A Study of K-12 Music Educators' Attitudes Toward Technology-assisted Assessment Tools

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A STUDY OF K-12 MUSIC EDUCATORS' ATTITUDES TOWARD TECHNOLOGY-ASSISTED ASSESSMENT TOOLS

By

Lance D. Nielsen

A DISSERTATION

Presented to the Faculty of
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Major: Music

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The purpose of this study was to examine K-12 music educators’ attitudes regarding the use of technology in the assessment of music learning. There is a considerable range of musical behaviors with different levels of complexity that can be assessed (Boyle & Radocy, 1987). A variety of software and web-based assessment tools are available for music educators. However, it is unclear how many teachers are taking advantage of incorporating these technological assessment tools into their instructional practice. This study provided current data about the demographics of teachers using technology to assess musical growth and the variables that might motivate a music teacher to use technology-assisted assessment tools. A researcher-designed survey was administered to a stratified, random sample of K-12 music educators. A sample of 2,211 music educators, provided by MENC: The National Association of Music Education, was surveyed. The survey questions determined the number of teachers using technology-assisted assessment tools and the types of assessment tools they use. The mean score from a series of belief statements suggested teachers’ attitudes towards assessment practices and technology was positive. However, it was discovered that specific school and teacher factors had a generally small influence on their perceptions of technology-assisted assessment tools. It was evident that music teachers are
utilizing technology for daily instruction more often than to assist with assessment strategies. The factors of time and resources are two important variables that affect teachers' decisions regarding the use of technology for assessment in music settings, and future studies are needed to investigate effective professional development opportunities in training teachers to incorporate technology-assisted assessment tools with music instruction.
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I want to thank my close friends and colleagues, many of whom, are part of my extended family. Their heartfelt support and encouragement towards the completion of this dissertation has been an important part of my success. I especially want to thank a dear friend and music colleague, Becky Wilhelm, for her many hours of reading and editing this dissertation.

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DEDICATION

One member of my doctoral committee, Dr. John Lammel, unfortunately passed away before the completion of my dissertation. Dr. Lammel, a Senior Lecturer in Educational Administration, was a model educator and educational leader in the State of Nebraska. His thoughtful and dedicated leadership style coupled with his true love for the educational process was an inspiration. I enjoyed our many one-on-one conversations about the present and future trends of public education. He was extremely interested and hopeful of the ever-changing role of instructional technology on student learning.

This dissertation is dedicated to the memory of Dr. John Lammel.
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CHAPTER 1
INTRODUCTION TO THE STUDY

Statement of the Problem

In the national debate over school reform, the underlying theme has been accountability for student learning. Therefore, educational leaders have refocused their efforts in developing and promoting best practices of instructional strategies and assessment approaches within their schools. Assessment is an indispensable component of the learning process. The Elementary and Secondary Education Act (ESEA) reauthorized in 2001 as part of the No Child Left Behind initiative, and the current ESEA reauthorization proposal, A Blueprint for Reform, emphasize the importance of holding teachers and schools accountable for student learning. Along with this renewed emphasis on raising educational standards, the holistic view of 21st century learning skills which promotes critical thinking and problem solving, communication, collaboration, and creativity and innovation seems to be a driving force in curricular planning (Partnership for 21st Century Skills, 2009).

Assessment of music learning has been a highly studied topic in music education. Within the music education literature, numerous articles and research studies have promoted assessment on music learning in the classroom (Colwell, 2002). In 1994, The National Standards for Music Education, as outlined in The School Music Program, A New Vision (1994), were adopted. As a result, music educators were provided a framework in which to develop a comprehensive music curriculum with elaborate learning concepts that may be assessed (Shuler, 1996). Since 1971, The National Assessment of Educational Progress (NAEP) has conducted
four arts assessments. The NAEP assessments provided data on the progress of students' knowledge and skill based-learning in the arts. This has been the only national test that has tracked the progress of music instruction. Nevertheless, due to the lack of funding and clarity of a consistent measurement tool, the data gathered can only simply provide a snapshot of the status of arts education. Therefore, individual state and local school districts have developed their own arts standards and benchmark assessment protocols.

In the current educational climate, data-driven decisions about best practices in teaching strategies and assessment of learning have become the major focus for all content areas, including school music programs. Curriculum specialists are implementing research-based strategies in order to improve student success in schools regardless of demographical descriptors of race, gender, or socio-economic status. Some scholars argue that this focus on assessment is not because there is a true interest in the assessment of students, but is caused by the state testing movement and accountability initiatives (Hoffer, 2008). Assessment outcomes are not always concerned with individual student growth but are more focused on the overall effectiveness of a program or school. Asmus (1999) suggested, "While the ultimate purpose of assessment is ensuring the most effective instruction possible to enhance student learning in music, assessment can also be used to determine the effectiveness of the teacher and the instructional program" (p. 22). Other advocates for music assessment have emphasized that proper assessment may provide evidence of musical growth, identify talented students, validate music programs and teacher effectiveness, motivate students to learn, and provide evidence of
accountability (Boyle, 1992; Brophy, 2000).

A crucial reason assessment is needed in the learning process of music is that students need feedback to develop a sense of their own learning (Abels, 2010). Two methods of assessment, informal and formal, are needed in the overall evaluation of a student’s musical growth. The informal method, referred to as formative assessment, provides immediate feedback to students and teachers during the course of instruction. Summative assessments are the formal benchmarks that are measured at the completion of a period of instruction whether it is the end of a unit of study or the end of a grading period. Stiggins (2007) described the objective measure of student achievement as assessments of learning, and the process-oriented measurement that promotes student engagement in their own learning and self-reflection as assessments for learning. A balance between the two types of assessments is important, however, assessments for learning tend to be absent in most curricula.

The use of technology for instruction and assessment has also caused a debate among educational scholars. In his book Oversold and Underused (2001), Larry Cuban contends that after all the time and money spent on technological equipment and software, there has been little evidence of academic achievement and transformations in teaching and learning techniques. His view, although being somewhat outdated and cynical of instructional technologies, has spearheaded important conversations on how to infuse technology into effective instruction. Becker (2000) argued that when constructivist-oriented teachers have the necessary resources and have a reasonable level of experience and skill in using
computers, computers have proven to be a valuable and well-functioning instructional tool.

Standards and guidelines for the integration of instructional technology into classroom practice have been created by local school districts, accrediting and professional organizations such as the National Council of Accreditation of Teacher Education (NCATE, 2000) and the International Society for Technology in Education (ISTE, 2008). One of the most widely used research-based books for school improvement by public school administrators has been Classroom Instruction That Works: Research-based Strategies for Increasing Student Achievement (Marzano, Pickering, & Pollock, 2001). This staff development approach was based on a meta-analysis on effective instructional practices conducted by the Mid-continent Research for Education and Learning (McREL). Since that original book, a new technology resource guide has been published which describes how technology can support the nine instructional strategies, as defined by Marzano and Kendall (2007). Within the body of research, it has been determined that the use of technology in the classroom has a positive influence on student learning when the learning goals are clearly articulated prior to the use of technology (Ringstaff & Kelly, 2002; Schacter, 1999). Russell and Sorge (1999) cited increased positive student attitude towards school, enhanced inquiry, and the promotion of problem solving skills as important outcomes of integrating technology with learning.

Technology can also transform music teaching and learning. Two recent literature reviews on computer-based research were conducted in an attempt to summarize the development of technology in music education (Webster, 2002;
Webster, 2007). Recent studies on the use of technology in music teaching have described trends in music educators' use of technology (Bauer, Reese, & McAllister, 2003; Reese & Rimington, 2000; Taylor & Deal, 2000). Although this research has been valuable, it is difficult to maintain current research data on technology-assisted teaching practices due to the constant changes and updates in technology.

Numerous computer-aided tools may be used for assessing students’ musical knowledge and performance skills. Rudolph (2004) divided music computer-aided instruction (CAI) into three categories of tool, tutor, and tutee. This framework provides a foundation of how technology can fit into a typical educational framework of teacher, learner, and curriculum. The tool software category includes any program that assists in the creation of music. Notation software such as Finale and Sibelius are two examples of tools that may assist teachers in the development of instructional and assessment activities. The tutor category includes CAI software that assists educators and students in the learning and assessment of music skills and knowledge. SmartMusic—interactive music software that allows students to practice and be assessed on music exercises—is an example of a tutor program. This software not only records a student’s performance of a musical selection, but also provides immediate feedback of their musical progress. This immediate feedback is essential and has proven to help a music student be more engaged in his or her own learning (Flanigan, 2008; Glenn, 2000; Lee, 2007). Interactive Pyware Assessment Software (iPAS) is another assessment instrument that is used most commonly with music method books such as the Standard of Excellence Enhanced Comprehensive Band Method. The last category, tutee, refers to computer and web-based programs
that allow individuals to create materials that other people can learn from. There are a number of online rubrics and music rubric designs that are easy for music teachers to adapt to their own classroom needs. Music theory and appreciation websites can also expand the opportunities for authentic assessments. One commonly used website, musictheory.net, provides online lessons, exercises, and quizzes on music theory.

