieved, all geographical regions and grade levels were represented.

In addition, due to the data collection being conducted exclusively through an internet-based survey, the subject pool may have had a positive bias towards technology. If such a bias existed, it might offer an explanation of the consistent and highly rated responses in the areas Technology Self-Efficacy and Teacher Attitudes Towards Technology. However, this positive bias towards technology may also have

allowed a more specific examination of the relationships of Technology Availability and Technology Professional Development on Technology Implementation in the Classroom.

Implications

As technology continues to evolve and become more intergraded into daily lives, possessing the ability to implement technology appropriately into the music classroom becomes increasingly important. The results of this study provide a means to support the growth and development of technology in the music classroom as an important and viable learning tool. Availability of Technology and Technology Professional Development were found to influence the level of technology implementation in the music classroom. These two factors are the most tangible and easily affected through external support. This study provides evidence that, through the appropriate support, increased technology implementation can occur in the music classroom, and with it, the advantages that technology can bring to student learning.

Recommendations for Future Research

Similar to related studies of technology implementation in the general education classroom, the body of research into technology implementation in the music classroom needs to be expanded. The examination of each of the influential factors should be individually addressed to determine what modifications can be made to promote successful integration of technology and music education.

REFERENCES

Anderson, S., & Maninger, R. (2007). Preservice teachers' abilities, beliefs, and intentions regarding technology integration. *Journal of Educational Computing Research*, 37(2), 151-172.

Apple Computer. (2005). *Changing the Conversation about Teaching, Learning, and Technology*. Retrieved July 11, 2007, from http://www.apple.com/education/k12/leadership/acot/library.html

Ball, K. (2006) *Plugged in: A case study of an exemplary technology-using teacher*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3238925).

Bansavich, J. (2005) *Factors influencing preservice teachers' readiness to integrate technology into their instruction.* Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3169712).

Bodley, D. (2000) *The development and testing of an interactive listening guide system for instructors of music appreciation*. Retrieved January 19, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 9972036).

Boling, C., Martin, S. H., & Martin, M. A., (2002) The effects of computer-assisted instruction on First Grade Students' vocabulary development. *Reading Improvement, 39*, 79-88.

Boone, S. (2005*) An analysis of the impact of coaching on teachers' levels of technology implementation*. Retrieved July 10, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 3197271).

Bowyer, D.(2000) *A new approach to computer-assisted instruction in music theory for elementary and middle school children*. Retrieved January 19, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 9973904).

Brinkerhoff, J. (2006). Effects of a long-duration, professional development academy on technology skills, computer self-efficacy, and technology integration beliefs and practices. *Journal of Research on Technology in Education*, 39(1), 22-43.

Brickner, D. (1995) *The effects of first and second-order barriers to change on the degree and nature of computer usage of mathematics teachers: A case study*. Retrieved June 24, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 9540219).

Ceppi-Bussmann, S. (2006) *A case study of a technology professional development program involving lesson study on teachers' perceptions of their professional practice*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3220463).

Chuang, W. (2000) *Formative research on the refinement of Web-based instructional design and development guidance systems for teaching music fundamentals at the pre-college level*. Retrieved January 19, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 9993557).

Cohen, V. (2001) Learning styles and technology in a ninth-grade high school population. *Journal of Research on Computing in Education, 33*, 355-366.

Clausen, J. (2005*) Integration of technology into the instructional practice of new teachers: Case studies of beginning teachers' use of technology*. Retrieved July 10, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 3200411).

Dalton, D., & Hannafin, M. (1988). The Effects of Computer-Assisted and Traditional Mastery Methods on Computational Accuracy and Attitudes. *Journal of Educational Research*, 82(1), 27-33.

Deihl, N., & Radocy, R. (1969) Computer-Assisted Instruction: Potential for Instrumental Music. *Bulletin: Council for Research in Music Education, 15*, 1-13.

Dekaney, E. (2003). The Effect of Computerized versus Classroom Instruction on Phonetic Pronunciation of English. *Journal of Research in Music Education*, 51(3), 206-217.

Dobbe, K. (1998) *A study of varied uses of interactive and presentation software programs in a music fundamentals course for non-majors*. Retrieved January 19, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 9834897).

Ertmer, P., Addison, P., Lane, M., Ross, E., & Woods,D. (1999). Examining Teachers' Beliefs About the Role of Technology in the Elementary Classroom. *Journal of Research on Computing in Education*, 32(1), 54-71.

Frankel, J. (2003) Teaching Music with PowerPoint. In E. Pontiff & A. Keating (Eds.), *Spotlight on Technology in the Music Classroom*. (pp. 7-8) Reston, VA: MENC: The National Association for Music Education.