Colwell (2002) noted that computer use in assessment holds considerable potential if the music educator is willing to devote the time and resources in developing assessment strategies that connect instruction, learning, and testing. The use of technology can be helpful to the teacher if the assessment tool meets the goal of authentic assessment. Although, the current research literature does not contain much data on the use of technology-assisted tools for the purpose of assessing music learning. One of the hurdles in the integration of technology with music education is the need for professional development. Teachers are not always afforded the professional time to learn new technologies let alone learn how to incorporate them into already established lesson plans. Two recent studies (Reese & Rimington, 2000; Taylor & Deal, 2000) found that most music educators are using technology in school more for administrative tasks rather than classroom instruction. They also discovered that 94% of music educators studied had a significant desire to learn more about technology. Contrastingly, only 25% of the teachers indicated that they were afforded technology training in their college music education program. Only 13% of school districts reported providing more than one technology professional development opportunity per school year.
Attitudes towards assessment and technology have found to be influenced by a number of teacher demographics. The Fishbein and Ajzen (1975) framework about attitude and behavior was rooted in the concept that attitudes are based on established beliefs and that beliefs are formulated by the experiences and knowledge of the individual. This framework has guided past research on individuals' reactions, intentions, and actual implementation of a new concept, whether that be a technology-based tool, new procedure, or instructional and assessment strategy.

A teacher's demographics in regard to educational background, work experience, and technology training will influence assessment integration into classroom instruction and student learning (McCoy, 1991; Russell & Austin, 2010; Simanton, 2000). Past research studies regarding gender differences in attitudes towards music and technology indicated that females have more positive attitudes towards music and males are more likely to use technology (Comber, Hargreaves, & Colley, 1993; Folkestad, 2007). Comber, Hargreaves, & Colley (1993) discovered that through experience of working with computers and music technology, students of both genders understand the potential of technology in music, therefore, changing their attitudes towards music technology. Gender differences in the perceptions of technology have narrowed in recent years (Nicolino, Fitzgerald, Maser, & Morote, 2006). Nevertheless, Folkestad (2007) stated that even though very few studies have continued to look at gender issues with regard to music and technology, it is still an important core variable to consider in future research.
Technology is the norm for most students in today’s classrooms. The students’ methods for learning are different from the methods their teachers may have used when they were students. Therefore, music educators must learn how to infuse technology into music instruction and assessment strategies. Educational leaders of both in-service and pre-service professional development courses must be willing to support this change with the appropriate resources and teacher training sessions. The goal of this research was to bridge the gap between two bodies of current research literature: research on attitudes regarding assessment and research on attitudes concerning music technology.

**Purpose of the Study**

The purpose of this study was to examine K-12 music educators’ attitudes regarding the use of technology in the assessment of music learning.

**Research Questions**

The following specific questions were addressed in this study:

1. How many music educators are using technology-assisted assessment tools, and what types of assessment tools are being utilized?

2. Is the attitude of music educators generally positive or negative toward using technology in the assessment process?

3. How do school setting factors influence music educator’s attitudes regarding the use of technology in the assessment of music learning? This question was divided into two parts:

   3a. Do certain types of professional development experiences influence music educators’ attitudes towards using technology-assisted assessment
tools?

3b. Do school setting and primary level of teaching assignment influence music educators’ attitudes towards using technology-assisted assessment tools?

4. To what extent do music educator demographic factors of gender, level of educational degree, and years of music teaching experience influence music educators’ attitudes about technology-assisted assessment tools?

Definition of Terms

Assessment: According to Colwell (1992), assessment refers to a considerable body of data that has the potential to diagnose and provide clues to causes. The terms measurement and testing can be used interchangeably as the smallest unit in assessment. Tests are the method of gathering objective data and measurement involves the quantification of the test data (Boyle & Radocy, 1987). Evaluation is a broader term defined as judgments based on the data collected from a measurement or test.

Attitude: An attitude is a hypothetical construct that represents an individual’s degree of like or dislike for an item, idea, or concept. Cutietta (1992) described attitude as “a firmly held mental network of beliefs, feelings, and values that is organized through an individual’s experiences, and that exerts a directive and dynamic influence on the individual’s perception and response to all objects and situations with which it is related” (p. 296).

Technology-Assisted Assessment Tools: For this study, technology-assisted assessment tools included hardware, software, and web-based
programs/applications that enable a teacher to collect data on students’ music
knowledge and musical skill development.

*Professional Development:* Educators’ professional development may take on
various meanings. With regard to technology skills, Grant (1996) provided the
following definition:

Professional development ... goes beyond the term ‘training’ with its
implications of learning skills, and encompasses a definition that includes
formal and informal means of helping teachers not only learn new skills but
also develop new insights into pedagogy and their own practice, and explore
new or advanced understandings of content and resources. [This] definition
of professional development includes support for teachers as they encounter
the challenges that come with putting into practice their evolving
understandings about the use of technology to support inquiry-based
learning. (p. 72)

**Theory**

The theoretical model for this study was based on the conceptual framework
regarding attitudes and behavior developed by Fishbein and Ajzen (1975). This
framework was rooted in the concept that attitudes are based on established beliefs
and that beliefs are formulated by the experiences and knowledge of the individual.
The Fishbein and Ajzen model has been utilized in other inquiries in music
education that have focused on attitude as a variable (Hanzlik, 2001; von Kampen,
2003).
The theory of reasoned action (TRA) was a continuation of Fishbein and Ajzen's original work and has had considerable implications on consumer behavior research especially in the area of mobile Internet technology (Davis, 1989). The technology acceptance model (TAM) was an adaptation of TRA and was first introduced by Davis (1989). This model focused on a person's individual perception of the technology and its value and ease of use (see Figure 1).

![Diagram of user acceptance models](image)

*Figure 1. Basic concept of underlying user acceptance models (Davis, 1989; Venkatesh et al., 2003)*

Davis (1989) defined perceived ease of use as the degree to which a person believes that using a particular system or tool would be free from effort. Kaasinen (2005) expanded the above framework to include trust and ease of adoption. This model has become a standard in studying consumer use of mobile access to Web services (see Figure 2). Trust indicated a positive belief about the reliability of a technological tool, or in this case, mobile service. Ease of adoption was another stage that the researchers found to have an effect on the decision to use technology. If a
user was unaware of services or unable to anticipate problems with a mobile service, the motivation to continue was lower.

Figure 2. Technology Acceptance Model for Mobile Services (TAMM) (Kaasinen, 2005)

A parallel statement can be made about the teacher’s decision to use technology-assisted assessment tools in his or her classroom. A teacher’s perceived ease of use and perceived value is factored into the decision-making process when determining to use an assessment tool. A teacher must also trust that the assessment tool will do what it is intended to do. By combining the Fishbein and Ajzen model of attitudes and beliefs to TAM as used in technology consumer research, a theoretical framework for this study was formulated (see Figure 3).

The factors that may influence teachers' use of technology can be divided into two categories: (1) school demographic factors, and (2) teacher demographic factors. The school demographics are comprised of the following variables: (1) time including both class instructional time and professional development time with
regard to learning and developing assessments using technology, (2) technology resources, (3) school setting including size and location, and (4) professional development opportunities. Teacher demographics include the following variables: (1) primary teaching area, (2) gender, (3) years of teaching experience, and (4) level of education. The comfort level in learning and using technology is resembled in this model as the perceived ease of use.

![Figure 3. Theoretical model: Factors influencing the decision to use Technology-Assisted Assessment Tools.](image)

**School Factors**

In previous research studies, certain school factors have been identified that influence the use of assessment strategies and technology. The size of school and school location has had an impact on the focus on assessment and the types of
technology available to teachers (Hanzlik, 2001; McCoy, 1991; Simanton, 2000). Time has been shown to affect a teacher's decision to incorporate assessment strategies into instruction (Kotora, 2005; Nightingale-Abel, 1994; Tracy, 2002). Time has also been an issue in learning and integrating technology into already established teaching and assessment strategies.

There is evidence of a continued need for training and support in the music profession regarding assessment strategies (Shuler, 1996; Brookhart, 2001; McMunn, Schenck, & McColskey, 2003; Mertler, 2004). In order to keep current with the constant evolution of technological tools and practices, professional development opportunities need to improve and occur more often (Bauer et al., 2003; Cain, 2004; Cuban, 2001). Assey (1999) asserted that arts educators must first learn how to use the hardware and software followed by training on how to develop lesson plans that integrate the new technology. Besides training and support, the availability of technological resources in schools has had an obvious impact on teachers' use of technology (Bauer, et al, 2003).