Gaither, C. (2005) *Professional development as a means to increasing teachers' self-efficacy for technology integration.* Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3173482).

Glenn, S. (2000) *The effects of a situated approach to musical performance education on student achievement: Practicing with an artificially intelligent computer accompanist*. Retrieved January 19, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 9984138).

Goedde, A. (2006) *Factors predicting preservice teacher technology competency.* Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3216858).

Green, B. (2003) *The comparative effects of computer-mediated interactive instruction and traditional instruction on music achievement in guitar performance.* Retrieved January 19, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT NQ86051).

Green, J. (2006*) The impact of teacher self efficacy and attitudes toward classroom computers(s) on the use of classroom technology*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3218278).

Hadley, M. & Sheingold, K. (1993) Commonalities and Distinctive Patters in Teachers' Integration of Computers. *American Journal of Education*, 101, 261-315.

Hall, K. K., (2001) Adults and Computer-Assisted-Instruction in Beginning Piano: Influences on musical self-efficacy and Music Education attitudes. *Missouri Journal of Research in Music Education, 38*, 4-29.

Hardin, S. (2006) *How teacher attitudes and administrator behaviors affect levels of technology integration in the classroom*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3225220).

Harris, A. (2003) *The effects of teacher characteristics, instructional support and the availability of technology on the degree of implementation of technology in Louisiana high school classrooms*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3117200).

Hitchcock, C. & Noonan, M. (2000) Computer-Assisted Instruction of Early Academic Skills. *Topics in Early Childhood Special Education, 20*, 145-158.

Hopkins, M. (2002) The Effects of Computer-Based Expository and Discovery Methods of Instruction on Aural Recognition of Music Concepts. *Journal of Research in Music Education*, 50 (2), 131-144.

Hutchison, J. (2006) *Experienced teachers learning meaningful classroom integrations of Web-based technology: A grounded theory study of the process*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3237086).

Johnson, I. (2006) *An investigation of the effects of the Georgia Framework for Integrating TECHnology (InTech) training program on teachers' computer self-efficacy and computer utilization*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3212759).

Jones, R. B., (2003) *MIDI*. Retrieved June 18, 2006, from http://www.rbjones.com/rbjpub/music/mus007.htm.

Keengwe, J.(2006) *Faculty integration of computer technology into instruction and students' perceptions of computer use to improve their learning*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3220231).

Kendall, N. (2006) *Teacher background and acceptability of the Internet as a resource for addressing student learning styles*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3203847).

Kennewell, S., & Morgan, A. (2006). Factors influencing learning through play in ICT settings. *Computers and Education*, 46(3), 265-279.

Kesten, A. (2006*) A case study: Social studies preservice teachers' perceptions and attitudes toward computer technologies*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3229414).

Klamik, L. (2005) *Creating a product to increase internal motivation to use technology in the classroom.* Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3240864).

Klee, D. (1998) *The effect of computer-generated accompaniment on the preparation of solo flute literature*. Retrieved January 19, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 9908571).

Kuhn, W., & Allvin, R. (1967) Computer-Assisted Teaching: A new approach to research in music. *Bulletin: Council for Research in Music Education, 11*, 1-13.

Lauro, D. (2005) *An analysis of teacher perceptions of staff development for technology integration*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3161268).

Lee, W. (2006) *The relationship between teachers' beliefs and perceptions about student use of computers and how they integrate technology into curricular instruction.* Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3249424).

Leh, A. (2000). Teachers' Comfort Level, Confidance, and Attitude Toward Technology at a Technology Course. San Diego, CA: Society for Information Technology & Teacher Education International Conference. (ERIC Document Reproduction Service No. ED 444492)

Liaw, S., Huang, H., & Chen, G. (2007). Surveying instructor and learner attitudes toward E-learning. *Computers & Education*, 49(4), 1066-1080.

Lincoln, H. (1969) The Computer and Music Research: Prospects and problems. *Bulletin: Council for Research in Music Education, 18*, 1-9.

Littrell, A., Zagumny, M., & Zagumny, L. (2005). Contextual and psychological predictors of instructional technology use in rural classrooms. *Educational Research Quarterly*, 29(2), 37-47.

Loverro, I. (2006) *Toward a pedagogy of educational technology for teacher education programs*. Retrieved July 10, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 3205867).

McConnell, T. (2006) *Using collaborative reflection to build technology integration skills among preservice elementary science teachers*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3251658).

Meltzer, S. (2006) *An analysis of professional development in technology for elementary school teachers*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3220673).

Moulton, S. (2005) *A longitudinal study: The effect of a multimedia-training program on teacher attitude and willingness to integrate technology into classroom instruction*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3162735).

Nelson, S. (2007) *The complex interplay of composing, developing musicianship and technology: A multiple case study*. Retrieved July 10, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 3256395).

Orman, E. (1998) Effect of Interactive Multimedia Computing on Young Saxophonists' Achievement and Attitude. Journal *of Research in Music Education*, 46 (1), 62-74.

Parrish, R. (1997) Development and Testing of a Computer-Assisted Instructional Program to Teach Music to Adult Nonmusicians. *Journal of Research in Music Education*, 45 (1), 90-102.

Pembrook, R., (1986) Some implications of Students' attitudes towards a computer-based melodic dictation program. *Journal of Research in Music Education, 34*, 121-133.

Peters, G. (1992) Music Software and Emerging Technology. *Music Educators Journal*, 79(3), 22-25+63.

Placek, R. (1974) Design and Trial of a Computer-Assisted Lesson in Rhythm. *Journal of Research in Music Education*, 22 (1), 13-23.

Pontiff, E. & Keating, A. (Eds.). (2003). *Spotlight on Technology in the Music Classroom*. Reston, VA: MENC: The National Association for Music Education.

Rashotte, A. (2005) *Resistance to technology integration in elementary teaching by the technologically proficient classroom teacher*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT MR12762).

Reel, T. (2006) *Integration of technology into the curriculum*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT MR17875).

Rogers, L. (2007) *Reassessing teacher technology integration: A case study*. Retrieved July 10, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 3249631).

Ross, E., Ertmer, P., & Johnson, T. (2001). *Technology integration and innovative teaching practices: A staff development model for facilitating change.*

National Convention of the Association for Educational Communications and Technology (ERIC Document Reproduction Service No. ED346082)

Ross, J & Schulz, R., (1999) Can computer-aided instruction accommodate all learners equally? *British Journal of Educational Technology, 30*, 5-24)

Scalisi, R. (2005) *The impact of staff development on middle school technology integration*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 1427586).

Schachter, B. (1999) *The use of new technology for piano instruction in a structured learning environment.* Retrieved January 19, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 9939550).

Scot, T. (2005) *Conditions, processes and consequences of technology integration: Policy to practice*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3177468).

Smith, D. (2006) *Analysis of factors contributing to teachers' acquisition and use of technology*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3222135).

Smith, K. (2002) *The effectiveness of computer-assisted instruction on the development of rhythm reading skills among middle school instrumental students.* Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3070051).

Stell, B. (1999) *Technology: Its use and impact upon secondary music instruction in a midwestern urban public school district.* Retrieved January 19, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 9921738).

Stubbs, K. (2007) *Use of technology in teacher preparation programs*. Retrieved July 10, 2007, from Dissertations & Theses @ University of Kansas database. (Publication No. AAT 3245896).

Sung, L. (2006) *How methods and technology instructors think about good practice: An exploration for transforming pre-service curriculum*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3210049).

Therrien, M. (1997) *Guidelines for the instructional design of technological and cooperative applications in a music program*. Retrieved January 19, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT MQ40234).

Vitale, D. (2005) *Developing technology integrators: The role of professional development for instructional technology integration*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3175437).

Watson, G. (2006). Technology professional development: Long-term effects on teacher self-efficacy. *Journal of Technology and Teacher Education*, 14(1), 151-166.

Watson, S. (2004) *Effective music training for preschool-aged children with autism*. Retrieved January 19, 2008, from Dissertations & Theses: Full Text database. (Publication No. AAT 1421523).

Waxman, H., Lin, M., & Michko, G. (2003). *A Meta-Analysis of the Effectiveness of Teaching and Learning with Technology on Student Outcomes* (Government Contract No. ED-01-CO-0011). Naperville, IL: Learning Point Associates.

Webster, P., (2002) Historical Perspectives on Technology and Music. *Music Educators Journal, 89*, 38-43, 54.

Weiss, B. (2007) *Participant involvement in planning professional development in technology integration*. Retrieved July 10, 2007, from Dissertations & Theses: Full Text database. (Publication No. AAT 3247772).

Weyhrich, S. (2001) *Apple II History*. Retrieved June 18, 2006, from http://www.apple2history.org/index.html.

Wiliams, D., Webster, P. R. (2005) *Experiencing Music Technology: Software, Data, and Hardware* (3rd ed.). New York: Schirmer Books.

Willett, B. & Netusil, A. (1989) Music Computer Drill and Learning Styles at the Fourth-Grade Level. *Journal of Research in Music Education*, 37 (3), 219-229.

Zhao, Y., & Frank, K., (2003) Factors Affecting Technology Uses in Schools: An Ecological Perspective. *American Educational Research Journal*, 40(4), 807-840.