Teacher Factors

Teacher demographics of experience and training are shown to have an influence on the use of assessment strategies (McCoy, 1991; Simanton, 2000). Assessment and grading practices are influenced by teaching level and specialization (McCoy, 1991; Russell & Austin, 2010). According to the Bauer, Reese, and McCallister (2003) study on technology professional development, the factors of years of experience, academic degrees, and areas of music teaching were found to be fairly neutral with some slight differences in the gender variable. The authors
explained that the differences in gender might be related to self-efficacy (Bauer, 2003) and familiarity (Fung, 2003) with technology. The statistical gap of females and males in the comfort level has narrowed in the last decade (Nicolino, Fitzgerald, Maser, & Morote, 2006). As conveyed in the statement of the problem, Folkestad (2007) promoted the inclusion of gender issues with regard to music and technology in future research for the continuation of tracking any future fluctuations in this trend.

Teachers' comfort level with using technology has had an impact on whether they are willing to incorporate it. Comfort levels in conjunction with technology professional development were found to be a major component of a successful teacher in-service (Schrum, 2001). However, in the study conducted by Bauer et al. (2003), teachers' high comfort level and knowledge after a ten-month period following a technology in-service had no long-term impact on teacher usage of technology in the classroom. Due to the contradiction of the effectiveness of technology professional development opportunities, this researcher included this aspect as a variable in this study.

**Basic Assumptions**

In studying how music educators' attitudes and demographics influence their use of technology-assisted assessment tools, the following assumptions were made:

1) It was assumed that teacher attitudes might be measured. An attitude is representative of an individual's degree of like or dislike towards an item or thought. According to Fishbein and Ajzen (1975), beliefs, attitudes, and
intentions can be empirically distinguished and that reliable and valid techniques for measuring these concepts are available.

2) It was assumed that a teacher’s decision to use any type of technology tool, whether for instructional or assessment purposes, reflects the TAM consumer framework as designed by Davis (1989) and Kaasinen (2005). As with consumers of technology, teachers will progress through a series of stages that reflect their comfort level in learning and using new technology.

3) It was assumed that teachers who do not place a high value on the assessment process were not interested in learning how to use technology-assisted assessment tools. Teachers who do not have a clear understanding of the reasons for assessment will find little value in learning a variety of technology-assisted assessment tools.

Delimitations of Study

The participants selected for this study were members of MENC, the National Association for Music Education, that teach K-12 general music, vocal, and instrumental music. This random sampling provided a representation of current trends across the country; however, it was unknown to the researcher if every state was included in the sample.

There are a number of variables that can influence a music teacher's perceptions and attitudes about using technology-assisted assessment strategies. For the purpose of this study, teacher demographic factors were delimited to gender, years of teaching experience, level of education, and primary grade level the teacher was teaching. The primary teaching assignment including choir, band,
strings, and general music was only reported as a descriptor of the participants due to the large number of teachers that teach multiple assignments. The school factors that were considered are school setting, technology resources, and professional development opportunities. Professional development was divided into two specific types, pre-service and in-service training. Music teachers that indicated on the survey that they were not current K-12 music teachers were eliminated from the study.

**Methodology**

This section briefly describes the methods and procedures that were used in the design of the study and are organized as follows: (1) subjects, (2) personnel and facilities, (3) materials and equipment, (4) procedure, and (5) design of the study.

**Description of the Population**

The subjects for this study included 2,211 music educators that are MENC members. MENC: The National Association of Music Education provided the researcher with a stratified, random sampling of K-12, elementary, middle level, and high school teachers that teach general music, vocal music, or instrumental music classes. The sample was created by selecting random emails from categories of primary grade level taught and music area of interest as selected by teachers on their MENC membership application.

Demographic information collected about the teacher participants included a description of music content areas they taught: elementary general music, choir, band, and strings. Participants were asked to indicate additional teaching areas such as guitar and music appreciation classes on a free-response question. Grade levels
were classified into four categories: elementary, middle level, high school, and a combination for teachers that teach multiple grade levels such as K-8 or K-12.

School setting included urban, suburban, and rural. Personal teacher demographical information included gender, number of years of teaching experience, and highest professional degree earned.

**Personnel and Facilities**

Personnel for this study included the MENC staff in formulating the random sampling and the music teacher participants. Each participating music teacher used the Internet to complete the online survey on either a school or personal computer. In the design stages of the survey, the researcher utilized a sampling of music teachers from one large Midwest school district in order to establish reliability and validity of the survey instrument. The researcher also enlisted the assistance of the staff of the Nebraska Evaluation and Research (NEAR) Center at the University of Nebraska–Lincoln for data analysis.

**Materials and Equipment**

The researcher purchased a monthly subscription to *SurveyMonkey*, online survey software, which was used as the instrument tool for this study. This survey service provided unlimited questions, a quick and simple data collection, and secure data storage of the survey responses. The researcher also utilized the *Statistical Package for the Social Sciences* (SPSS) Version 18 during the data analysis process. The researcher designed a survey including questions divided into six categories: (1) research study consent, (2) use of instructional technology in music, (3) use of technology-assisted assessment tools, (4) professional development, (5) teacher
perceptions on music assessment and technology (PMAT), and (6) demographics. The survey questions were formulated based on current research and the theoretical model for this study.

A table of specifications was created in order to guide the researcher in the development of the survey instrument. Five constructs (factors) that were used included: (1) technology ease of use, (2) beliefs about assessment, (3) beliefs about technology, (4) familiarity, and (5) endorsement by the experts. A pilot survey was conducted with music teachers from an area school district in order to test the reliability and face validity of the survey questions. Thirty-eight music teachers participated in the initial pilot study. The teachers were asked to provide feedback at the conclusion of the study about survey content, clarity of instructions, and survey format to help establish face validity. The comments were positive with a few suggestions for rewording and restructuring certain questions especially on the teacher perception section of the survey. The researcher revised the survey based on the pilot study feedback and submitted the final version to a six-person panel for review of content validity. The panel included two university professors, two doctoral students, and two music education colleagues. A final pilot run of the survey was conducted to another group of music educators in order to establish an estimated reliability coefficient of the instrument.

**Procedures**

The procedures necessary to conduct this investigation began with the creation of an instrument tool. An online survey was developed and piloted by the researcher. A survey approach is a frequently used research method designed to use
data gathered from a group of people to describe relationships (Abeles & Conway, 2010). The attitude assessment portion of the survey included 22 belief statements with questions stated in both the negative and positive context. Participants were asked to indicate their feelings about each belief statement using a 5-point Likert scale ranging from *Strongly Disagree* to *Strongly Agree*. A mean score on the attitude assessment section that was recorded higher than 3 was considered a positive score.

After the researcher obtained campus Institutional Review Board approval for this survey study, an email contact, which included the description and purpose of the study as well as an invitation to participate, was initiated with each participant. A web-based survey was administered electronically to the participants. The link to the survey was included in the initial contact. The survey took less than fifteen minutes to complete. Two follow-up emails were sent to participants at seven and ten days after the initial email reminding the music teachers to complete the survey by the assigned deadline.

**Design of the Study**

This study was classified as a non-experimental, quantitative method and was based on the theoretical model for this study. The study design was intended to find whether or not select school and teacher factors have an influence on teachers’ attitudes towards the perceived value of new technologies and the intention to use technology for the assessment of music learning.

The researcher designed the survey instrument, which was administered as a one-time test measurement. Two important measures of survey quality are
reliability and validity. Although a common method of determining reliability of a test instrument is the test-retest format, it is not recommended for attitude measurement (Adams, 1982). The survey questions were modeled after other assessment studies found in the literature in order to establish content validity. A pilot study of the survey tool was conducted with a population of music educators from a local school district with a response rate of \( n = 38 \). The pilot participants were asked to provide feedback about the survey. This helped establish both the reliability of the instrument and face validity of the survey instrument. The final version of the survey was reviewed by a panel of music education experts, as explained in the materials and equipment section, and a second pilot study was implemented with a second group of music teachers \( (n = 21) \). Two questions were eventually eliminated from the PMAT portion of the survey, which increased the coefficient of reliability of the instrument to \( (\alpha = .76) \).

**Data Analysis**

The data analysis for this study described the population of music teachers that utilize technology-assisted assessment tools in music instruction. For each of the research questions, there were different data analysis procedures.

**Research question 1:** How many music educators are using technology-assisted assessment tools and what types of assessment tools are being utilized?

Simple descriptive statistics were used to report the number of music educators using technology as a part of their assessment strategies, as well as to describe the types of assessment tools the teachers were actually using in their music classroom.

**Research question 2:** Is the general attitude of music educators positive or
negative toward using technology for assessment? Descriptive statistics, \( t \)-tests, and a one-way analysis of variance (ANOVA) were used to answer this baseline question. Responses on a set of 22 belief statements about assessment and technology were gathered using a Likert scale. Likert descriptors were assigned a 5-point numerical scale. A mean higher than 3.0 was chosen to be an indication of a positive attitude by a teacher regarding the use of technology-assisted assessment strategies.

The second section of this study examined inferential data of possible effects on teachers’ attitudes. A factorial design was utilized for data analysis. The advantages to a factorial design are that multiple experiments can be conducted simultaneously, extraneous variability can be controlled leading to lower experimental error and increased power, and any interactions between the independent variables can be determined.