APPENDIX A:
Survey Instrument

Demographic Information		
For each of the following items, select or write in the answer in the blank that best applies to you. Please mark all answers distinctively		
1.	What is your gender?	☐ Male ☐ Female
2.	What is your current age?	
3.	What is your highest degree achieved?	☐ Bachelors ☐ Masters ☐ Doctorate ☐ Other:
4.	How many years of teaching experience do you have?	
5.	What grade levels do you currently teach? (Check all that apply)	☐ Elementary ☐ Middle School/ Junior High ☐ High School ☐ Higher Education ☐ Private Lessons ☐ Other:
6.	What types of classes do you currently teach? (Check all that apply)	☐ Wind Ensembles ☐ Percussion Ensembles ☐ String Ensembles ☐ Large Ensemble ☐ Small Ensemble ☐ Private Lessons ☐ General Music ☐ Music History ☐ Music Appreciation ☐ Music Technology ☐ Music Theory ☐ Other Music Classes: ☐ Other:

Technology Availability			
For each of the following items, select YES or NO under AGREE to indicate whether you currently agree with the statement. Then select how important/useful you personally consider that item to be as you strive to meet your daily responsibilities/goals as a classroom teacher.			
	Statement	Agree	Importance/Usefulness
7.	Computers and other technology for my classroom is sufficiently available.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential
8.	Computers and other technology for the purpose of music education is sufficiently available.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential
9.	I have a computer available for use at school.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential
10.	I have a computer with appropriate music software and hardware available for use at school.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential

11.	I have a computer available for instructional use in my classroom.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential
12.	I have a computer with appropriate music software and hardware available for instructional use in my classroom.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential
13.	I have student computers available for instructional use in my classroom.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential
14.	I have student computers with appropriate music software and hardware available for instructional use in my classroom.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential
15.	I have student computers available for instructional use in my school.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential

16.	I have student computers with appropriate music software and hardware available for instructional use in my school.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential
17.	I have a computer at home.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential
18.	I use a computer at home for school related purposes.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential
19.	I have a computer at home with music education related software that I use for school related purposes.	☐ Yes ☐ No	☐ 1-Not Important/Useful at all ☐ 2-Not Very Important/Useful ☐ 3-Less Important/Useful ☐ 4-Somewhat Important/Useful ☐ 5-Very Important/Useful ☐ 6-Essential

Teacher Attitudes		
For each of the following items, select the answer that best applies to you.		
20.	Using technology enhances student learning.	☐ 1-Strongly Disagree ☐ 2-Disagree ☐ 3-Tend to Disagree ☐ 4-Tend to Agree ☐ 5-Agree ☐ 6-Strongly Agree
21.	Using technology enhances student learning in music	☐ 1-Strongly Disagree ☐ 2-Disagree ☐ 3-Tend to Disagree ☐ 4-Tend to Agree ☐ 5-Agree ☐ 6-Strongly Agree
22.	I have many uses for technology in my classroom.	☐ 1-Strongly Disagree ☐ 2-Disagree ☐ 3-Tend to Disagree ☐ 4-Tend to Agree ☐ 5-Agree ☐ 6-Strongly Agree
23.	I have many uses for music technology in my classroom.	☐ 1-Strongly Disagree ☐ 2-Disagree ☐ 3-Tend to Disagree ☐ 4-Tend to Agree ☐ 5-Agree ☐ 6-Strongly Agree

24.	I feel confident in my ability to use technology.	☐ 1-Strongly Disagree ☐ 2-Disagree ☐ 3-Tend to Disagree ☐ 4-Tend to Agree ☐ 5-Agree ☐ 6-Strongly Agree
25.	I feel confident in my ability to use music technology.	☐ 1-Strongly Disagree ☐ 2-Disagree ☐ 3-Tend to Disagree ☐ 4-Tend to Agree ☐ 5-Agree ☐ 6-Strongly Agree
26.	I expect my technology activities to be successful.	☐ 1-Strongly Disagree ☐ 2-Disagree ☐ 3-Tend to Disagree ☐ 4-Tend to Agree ☐ 5-Agree ☐ 6-Strongly Agree
27.	I put a lot of effort into implementing technology activities/projects.	☐ 1-Strongly Disagree ☐ 2-Disagree ☐ 3-Tend to Disagree ☐ 4-Tend to Agree ☐ 5-Agree ☐ 6-Strongly Agree
28.	I keep working even when there are problems with technology.	☐ 1-Strongly Disagree ☐ 2-Disagree ☐ 3-Tend to Disagree ☐ 4-Tend to Agree ☐ 5-Agree ☐ 6-Strongly Agree

29.	My instructional leader encourages me to integrate technology into my curriculum.	☐ 1-Strongly Disagree ☐ 2-Disagree ☐ 3-Tend to Disagree ☐ 4-Tend to Agree ☐ 5-Agree ☐ 6-Strongly Agree
30.	My instructional leader talks/communicates with me frequently about integration of technology in my classroom.	☐ 1-Strongly Disagree ☐ 2-Disagree ☐ 3-Tend to Disagree ☐ 4-Tend to Agree ☐ 5-Agree ☐ 6-Strongly Agree
31.	I use a computer at home for the school-related purposes selected. (Check all that apply)	☐ 1-I do not use a computer at home. ☐ 2-To prepare quizzes/tests. ☐ 3-To locate online resources. ☐ 4-To communicate by e-mail ☐ 5-To e-mail handouts/materials for classroom use. ☐ 6-Other

Degree of Implementation of Technology in the Classroom		
32.	Please select the statement that best describes the frequency of technology use in your classroom	☐ 1-Never ☐ 2-Several times a semester ☐ 3-Several times a month ☐ 4-Several times a week ☐ 5-Daily ☐ 6-Several times a day

33.	Please select the statement that best describes the frequency of technology use in your classroom for the purpose of music education.	☐ 1-Never ☐ 2-Several times a semester ☐ 3-Several times a month ☐ 4-Several times a week ☐ 5-Daily ☐ 6-Several times a day

34. Please select the statement that best describes the level of technology use in your classroom.

	1	I do not use technology, including the computer, for personal or professional use.
	2	I use technology in my home or classroom, including the computer for e-mail and/or menu driven programs and /or to search the web for teaching preparation.
	3	I use technology in my classroom including computer use for e-mail, for common software applications, and to search the web for teaching preparation. I am also aware of the national, state, and local technology standards and occasionally incorporate them into my lesson plans
	4	In integrate technology in the delivery of my lessons, depend on e-mail exchange with colleagues and students, use computer management tools, and rely on many software applications. I also expect my students to use internet and/or common software applications as class requirements. In addition, I am aware of the national, state, and local technology standards and occasionally incorporate them into my lesson plans
	5	I consider technology to be an integral component for all aspects of teaching and learning. I use multiple features of computer technology (presentation software, web page design, SPSS, and web quests) as needed in my classes. I am proficient in file maintenance, as well as maintenance of a computer system. My students are immersed in technology in the classes I teach. Additionally, I almost always incorporate national, state, and local technology standards into my lessons.

35. Please select the statement that best describes the level of technology use in your classroom for the purpose of music education.

	1	I do not use music technology for personal or professional use.
	2	I use music technology in my home or classroom.
	3	I use music technology in my classroom, including common music software applications.
	4	In integrate music technology in the delivery of my lessons. I also expect my students to use internet and/or common music software applications as class requirements.
	5	I consider music technology to be an integral component of teaching and learning in my classroom. I use multiple features of music technology as needed in my classes. My students are immersed in music technology in the classes I teach.

Technology Education			
	Statement	Hours	Please Describe
36.	How many hours of technology professional development have you received?		
37.	How many hours of music technology focused professional development have you received?		
38.	How many hours of direct technology training have you received in a higher education environment?		
39.	Was technology integrated into any of your teacher training courses?	☐ Yes ☐ No	☐ General Education ☐ Music Ensemble ☐ Music Methods ☐ Technology Lab ☐ Professional Education ☐ Private Lessons ☐ Other:

Open Ended Questions	
40.	How do you use technology, music or other, in your classroom?
41.	How do you think technology should be used in the teaching and learning of music?
42.	Is there anything else you would like to mention about your teaching experiences with computers?

Optional: E-mail (If you would like to receive the information on the finding of this study)

APPENDIX B:
Modifications of Original Test Instrument

The following modifications were made to the Technology and Professional Development Survey of Louisiana High School Teachers. The adaptations were made to answer the current research questions and remove irrelevant questions.

Questions Removed from Original Test Instrument

The following items were remover from the original survey due to irrelevance to current research. Item numbers refer to original instrument.