Research question 3: How do school setting factors influence music educator's attitudes regarding the use of technology in the assessment of music learning? This question was divided into two parts:

3a. Do certain types of professional development experiences influence music educators' attitudes towards using technology-assisted assessment tools?

3b. Do school setting and primary level of teaching assignment influence music educators' attitudes towards using technology-assisted assessment tools?

Three factors were examined: (1) type of professional development experience, (2) school setting, and (3) primary level of teaching assignment. The dependent variable
was attitude concerning usage of technology-assisted music assessment tools. The data was analyzed using descriptive statistics, a one-way ANOVA for question 3a, and a 3 x 4 factorial ANOVA for question 3b.

**Research question 4:** To what extent do music educator demographic factors of gender, level of educational degree, and years of music teaching experience influence music educators' attitudes about technology-assisted assessment tools? This question had three main subsets; (1) gender, (2) level of educational degree, and (3) years of music teaching experience. A 2 x 3 x 4 factorial ANOVA was used to analyze the overall interactions between all teacher and school factors.

**Significance of the Study**

Technology is constantly being revised and improved. Educators receive new and updated software and web resources at a quicker rate than a few years ago. Furthermore, the emphasis on both formative and summative assessments in all classes by school leaders has required educators to learn and implement various assessment strategies. There are a variety of technology-assisted assessment tools available that music teachers may implement into their current assessment practices. However, it is unclear how many teachers are taking advantage of incorporating these technological assessment tools into their instructional practice.

This study provided insight on which music teachers are using technology and the reasons teachers have chosen to use or not use technology-assisted assessment tools in music. Based on prior research, there are various school and teacher factors that may influence a music teacher's intended use to the actual use of
technology. As the body of research literature on this subject is not of sufficient breadth to draw definitive conclusions and because the quality and quantity of technology-assisted assessment tools is constantly changing, this research would seem to be important in addressing these needs. This study will aid in the data-driven decision-making required of music education teacher educators and school administrators in their attempt to provide effective professional development and training for pre-service and in-service music teachers in the use of technology-assisted assessments.
CHAPTER 2

REVIEW OF THE RELATED LITERATURE

Overview

This survey method study was designed to examine K-12 music educators' demographics and their attitudes towards using technology upon their decision to utilize technology-assisted assessment tools. In order to establish the parameters for this study, a general search of the literature was conducted utilizing a variety of databases, journals, websites, and bibliographic resources from such electronic search engines as the EBSCO database, ERIC, JSTOR, and Google Scholar. There were two overarching bodies of research literature that assisted in developing the current study: assessment and music technology. Coupled with studies about attitude formation which served as the dependent variable for this study, the literature review is divided into six sections: (1) assessment theories and practice in education and arts education, (2) trends in music technology, (3) technology-assisted music assessments, (4) attitude studies in music education, (5) influences of teacher demographics on technology use, and (6) music teacher professional development.

Assessment Theories and Practice in Education and Arts Education

The rationale for assessment is to determine how well students are learning. Evidence of student learning will occur if instruction and assessment are integrally related. There must be a direct connection between the curriculum and what the student is expected to know (Colwell, 2002). According to Pellegrino, Chudowsky, & Glaser (2001), there are three foundational elements that comprise the assessment
triangle: cognition, observation, and interpretation. In other words, students must
develop knowledge and competence in a subject area, educators must have ample
opportunities to observe students' performances in that area, and a method of
interpretation must exist that draws inferences about the students' performances.

In the current educational climate, data-driven reflections and decisions about
best practices within all content areas are targeting massive school reform
initiatives both at the local and national levels. The *Elementary and Secondary
Education Act of 1965* (Public Law 89-10) was a pivotal piece of legislation in
reforming American education. The law recognized and supported the importance
of the arts, which received financial support through funds under Title I.
Throughout the years with subsequent reauthorizations of the law; the focus has
shifted to the importance of basic skills of reading and math. Even though the arts
were still included in the language as "academic core" subjects in the *No Child Left
Behind Act* (NCLB) of 2002, the political ramifications of requiring only reading and
math testing to determine academic success has caused the other subject areas to
take a back seat. If a state does not meet the NCLB requirements in reading and
math, they may lose funding for federal supported education programs.

The recent ESEA reauthorization proposal, *The Race to the Top Initiative*,
continues to mandate that educational systems show improvement of student
learning and teacher effectiveness in all schools. The ultimate goal is to improve
student learning for all students regardless of socio-economic background, gender,
and race. These school reform ideas have had a direct impact on how we evaluate
the effectiveness of music education programs. The National Assessment of
Educational Progress (NAEP) arts assessment is a national assessment intended to give a perspective on what students across America know or can do in the arts. Due to budget concerns and the fact there were large gaps of time in between assessments, the outcomes of the test have had little impact on arts education. State standards and large-scale assessments in the arts have also been developed to evaluate the status of music at the local level. However, not all states have achieved this goal. Two distinct trends have appeared for state-level assessments: states that have eliminated expensive performance measures for cheaper and easier administrative formats and a blended effort that includes methods of state, district, and classroom assessments in which to represent student achievement (Philip, 2001).

Some scholars argue this renewed focus on assessment is not because there is a true interest in the assessment of students, but because of the state testing movement and accountability initiatives (Hoffer, 2008). The focus on assessment is not always centered on individual student growth, but more on the overall effectiveness of a program or school. According to Asmus (1999), "while the ultimate purpose of assessment is ensuring the most effective instruction possible to enhance student learning in music, assessment can also be used to determine the effectiveness of the teacher and the instructional program" (p. 22). Other music assessment advocates emphasize that proper assessment may provide evidence of musical growth, identify talented students, validate music programs and teacher effectiveness, motivate students to learn, and provide evidence of accountability (Boyle, 1992; Brophy, 2000). Cronbach, as stated in Colwell (1992), was not in favor
of the standards-based model; he supported the formative approach to evaluation over the summative approach in program evaluation. Colwell stated, "Cronbach's stance is that philosophical and conceptual beliefs are more powerful than lists of significant and non-significant differences; thus theories can be more successful in changing behaviors than lists of consequences for failure to change" (p. 1137). Colwell also concluded that this way of thinking, unfortunately, does not hold any clout within the political landscape of education. Equality for all participants regardless of socio-economic status, gender, and race when determining the allocation of resources prevails over individual achievement.

The fundamental principal of learning theory is that assessment strategies must provide students with immediate feedback in order for them to develop their own sense of learning (Dilger & Roland, 1993; Abeles, 2010). Within the literature, there are various assessment terms used to describe this process. Evaluation and assessment are sometimes used interchangeably. According to Colwell (1992), assessment refers to a considerable body of data that has the potential to diagnose and provide clues or answers to causes and problems. The terms measurement and testing are commonly used interchangeably as the smallest unit in assessment. Nonetheless, there is a clear distinction between the two terms. Tests are simply the method of gathering objective data and measurement involves the quantification of the test data (Boyle & Radocy, 1987). Evaluation is a comprehensive term defined as judgments based on the data collected from a measurement or test. Additional assessment terms are used based on their purpose. An informal assessment method, referred to as formative assessment, provides immediate feedback to students and
teachers during the course of instruction. Summative assessments are formal benchmarks measured at the completion of a period of instruction whether it is at the end of a unit of study or at the end of a grading period. What is sometimes missing is a balance of assessment approaches that promotes learning during instruction. Fautley (2007) defines assessment for learning as a way to review a student’s work, which will have a direct benefit on them in the future. Fautley (2007) stated:

Assessment for learning in music is therefore concerned with improving and developing the musical work which pupils present, be it composing, performing, or listening, and arises in a natural way out of the work which is done on a day-to-day basis in the classroom (pg. 1).

Rather than focusing on assessment at the end of the teaching and learning process as shown at the top of Figure 4, assessment for learning should be woven into the overall learning process.

*Figure 4.* Mode of Instruction, Linear Progression compared to Integration Model, Fautley, 2007.
Fautley (2007) summarized the 1999 Assessment Reform Group guiding principles of assessment for learning as follows: (1) embedding a view of teaching and learning together, (2) sharing learning goals with students, (3) assisting students in knowing and recognizing the standards they are trying to achieve, (4) providing opportunities for student self-assessment, (5) providing feedback that will guide students in the next steps in the learning process, (6) involving both teachers and students in the review and analyses of assessment data, and (7) establishing the concept that all students can improve.