Item	Question
6	In what school district do you currently teach?
7	In what school do you currently do the majority of your teaching?
8	How do you classify your main teaching assignment at this school?
11	I have a computer with internet access available fo instructional use in my classroom.
12	I participate in collaboration with other teachers on issues of instruction that involve teaching with technology
13	I participate in mentoring/peer observation/coaching relative to the integration of technology in the classroom
14	I participate in a network of teachers that discusses/addresses technology in the classroom.
15	My school provides on-site technology support.
17	The following questions pertained to Louisiana Technology Initiatives. A. FIRSTTech B. Louisiana INTECH C. Louisiana INTECH 2 Science D. INTECH Social Studies E. PASS-PORT F. T.H.E. | QUEST
19	The following questions pertained to resources. A. Assistive Technology B. Bridging the Gap: UDL C. Computers for Kids (CLK) D. Making Connections E. Marco Polo State Partnerships F. Science Out of this World G. Statewide Distributive Learning Network/Louisiana Virtual School H. Technology Standards/Guidelines

20	The following questions pertain to instructional support. A. Teachers at the school site B. Principal at the school site C. Teachers at other school sites D. Technology coordinator/aide at school site E. District mentor, technology coordinator, or resource person F. Online Resources G. Other
30	A. Select your instructional Leader B. Which best describes you leaders managerial style.

Questions Adapted to Current Test Instrument

The following items are questions from the original survey that were modified to specifically address music technology. The original questions still also appear in the current survey. Item numbers reference both instruments.

Original Instrument		Current instrument	
Item	Question	Item	Question
2	In what year were you born?	2	What is your current age?
9	Computers and other technology for my classroom is sufficiently available.	8	Computers and other technology for the purpose of music education is sufficiently available.
10	I have a computer with internet access available for use at school.	10	I have a computer with appropriate music software and hardware available for use at school.
18	I use a computer at home for school related purposes.	19	I have a computer at home with music education related software that I use for school related purposes.
21	Using technology enhances student learning.	21	Using technology enhances student learning in music
22	I have many uses for technology in my classroom.	23	I have many uses for music technology in my classroom.
23	I feel confident in my ability to use technology.	25	I feel confident in my ability to use music technology.
31A	Please select the statement that best describes the frequency of technology use in your classroom	33	Please select the statement that best describes the frequency of technology use in your classroom for the purpose of music education.

31B	Please select the statement that best describes the level of technology use in your classroom.	35	Please select the statement that best describes the level of technology use in your classroom for the purpose of music education.
33	How do you think technology should be used to improve teaching, learning, and scholarship?	41	How do you think technology should be used in the teaching and learning of music?

Questions Added to Current Test Instrument

The following questions were added to the current survey. Questions were developed to resemble questions from original survey. Item numbers refer to current instrument.

Item	Question
6	What types of classes do you currently teach? (Check all that apply)
11	I have a computer available for instructional use in my classroom.
12	I have a computer with appropriate music software and hardware available for instructional use in my classroom.
13	I have student computers available for instructional use in my classroom.
14	I have student computers with appropriate music software and hardware available for instructional use in my classroom.
15	I have student computers available for instructional use in my school.
16	I have student computers with appropriate music software and hardware available for instructional use in my school.
37	How many hours of music technology focused professional development have you received?
38	How many hours of direct technology training have you received in a higher education environment?
39	Was technology integrated into any of your teacher training courses?
40	How do you use technology, music or other, in your classroom?

APPENDIX C:
Rotated Component Matrix for Two Components

Rotated Component Matrix for Two Components

	Component	
	1	2
q_7b	**.725**	.355
q_8b	**.661**	.221
q_9b	.420	.160
q_10b	.419	.543
q_11b	**.700**	.487
q_12b	**.665**	.446
q_13b	**.805**	-.121
q_14b	**.783**	.092
q_15b	**.543**	.348
q_16b	**.642**	.141
q_17b	**.589**	.104
q_18b	**.737**	-.115
q_19b	**.628**	.354
q_20	.418	**.610**
q_21	.473	.472
q_22	.557	**.646**
q_23	.557	**.742**
q_24	.205	**.758**
q_25	.118	**.689**
q_26	.415	**.563**
q_27	.480	**.700**
q_28	**.541**	.434
q_29	-.321	**.701**
q_30	-.350	**.780**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

APPENDIX D:
Summary of Data Reduction by Factor

The following is a summary of data reduction conducted for each Factor

Factor One: Degree of General Technology Implementation

Data reduction of Factor One was accomplished by obtaining the product of the two survey items relating to Factor One. The product of Item 32, Frequency of General Technology Use, and Item 34, Level of Technology Use, provides a number representing the Degree that General Technology is Implemented in the Music Classroom. The following equation represents this reduction.

$$\text{Factor 1} = Q32 * Q34$$

Factor Two: Degree of Music Technology Implementation

Data reduction of Factor Two was accomplished by obtaining the product of the two survey items relating to Factor Two. The product of Item 33, Frequency of Music Technology Use, and Item 35, Level of Music Technology Use, provides a number representing the Degree that Music Technology is Implemented in the Music Classroom. The following equation represents this reduction.

$$\text{Factor 2} = Q33 * Q35$$

Factor Three: General Technology Availability

Data reduction of Factor Three was accomplished through the summation of affirmative responses to the Survey Items relating to Factor Three. The resulting number provided a representation of the Availability of General Technology.

$$\text{Factor 3} = Q7a + Q9a + Q11a + Q13a + Q15a + Q17a$$

Factor Four: Music Technology Availability

Data reduction of Factor Four was accomplished through the summation of affirmative responses to the Survey Items relating to Factor Four. The resulting number provided a representation of the Availability of Music Technology.

$$\text{Factor 4} = Q8a + Q10a + Q12a + Q14a + Q16a + Q19a$$

Factor Five: Teacher General Technology Self-Efficacy

Data reduction of Factor Five was accomplished in two steps. The first step was the use of factor analysis to determine proper grouping of survey items. All items in Factor Five aligned as predicted, with the exception of Item 28, which was omitted from final analysis because it failed to group during the factor analysis. The second step consisted of finding the mean of the item responses related to Factor Five. The resulting number provided a representation of the Subject's General Technology Self-Efficacy.

$$\text{Factor 5} = (Q20 + Q22 + Q24 + Q26 + Q30) / 5$$

Factor Six: Teacher Music Technology Self-Efficacy

Data reduction of Factor Six was accomplished in two steps. The first step was the use of factor analysis to determine proper grouping of survey items. All items in Factor Six aligned as predicted. The second step consisted of finding the mean of the item responses related to Factor Six. The resulting number provided a representation of the Subject's Music Technology Self-Efficacy.

$$\text{Factor 6} = (Q23 + Q25 + Q27 + Q29) / 4$$

Factor Seven: Teacher Attitudes Towards Technology in the Classroom

Data reduction of Factor Seven was accomplished in two steps. The first step was the use of factor analysis to determine proper grouping of survey items. All items in Factor Seven aligned as predicted, with the exception of Item 9b, which was omitted from final analysis because it failed to appropriately group during the factor analysis. The second step consisted of finding the mean of the item responses related to Factor Five. The resulting number provided a representation of the Subject's Attitude Towards General Technology in the Music Classroom.

$$\text{Factor 7} = (Q7b + Q11b + Q13b + Q15b + Q17b + Q18b) / 6$$

Factor Eight: Teacher Attitudes Towards Music Technology in the Classroom.

Data reduction of Factor Eight was accomplished in two steps. The first step was the use of factor analysis to determine proper grouping of survey items. All items in Factor Eight aligned as predicted, with the exception of Item 10b and Item 21, which were omitted from final analysis because it failed to appropriately group during the factor analysis. The second step consisted of finding the mean of the item responses related to Factor Five. The resulting number provided a representation of the Subject's Attitude Towards Music Technology in the Classroom.

$$\text{Factor 8} = (Q8b + Q12b + Q14b + Q16b + Q19b) / 5$$

Factor Nine: Teacher Technology Education

No data reduction was required.

Factor Ten: Teacher Music Technology Training

No data reduction was required.

APPENDIX E:
Post-Data Reduction Reliability

Post-Data Reduction Reliability

Factor	Question by Number	Reliability*	
		Area	Research Question
1	32, 34	0.53(0.57)	
2	33, 35	0.59(0.62)	0.82(0.81)
5	24, 26, 30	0.69(0.69)	
6	25, 27, 29	0.58(0.58)	0.83(0.84)
7	7b, 11b, 13b, 15b, 17b, 18b	0.81(0.83)	
8	8b, 12b, 14b, 16b, 19b	0.87(0.88)	0.90(0.91)
			0.89(0.91)

*Note: Alpha(Standardized Items)

APPENDIX F:
HSCL Approval Letter

KU RESEARCH & GRADUATE STUDIES
The University of Kansas

7/14/2008
HSCL #17460

Shawn Agnew
8916 W 48th St
Merriam, KS 66203

The Human Subjects Committee, Lawrence Campus (HSCL) has received your response to its expedited review of your research project

17460 Agnew/Johnson (Music Education) Factors Influencing the Implementation of Technology in the Music Classroom

and approved this project under the expedited procedure provided in 45 CFR 46.110 (f) (7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

Since your research presents no risk to participants and involves no procedures for which written consent is normally required outside of the research context HSCL may waive the requirement for a signed consent form (45 CFR 46.117 (c) (2). Your information statement meets HSCL requirements. The Office for Human Research Protections requires that your information statement must include the note of HSCL approval and expiration date, which has been entered on the form sent back to you with this approval.