Assessment issues in music are complex, but an essential part of the music education field (Nierman, 1985; Boyle, 1992). Several of the empirical research studies conducted on music assessment have utilized the survey approach. Studies on assessment in elementary music (Barkley, 2006; Carter, 1986; Nightingale-Abell, 1994; Tally, 2005) and secondary music (Hanzlik, 2001; Hill, 1999; Kancianic, 2006; Kotora, 2005; McClung, 1996; McCoy, 1988; Russel & Austin, 2010; Sears, 2002; Sherman, 2006; Simanton, 2000; Tracy, 2002) have characterized the usual trends of music assessment approaches. Educator demographics of teaching experience and training have shown to have an influence on the use of different assessment strategies (McCoy, 1991; Simanton, 2000). Also, assessment and grading practices are influenced by teaching level and specialization (Russell & Austin, 2010). Trends indicate that assessment practices tend to focus on informal and subjective grading standards including participation, effort, attendance, and attitude (Barkley, 2006; Carter, 1986; McCoy, 1991; Nightingale-Abell, 1994; Russel & Austin, 2010). Due to the elective nature of music classes and the fact that music may be considered a co-
curricular content area, music grades tend to be higher and subjective compared to
general education disciplines (Bridgham, 1973; Dietrich, 1973; Johnson, 2008). One
of the challenges facing music educators is the typically large size of classes,
especially in a performance-based class. It is difficult for music educators to provide
immediate feedback to each student in a class of 25 or more students. Consequently,
performance-based classes tend to grade on attendance, practice records, and other
non-achievement standards whereas elementary and middle level teachers tend to
focus on knowledge-based and achievement practices. On the other hand, the
general literature in music education suggests assessing achievement based on
extra-musical skills should not be encouraged (Abeles, Hoffer, & Klotman, 1994;
Boyle & Radocy, 1987; Colwell, 2008; Lehman, 1999). The evaluation process
requires a specific decision making process. Boyle and Radocy (1987) explained
that, "evaluation decisions are better when they have a strong information base, that
is, a base including both subjective and objective information...an information base
without appropriate objective information is inadequate for most educational
decision making" (pg. 2).

The argument that the evaluation of visual and performing arts are
subjective in nature has perpetuated further discussions on music assessments.
Assessment in music education cannot rely simply upon the evaluation of
performance or cognitive knowledge of music; the significance of assessment
models in the promotion of aesthetic sensitivity is important as well (Creasy, 1997).
This subjective manner of grading that focuses on aesthetic elements leads to
another challenge for music educators; that of establishing reliability in the inherent
subjective nature of performance-based assessments. Music as an art form requires a sense of personal feeling and reflection that may be perceived differently from one person to another. Unless the music teacher carefully incorporates a well-designed rubric or a consistent set of standards for each musical task, the reliability of the testing practice may be vulnerable.

With the renewed focus on assessment and accountability, recent studies have shown that there has been little progress in assessment strategies in music (Russell & Austin, 2010; Johnson, 2008). Referring to the fundamental principle of learning theory, specific and prompt feedback needs to be provided to engage student motivation and learning. Unfortunately, teachers tend to teach and assess in the way they were taught. Boyle and Radocy (1987) suggested, "with the increasing concern for quality education in schools, there has been a growing need to identify quality teachers" (p. 221). What constitutes a quality teacher is highly debated; nonetheless, a deep understanding of content-area knowledge and the willingness to implement best practices of teaching are considerable characteristics.

Consequently, there is a real need for continued assessment training and support in the music profession (Assey, 1999; Brookhart, 2001; McMunn, Schenck, & McColskey, 2003; Mertler, 2004). Assessment training must occur both within the pre-service training stage provided by higher institutions of learning as well as in-service training by K-12 school districts. The professional development needs of new teachers compared to career teachers will be different based on their experiences. As suggested by Conway (2006), continued research on the importance of professional development opportunities at various points in their professional
“life-cycle” is needed (pg. 8). Conway’s suggestion is timely with regard to professional training of instructional practices using technology.

**Trends in Music Technology**

Music educators are experiencing a time of increasing technological advancements in instructional and assessment methods in music. Technology has perpetuated new curriculum developments in music education. Over the last fifteen years, a paradigm shift has occurred from the traditional drill-and-practice use of music technology to a constructivist perspective (Duffy & Johassen, 1992; Jonassen, Peck, & Wilson, 1999). Within the constructivist view, a student will learn and understand the structure of music through experimenting and manipulating musical sounds during the creative process of music. As teachers begin to incorporate new technologies in music instruction, students will be able to create music, arrange and edit music, and see the relationships between music and visual images (Cain, 2004). With further advances in computer hardware and the growth of music software especially in the field of digital audio arts, the landscape of music instruction will continue to change (Williams & Webster, 2006). Kratus (2007) asserts that technology has forever changed the experience of music. Digital mp3 players have allowed music to be portable, more accessible, individualistic, and musical communities are now formed by musical interest rather than physical proximity. The rapid development of portable mobile devices and Smartphone technologies are currently impacting education at all levels (Johnson, Levine, Smith, & Stone, 2010). This revolutionary technology is having an impact on the musical experience in how students can learn, create, and share their knowledge of music with others. There is
no doubt that mobile devices will change the landscape of music education, however, research inquires of this subject is in it’s infancy.

A recent trend in music instruction has been the rise of Internet-based materials that may be used for music teaching and learning (Bauer, 1999; Bauer & Daugherty, 2001; & Webster, 2002). As reported in a subsequent literature review by Webster (2007), two specific research studies examined the practicality of incorporating Internet resources into music instruction. The first study that was mentioned was conducted by Barry (2003), which examined graduate music programs that incorporated supplemental online research resources, web-based teaching content, and multi-media course content. It was reported students’ perceptions about the web-based resources and instructions were generally positive. Another study conducted by Ryder (2004) concerning Internet-based instruction on vocal anatomy, function, and health reported statistically significant gains on attitude and achievement scores with 200 high school students.

Webster (2007) also noted the importance of developing research of distance learning in music education. The Internet has revolutionized distance education throughout the 1990s to the present. It has provided instant information sharing and flexibility in instructional delivery methods. Course content could be presented online either synchronously—the teacher and student are connected virtually at the same time—or asynchronously—the student and teacher interaction are independent from each other with regard to space and time. Current research on learning in K-12 virtual high schools has focused primarily on academic achievement. A series of literature reviews and meta-analysis have been published
in recent years in an attempt to provide a comprehensive overview of the research pertaining to higher education and K-12 distance education (Barbour & Reeves, 2009; Bernard, Abrami, Lou, Borokhovski, Wade, Wozney, Wallet, Fiset, & Huang, 2004; Cavanaugh, Barbour, & Clark, 2009; Machtmes & Asher, 2000; Patrick & Powell, 2009; Rice, 2006; Shachar & Neumann, 2003; Ungerleider & Burns, 2003).

While many of the studies reviewed were informative, most comparative data was found to be inconclusive. A recent summary of K-12 online learning research (Smith, Clark, & Blomeyer, 2005) found evidence that online learning can be just as effective as face-to-face learning, however, continued research on the effective use of technology for instruction and assessment in distance learning is needed especially in arts education.

Recent studies in the use of technology in music teaching have described trends in music educators' use of technology (Bauer et al., 2003; Reese & Rimington, 2000; Taylor & Deal, 2000). This research has shown that although there is a desire by the music teacher to learn and use technology, there is a moderately low score of teachers that are actually using technology in their classrooms. Two specific studies (Reese & Rimington, 2000; Taylor & Deal, 2000) found that most music educators using technology in school (a range between 75% and 92%) are primarily doing so to complete administrative tasks. Less than 30% of the music teachers indicated that they were using technology for classroom instruction.

**Technology-assisted Music Assessments**

Colwell (2002) noted that computer use in assessment holds considerable potential if the music educator is willing to devote time and resources to developing
assessment strategies that connect instruction, learning, and testing. Assey (1999) addressed the need for teachers to develop meaningful assessments that will validate the learning objectives. She also described how assessment in the arts is a terrific opportunity to use technology to record successful learning experiences by creating a collection or portfolio of best works. Online portfolios can display how a student has mastered the music objectives as effectively as paper and pencil assignments. Boyle and Radocy (1987) also supported the potential use of technology for the use of evaluation; "the computer has great potential for measurement and evaluation of musical behaviors" (pg. 221). Whether that technology includes digital sound recordings of performance assessments, online testing or rubric development, or integrating technology with the music content, it can enable students to reflect on their own learning. It cannot be stated enough that a successful technology-assisted assessment, as well as all assessments, is in the curriculum design.

Venn (1990) created a computer-based instrument that used a personal computer and audio CD-ROM. The purpose of this instrument was to measure four musical elements (melody, rhythm, texture, and tonality) in an elementary general music class. Test-retest reliability for the 30 students that participated in the study was .79. Hickey and Webster (1999) designed a computer-administered test of the Webster Measure of Creative Thinking in Music-II. This measurement tool used MIDI instruments such as keyboards and drum pads to capture creative responses of quasi-improvisatory tasks by children ages 6 to 10.
Flohr (1996) developed a computer-generated test instrument that was designed to measure children’s awareness of steady beat. A revision of that test, *Rhythmic Performance Test-Revised* (RPT-R), included two parts: tempo synchronization and rhythm pattern identification (Meeuwsen, Flohr, & Fink, 1998). The computer-based test utilized the keyboard to record information. The first part asked students to tap with a basic pulse using a computer key while listening to five versions of a folk song recording. The tempos varied from 110 to 150 beats per minute. Part two included 20 different rhythmic patterns in which the student listened, remembered, and performed the rhythm by tapping on the space bar of the computer keyboard. Each rhythmic pattern was one to three measures long representing different meters, tempos, and duration of notes. The RPT-R has been validated as a rhythmic perception diagnostic test among elementary children (Meeuwsen et al., 1998) and college age students (Flohr & Meeuwsen, 2001). The test was intended to be used as a screening process, as well as a pre-test and/or post-test for intervention studies. For both age groups, elementary children and college age students, reliability coefficients indicated the different parts of the RPT-R to be internally consistent.

Other studies have explored the effectiveness of software assessment programs, such as *SmartMusic* in performance-based assessments (Flanigan, 2008; Glenn, 2000; Glenn & Fitzgerald, 2002; Lee, 2007). Glenn and Fitzgerald (2002) investigated attitude, motivation, and self-efficacy of applied music students in college that used *SmartMusic*. The students revealed that the program served the purpose of repetitive practice, but no real improvement on musicianship occurred.
Flanigan (2008) examined the effectiveness of *SmartMusic* on intonation and rhythmic accuracy with twenty college brass players over a four-week period. Results indicated no statistically significant difference on intonation accuracy and rhythmic note errors between groups of students that practiced with *SmartMusic* and students that did not practice with *SmartMusic*. An expert panel of judges that evaluated the performances between the two groups did find a significant difference with *SmartMusic* students displaying a greater pretest to posttest improvement on intonation, tone quality, and expressive quality. Participants that used the *SmartMusic* program indicated a positive reaction to using the software.

One approach to using technological assessment strategies is to have students' share and critique musical works with others via websites (Savage & Challis, 2002; Seddon, Joubert, Johnsen, & Tangenes, 2003). The personal reflections about performances, compositions, and improvisational works are an example of authentic assessment of students' understanding of the musical process. Educational portals, blogs, and Wikis are common and viable tools in achieving this goal.

**Attitude Studies in Music Education**

It is proven that attitudes have a profound impact on teacher behaviors and practices. Studies regarding the attitudes of music educators towards the use of technology and towards the importance of assessment are becoming more prominent in current literature. It is important to understand what factors motivate a teacher to incorporate technology not only for assessment, but also in daily instructional practices so that school administrators may provide adequate
professional development and training.

The attitude formation model (Rosenberg and Hovland, 1960) illustrates that attitudes will reflect a teacher's belief system, which will also influence the instructional behaviors of the teacher. Therefore, any study about teachers' decisions and actions in the classroom should involve an investigation into teachers' beliefs because beliefs profoundly influence teacher perceptions (Pajares, 1992). There are various studies that support and reject this notion of attitude formation and various definitions have been formulated to explain the phenomenon of an attitude (Fischer, 1977). An attitude is a hypothetical construct that represents an individual's degree of like or dislike for an item, idea, or concept. In music, attitude has been defined as a "predisposition to evaluate psychological objects in a favorable or unfavorable manner" (Kuhn, 1980). Cutietta (1992) provided the most complete description of attitude:

An attitude is a firmly held mental network of beliefs, feelings, and values that is organized through an individual's experiences, and that exerts a directive and dynamic influence on the individual's perception and response to all objects and situations with which it is related. This definition is in the tradition of L. L. Thurstone, who defined attitude as "the sum of a man's inclinations and feelings, prejudice or bias, preconceived notions, ideas, fears, threats, and convictions about any specific topic" (1928). Thus attitudes are learned networks of complex interactions between facts (as believed), feelings, and values. These networks are, by necessity, highly individualized (p. 296).
In Ables, Hoffer, and Klotman (1994), a general view of the formation of a person's attitude is based on three constructs; (1) similarity, what they know and can understand; (2) conformity, the adoption of an attitude around the association and reinforcement of others; and (3) advantageous, a person embraces an attitude that will be beneficial to them.

In a study that measured a teacher's attitudes toward creativity in the classroom, a negative relationship was found between teacher attitudes and instructional behaviors (Al-Agmi, 1995). On the other hand, Kershaw (1994) found that teachers that displayed positive attitudes towards assessment were not limited to the types of assessment strategies that they chose. Both of those studies emphasize that a teacher's familiarity and personal experiences with either technology or assessment strategies will influence their belief system.

In the final paragraph of this section, a brief overview of attitude concepts of students toward technology will be mentioned. Although secondary to the background of this study, it goes without saying that student attitudes towards technology will have an effect on how well it is perceived and accepted in the music classroom. For example, Ho (2004) found high levels of confidence between boys and girls in using music technology and web-based resources in Hong Kong schools. Few gender differences in attitude were found, but primary students were more positive than secondary students in the use of technology. Walls (2002) conducted a study on the use of a hypermedia program on music composition. Results indicated generally positive reactions by middle and high school students to the integration and evaluation of this type of multimedia into a music rehearsal setting.
Influences of Demographics on Technology Use

Teacher demographics of experience and training have shown to have an influence on the use of assessment strategies (McCoy, 1991; Simanton, 2000). Assessment and grading practices are influenced by teaching level and specialization (McCoy, 1988, 1991; Russell & Austin, 2010). According to research by Bauer et al. (2003) on technology professional development, the factors of years of experience, academic degrees, and areas of music teaching were found to be fairly neutral with some slight differences in the gender variable. The authors explained that the differences in gender might be related to self-efficacy (Bauer, 2003) and familiarity (Fung, 2003) with technology.

With regard to gender differences in attitudes towards music and technology in general, it has been found that girls dominate positive attitudes towards music and boys tend to more positive in using technology. There is a level of comfort that each person must reach before the use of technology becomes routine (Nicolino, Fitzgerald, Maser, & Morote, 2006). Comber, Hargreaves, & Colley (1993) found that through experience of working with computers and music technology, students of both genders understand the potential of technology in music therefore, changing their attitudes towards music technology. Results from Folkestad, Comber, Hargreaves, Colley (1996) confirmed the gender difference in computer use, however, using computers to be creative in music-making was regarded more of a musical activity than a computer activity. Folkestad (2007) continues to support that "gender issues is one of the core subjects in music education in general and in computer-based musical activities in particular” (p. 1330).
Teacher Professional Development

Teacher professional development and comfort level of technology will impact the use of technology in the classroom. Moore (2009) attempted to synthesize various definitions of professional development from the educational literature. Referring to statements by Hooky (2002) about professional development as the change in a teacher's knowledge base and actions, Moore stated, "professional development framework is redefined as the inclusion of institutional and personal professional responsibility for the enhancement and growth in the music teacher's knowledge base and actions towards professional maturity" (p. 320).

Research findings about integrating technology tools into the general curriculum have revealed a positive effect on shifting teachers' beliefs and practices (Matzen & Edmunds, 2007; Sandholtz, Ringstaff, & Dwyer, 1997). Therefore, professional development in technology must move away from the stand-alone model of technology training to a student-centered pedagogy (Palak & Walls, 2009). Teachers must not only be trained on how technology may assist in the delivery of content, but also on how to engage and assess student learning.

Bowles (2003) examined the perceived needs of professional development by music teachers by administering a survey to a state music education association in the upper Midwest. The survey yielded a 29.6% (n = 456) return rate out of 1,541 music teachers. The main topics of interest for professional development by music teachers were (1) technology (66%), (2) assessment (57%), (3) instrumental / choral literature (53%), (4) standards (45%), (5) creativity (43%), and (6) grant
writing (38%). Technology and assessment were also two of the top three topics concerning the choice of professional development for elementary music educators in Wisconsin and Minnesota (Tarnowski & Murphy, 2003).

Reese, Repp, Meltzer, and Burrack (2002) described a multimedia website used for an online professional development program. The website was designed to provide positive, technological support for teachers. This particular study found that teachers did not use the site as often as predicted causing data analysis to be difficult. Teachers tended to like face-to-face interaction for technology support over the online approach. A study by Bryne and MacDonald (2002) investigated the use of music technology by in-service teachers in Scotland. Two focus groups provided the researchers with the following concerns: technology access by students, core music skills, gender demarcation, parent support, and school support. One particular professional development program for music educators was designed based on research (Moore, 2009). The appropriateness of the hands-on program provided resources and opportunities that strengthened the musical knowledge, skills, and technological expertise of music specialists serving K-12 at-risk students. The majority of the teachers who participated in this professional development program indicated a new sense of confidence in using technology and that what was personally applied and individually practiced was learned best.

Reese and Rimington (2000) found that a large majority of music teachers (94%) desired to participate in technology training sessions. However, only 25% of in-service teachers indicated that technology training was a part of their undergraduate teacher education program and that only 13% of school districts
were offering more than one technology training session per year. Taylor and Deal (2000) also found there is a genuine need by music educators to participate in technology training. Ninety percent of the music teachers in Taylor and Deal study indicated they would be willing to participate in a technology workshop. However, Bauer, Reese, & McAllister (2003) discovered teachers' high comfort level and knowledge after a ten-month period following a technology in-service had no long-term impact on teacher usage of technology in the classroom. There is a continuous need in educational research to determine what types of professional development opportunities will motivate teachers to learn and implement technology into already established teaching strategies. This is a monumental task due to the rapid technological advances in both hardware and software packages.