1. At designated intervals until the project is completed, a Project Status Report must be returned to the HSCL office.
2. Any significant change in the experimental procedure as described should be reviewed by this Committee prior to altering the project.
3. Notify HSCL about any new investigators not named in original application. Note that new investigators must take the online tutorial at http://www.rcr.ku.edu/hscl/hsp_tutorial/000.shtml.
4. Any injury to a subject because of the research procedure must be reported to the Committee immediately.
5. When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity. If you use a signed consent form, provide a copy of the consent form to subjects at the time of consent.
6. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.

Please inform HSCL when this project is terminated. You must also provide HSCL with an annual status report to maintain HSCL approval. Unless renewed, approval lapses one year after approval date. If your project receives funding which requests an annual update approval, you must request this from HSCL one month prior to the annual update. Thanks for your cooperation. If you have any questions, please contact me.

Sincerely,

Mary Denning

Mary Denning
Co-Coordinator
Human Subjects Committee Lawrence

cc: Chris Johnson

Human Subjects Committee Lawrence
Youngberg Hall | 2385 Irving Hill Road | Lawrence, KS 66045 | (785) 864-7429 | Fax (785) 864-5049 | www.rcr.ku.edu/hscl

APPENDIX G:
Participant Solicitation Email

Dear Fellow Music Educator,

I am currently gathering information for a study entitled *Factors Influencing the Implementation of Technology in the Music Classroom*. The purpose of this study is to examine how factors that influence the use of technology in education differ between general and music classroom. The results of this study have the potential to provide essential information on use of technology in the music classroom and help guide the improvement of future technology professional development for music teachers.

The Department of Music Education and Music Therapy at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish to participate in the present study. You should be aware that even if you agree to participate, you are free to withdraw at any time without penalty.

You can help me collect information on technology use by taking a brief survey about your own use of technology in your music classroom. The content of the questionnaires should cause no more discomfort than you would experience in your everyday life. Although participation may not benefit you directly, we believe that the information obtained from this study will help gain a better understanding of the factors influencing technology use in the music classroom.

By completing the survey, you are agreeing to participate in this study. Your participation in this study is completely voluntary. Your responses will be confidential and your identity will remain anonymous. It is possible, however, with internet communications, that through intent or accident someone other than the intended recipient may see your response.

The survey will require approximately 7-10 minutes of your time. In order for me to include your responses in my study, I'll need your information back by August 28th, 2008.

If you would like additional information concerning this study before or after it is completed, please feel free to contact us by phone or mail. Completion of the survey indicates your willingness to participate in this project and that you are at least age eighteen. If you have any additional questions about your rights as a research participant, you may call (785) 864-7429 or write the Human Subjects Committee Lawrence Campus (HSCL), University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7563, email dhann@ku.edu.

To participate in the survey, please follow the link below:

http://www.agnewthesis.com/thesissurvey.cgi?id=XXXX

If you cannot click the provided link, please copy the above web address exactly as it appears above into your preferred web browser.

I appreciate you taking time out of your summer schedule to complete this survey. If you have any questions or comments, please contact me through email at XXXXXX@ku.edu or by replying to this email. Your participation is essential to the success of my study and I truly appreciate your assistance.

Sincerely,

Shawn Agnew
Principal Investigator
Department of Music Education and Music Therapy
Murphy Hall
University of Kansas
Lawrence, KS 66045
(785) 864-4784
XXXXXX@ku.edu

Christopher Johnson, Ph.D.
Faculty Supervisor
Department of Music Education and Music Therapy
Murphy Hall
University of Kansas
Lawrence, KS 66045
(785) 864-4784
XXX@ku.edu

APPENDIX H:
Participant Follow-up Email

Dear Fellow Music Educator,

I recently sent you an email inviting you to participate in a survey on the use of technology in the music classroom. I appreciate that many of us are quite busy in the summer; however, your responses to this survey are very important to the success of this study and I again invite you to take a few minutes to complete the survey.

http://www.agnewthesis.com/thesissurvey.cgi?id=XXXX

Please note that I have attached the original invitation (see below) in the event that you did not receive the original. As I stated before, I'll need your survey responses by August 28th, 2008 in order to include them in my study results.

Again, thank you for your time in filling out the survey.

Sincerely,

Shawn Agnew

I am currently gathering information for a study entitled *Factors Influencing the Implementation of Technology in the Music Classroom*. The purpose of this study is to examine how factors that influence the use of technology in education differ between general and music classroom. The results of this study have the potential to provide essential information on use of technology in the music classroom and help guide the improvement of future technology professional development for music teachers.

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I appreciate you taking time out of your summer schedule to complete this survey. If you have any questions or comments, please contact me through email at XXXXXX@ku.edu or by replying to this email. Your participation is essential to the success of my study and I truly appreciate your assistance.

Sincerely,

Shawn Agnew
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