Effective technology workshops must provide more than just how to operate a piece of software or hardware. Russel and Sorge (1999) discovered that the most effective technology workshops for teachers are one-day workshops scattered throughout the year. They also promoted the following:

The workshops must incorporate all that we know about good instruction. Teachers learn best when they are actively involved, rather than listening to lectures or watching demonstrations. They must be challenged to try technology in their own classroom and be encouraged to share results—both good and bad—and receive feedback from their peers in a non-threatening environment. The local technology coordinator is in an excellent position to facilitate the continuing education of teachers (p. 9).

Moore (2009) also recommended that the teaching of technology must
include structured and active participation that includes teachers’ regular involvement in hands-on applications of music technology. Training on how to implement the new technology for the purposes of enhancing music instruction and assessment is essential. Assey (1999) articulated it best: "The most successful application of technology will be combining the best learning theories and instruction with digital methods. The instructional programs for students and teachers cannot be overshadowed by the technology" (p. 81).

**Summary**

In summary, there were two overarching bodies of research literature that assisted in developing the current study, music assessment and music instructional technology. Studies about teacher attitudes on assessment practices have shown that teachers in general understand the importance of assessment for learning. Studies on teacher's experience and professional training as well as areas of teaching specification and grade level have shown to have an effect on whether a teacher is willing to incorporate proper assessment strategies as a part of their instruction. Due to the subjective nature of music as an art form, much needs to be done so that students' achievement and knowledge of music become the focus rather than extra-musical factors such as participation, attendance, and attitude. A well-designed assessment strategy will provide evidence of musical growth of the student, motivate students to learn, provide validation of music programs and teacher effectiveness.

Research in music technology over the last twenty years has indicated a significant growth and impact on music education. Even so, music educators are not
keeping pace with the rapid growth of new technologies available to them. This is partially due to lack of proper training and understanding of instructional technology for both pre-service and in-service teachers. The rate of technology development and changes are moving at such a rapid rate, it is difficult to establish a conceptual base of best instructional technology practices.

Between the two bodies of literature, the researcher discovered a gap in research that specifically focused on technology-assisted assessment tools. There are a variety of technology-assisted assessment tools available for music educators, but it is unknown how many educators are actually using these tools and whether they are using these tools in providing authentic assessment of music learning. The potential of incorporating such tools would benefit both teachers and students.
CHAPTER 3

METHODOLOGY

Introduction

This survey method study was designed to examine K-12 music educators’ attitudes regarding the use of technology in the assessment of music learning. This chapter provides specific details concerning the methods and procedures that were used for this study and follows the organizational format of (1) subjects, (2) development of the survey instrument, (3) procedure, and (4) data analysis.

The most influential survey research on the subjects of assessment and technology were discussed in the review of the literature. The current study attempted to combine previous research findings on the use of technology and beliefs towards assessment in developing a research design that specifically focused on the use of technology tools for assessment. This goal was accomplished by using a researcher-designed survey instrument. The use of survey research is a systematic and impartial means of gathering accurate information from a large population of people (Backstrom & Hursh, 1981; Kerlinger, 1979). In addition, Dillman, Smyth, and Christian (2009) explain that the goal of survey research is "to design scientifically sound data collection systems that allow us to obtain precise estimates of the behaviors and attitudes of all people in a population by sampling and obtaining results from only a fraction of them" (pg. 11). To further validate the use of surveys, Schuman & Presser (1996) simply stated that surveys are useful for "charting trends in attitudes over time" (pg. 6).
Subjects

The subjects for this study included 2,211 music educators that were MENC members. MENC: The National Association of Music Education provided the researcher a stratified, random sampling of MENC members who have an interest in music education in the K-12 setting and teach general music, vocal music, or instrumental music classes. Only school email addresses were provided to the researcher.

Other personnel that assisted with this study included the MENC staff in formulating the random sampling, music teachers from a large Midwest school district that participated in a pilot of the survey instrument, a panel of experts who reviewed the survey instrument, and the music teacher participants of the actual research study. There were thirty-eight music teachers that participated in the initial pilot study and twenty-one in a second instrument evaluation. The researcher also enlisted the assistance of the staff at the Nebraska Evaluation and Research (NEAR) Center at the University of Nebraska–Lincoln for data analysis.

Description of the Population

An a priori calculation of the required sample size was conducted with an alpha level of .05 and a confidence level of ± .05. Assuming a normal response rate, it was determined that a sample size of 327 completed surveys was needed. At the completion of the survey, 492 responses were recorded, 22% rate of return. Twenty-eight respondents did not fully complete the survey, leaving a total of 464 usable survey responses. Further investigation beyond the 492 responses, 57 people were ineligible to participate in the study because they were no longer
teaching K-12 music. Some of the participants emailed the researcher stating they were no longer teaching at the K-12 level because of a new teaching position at a college or university or the teacher was recently retired. Eight participants simply declined to participate and 152 participant emails were undeliverable. It should be noted that when using membership lists from associations, the member email contacts could be as much as a year old depending on the time of the year the teacher renews their membership.

Teacher demographics included a description of music content areas of elementary general music (60.3%), choir (44.7%), band (42.7%), and strings (12.9%). Participants described additional teaching areas such as guitar and music appreciation classes on a free-response question. Grade levels that were taught ranged from elementary (30.3%), middle level (16.7%), high school (29.4%), and a combination of grade levels (23.2%). School setting included urban (26.6%), suburban (50.4%), and rural (22.5%). Personal teacher demographical information included gender, males (43.3%) and females (56.6%); and, the number of years of teaching experience; 1-10 years (22.7%), 11-20 years, (25.1%), 21-30 years (31.1%), and 30+ years (20.6%). One final demographical information crucial to this study included highest professional degree earned which included Bachelors (22.7%), Masters (63.9%), and Doctorate (12.9%). The participants were fairly representative of the music education population. It is unknown what different areas of the country were represented in this sample.
Development of the Survey Instrument

The *Technology-Assisted Assessment Tools in Music Education* survey instrument was developed by the researcher for data collection purposes and was approved by the University of Nebraska Institutional Review Board for the Protections of Human Rights (see Appendix A). The survey instrument also gathered demographical information about the teachers and schools where they taught, technology tools that were being used by the teachers, and professional development opportunities. The survey was composed of six sections in the following order: (1) research study consent, (2) use of instructional technology in music, (3) use of technology-assisted assessment tools, (4) professional development, (5) teacher perceptions on music assessment and technology (PMAT), and (6) demographics. Section two and three asked questions about current and past experiences of using instructional technology and assessment practices. Section four asked the teachers about professional development training using technology. The purpose of section five was to establish an attitude score that served as the dependent variable for the study. This section was entitled *Perceptions on Music Assessment and Technology* (PMAT). The PMAT included twenty-two belief statements about the value of assessment and teacher perceptions on using technology to assist with assessing students. The final section included basic demographical information including gender, years of teaching, area of specialization and grade level taught, years of teaching, highest educational degree earned, and school location and size.
Stage One: Table of Specifications

The pillars of specifications for this survey were formulated by the review of the literature and input from current music educators. Input from music educators on their current use of technology for assessment was gathered in an initial survey. Questions were developed to gather descriptive data on whether music teachers are using technology-assisted assessment tools and what types of tools are being utilized most frequently. Further questions on general assessment practices and professional development experiences were asked in order to establish answers to the first two research questions. Five constructs (factors) that guided the construction of this survey were: (1) technology ease of use, (2) beliefs about assessment, (3) beliefs about technology, (4) familiarity, and (5) endorsement by the experts.

Stage Two: Instrument Design

In stage two, the survey construction focused on the development of the PMAT section of the survey instrument. The researcher generated an initial set of twenty-four belief statements. The statements were based on the five constructs described earlier. Under each construct, a set of belief statements were evenly worded positively or negatively in order to increase the reliability of the survey instrument. Likert descriptors ranging from Strongly Disagree to Strongly Agree were used. Numerical values ranging from 1 to 5 were assigned to each Likert descriptor based on the positive or negative intent of the statement. The five constructs are described in more detail in the following narrative.
**Technology ease of use.** Referring to the theory section in chapter one, *ease of use* was defined by Davis (1989) as the degree in which a person believes that using a particular system or tool would be free from effort. This is a crucial step for music teachers in their adoption of new technology into instructional and assessment practices. Examples of the belief statements developed for this section were: (1) *I become frustrated when learning how to use new technology tools*; (2) *It takes too much time to learn how to use technology*; and (3) *Technology saves me time in assessing individual student's musical growth.*

**Beliefs about assessment.** The belief statements established for this construct focused on a music teacher's perceptions about assessment. A general question that guided this construct was whether the teacher had a positive or negative belief regarding music assessment. Specific statements created for this section included: (1) *I believe it is important to assess the musical growth of my students*; (2) *I do NOT have enough class time to assess my students properly*; and (3) *I feel assessment can be helpful in promoting students' musical growth.*

**Beliefs about technology.** In the same nature as the second construct, the intention of the third factor was to focus on beliefs about the purpose and usefulness of technology. A teacher's willingness to adopt a technology tool with already established instructional and assessment practices is based on their level of "trust" that the tool will do what it is intended to do. This construct was also looking at positive and negative beliefs about technology.

Examples of technology belief statements were: (1) *I feel that many of the technology-assisted assessment tools that are available for music are too expensive*;
(2) I would NOT use technology even if I had the resources available; and (3) I am willing to search for additional funding to purchase music technology for my classroom.

**Familiarity.** The construct of familiarity is based on the premise that people like what they know. They are comfortable using or trying new types of technology if they have had the proper training and experience in using the technology. The goal of this construct was to capture the teachers’ perceptions of pre-service and/or in-service professional development experiences in regard to both assessment and technology.

Examples of belief statements for the familiarity construct included: (1) I would use technology-assisted assessment tools if I had more professional development time devoted to learning how to use it; (2) I have NOT had any experience in learning to use music technology assessment tools; and (3) I wish I had more time to learn and implement technology into my assessment practices.

**Endorsement by experts.** The belief statements for the final construct were generated based on the input and influence of experts in the profession. Specifically, are there other music educators that are using technology for assessment successfully? Examples of statements in reference to this construct included: (1) My colleagues are using technology in their music classrooms; (2) There are often technology sessions at the conferences I attend; and (3) I believe technology is too unreliable to be used for assessment.
Stage 3: Instrument Assessment

An important final step of the development of the PMAT survey instrument included an examination of validity and reliability. In order to establish content validity, the opinion statements were reviewed by a panel of experts: two doctoral students in music education, two University of Nebraska–Lincoln faculty members, one music supervisor of a large school district and one middle school music teacher. The panel members were given a copy of the survey and the table of specifications. The panel also examined items of face validity, which included length of the survey, simple rewording of certain questions, and formatting concerns. Each panel member completed a rating form (see Appendix B) and provided specific comments about the survey. A final version of the survey was constructed based on the input by the panel of experts. Minor suggestions were provided in clarity of word choice in the questions and belief statements. With regard to content validity, the panel of experts was asked to review the 24 belief statements of the PMAT in relation to the five constructs associated with the table of specifications. All panel members indicated a closely related comparison with the exception of two statements, which will be explained further in the next paragraph.

The survey instrument was piloted by asking music teachers in one large Midwest school district to take the survey. A factor analysis was conducted to examine the internal consistency reliability of the instrument. The estimate coefficient of reliability ($\alpha = .74$) was found to be in the threshold of acceptability. Due to the fact this was a one time pilot administration of the instrument that included a small sample of participants, the reliability coefficient was an estimation
of its internal consistency. The data did provide the researcher with information about three statements that had relatively low values. In comparing the three belief statements to the feedback by the panel of experts, two statements were eliminated from the survey increasing the estimated coefficient of reliability ($\alpha = .76$). Based on further feedback by the panel concerning the third statement, it was determined that it was an important statement to include within the PMAT section. Therefore, with some changes in wording, it was included in the survey. The final version of the PMAT portion of the survey included 22 belief statements. A post hoc factor analysis on the PMAT reinforced the above findings. The coefficient of reliability ($\alpha = .781$) was reported on the perception section after the actual survey was completed ($n = 464$).

**Procedure**

The researcher utilized an online survey software and questionnaire tool called *SurveyMonkey*. This service provided unlimited questions, a quick and simple data collection service, and secure data storage of the survey responses. The researcher also used PASW/SPSS, a statistical analysis computer program during the data analysis process. Once the survey questions were developed from the table of specifications, the online version was formulated. The researcher took special care in designing the survey that was easy to complete and readable by the participants.

After the researcher obtained campus Institutional Review Board approval for this survey study, an email contact was initiated with each participant, which included the description and purpose of the study as well as an invitation to
participate (see Appendix C). A web-based survey was administered electronically to the participants (see Appendix E). The link to the survey was included in the initial contact. The survey took less than fifteen minutes to complete. The initial response rate netted a return rate of approximately 15%.

Two follow-up emails were sent to participants seven and fourteen days after the initial email reminding the music teachers to complete the survey by the assigned deadline (see Appendix D). The follow-up email contacts resulted in an additional 7% response rate providing a grand total for the survey administration of 22%. At the completion of the survey, the data was downloaded from SurveyMonkey into an Excel document for data analysis purposes.

**Data Analysis**

The data analysis procedure described the population of music teachers that utilize technology-assisted assessment tools in music instruction. The research questions and data can be divided into two parts: descriptive data and inferential data. For each of the research questions, a different data analysis procedure was employed in order to provide a generalization of the sample with the dependent variable of attitude.

**Part 1: Descriptive Data**

**Research question 1:** How many music educators are using technology-assisted assessment tools and what types of assessment tools are being utilized? Simple descriptive statistics determined the number of music educators using technology as a part of their assessment strategies as well as described the types of assessment tools they are using in their music classroom.
**Research question 2:** Is the general attitude of music educators positive or negative toward using technology for assessment? This question helped develop the attitude score, which served as the dependent variable. Likert descriptors ranging from *Strongly Disagree* to *Strongly Agree* were used. Incorporating a five-point numerical scale on 22 belief statements, a numerical mean score was computed for each individual. Any mean score over 3 indicated a positive attitude towards technology and assessment. One-way ANOVAs and *t*-tests were implemented in comparing the attitude score to actual use of technology.

**Part 2: Inferential Data**

The second part of this study examined possible effects on teachers' attitudes. A one-way analysis of variance (ANOVA) and a factorial design were utilized for data analysis. The advantages to a factorial design are that multiple experiments can be conducted simultaneously, extraneous variability can be controlled leading to lower experimental error and increased power, and any interactions between the independent variables can be determined.

**Research question 3:** How do school setting factors influence music educator's attitudes regarding the use of technology in the assessment of music learning?

3a. Do certain types of professional development experiences influence music educators' attitudes towards using technology-assisted assessment tools?

3b. Do school setting and primary level of teaching assignment influence music educators' attitudes towards using technology-assisted assessment
tools?

Three factors were examined: (1) type of professional development experience (school mandated, school voluntary, personal voluntary, and college pre-service), (2) school setting (urban, suburban, rural), and (3) the primary level of teaching assignment (elementary only, middle school only, high school only, or combined levels). The dependent variable was attitude regarding using technology to assess music concepts or skills. Based on the complex layers of the factors under investigation of this question, the data was analyzed in two parts. First, the professional development options were analyzed simply by descriptive statistics and a one-way ANOVA to determine what are the most common professional development opportunities that teachers are engaged in to learn technology. The second part looked at the school setting variables and whether there was any influence on the dependent variable. This was accomplished by using a 3 x 4 factorial ANOVA.

**Research question 4:** To what extent do music educator demographic factors of gender, level of educational degree, and years of music teaching experience influence music educators' attitudes about technology-assisted assessment tools? This question had three main subsets: (1) gender, (2) level of educational degree, and (3) years of music teaching experience. A 2 x 3 x 4 factorial ANOVA was used to analyze the overall interactions between all teacher and school factors.
Summary

This chapter presented the details of the methods and procedures utilized in this study. A description of the participants, explanation of the survey instrument design, procedures, and data analysis were explained. The trends of music teachers using technology for music assessment were examined using a researcher-developed survey. During the instrument design process, a review of the literature and a panel of experts including doctoral students, university professors, and public school music educators helped establish content validity and face validity. A factor analysis was conducted to examine the internal consistency reliability of the instrument. A pilot study established a reliability coefficient that was within an acceptable range.

The survey was emailed to a national list of 2,211 music teachers. Participant responses on the PMAT helped determine whether music teachers have a positive or negative feeling towards using technology for assessment, and what specific teacher and school factors influence their decision to use technology-assisted assessment tools. The data analysis for this study used descriptive statistics to describe the population of music teachers that participated in the study. For research question two, three, and four, one-way ANOVAs, t-tests, and different levels of a factorial ANOVA were employed to examine the influences of teacher and school variables on K-12 music educators’ attitudes.
CHAPTER 4

PRESENTATION AND ANALYSIS OF DATA

Introduction

The purpose of this study was to examine K-12 music educators' demographics and attitudes towards assessment and technology in their decision to utilize technology-assisted assessment tools. In order to achieve the purpose of the study, four research questions were developed. First, it was determined how many music educators were using technology-assisted assessment tools and the types of assessment tools that were most frequently used in music classrooms. Second, an examination was conducted on whether the music educator’s general attitude in using technology for assessment was positive or negative. The third research question regarding school setting variables was divided into two parts; (a) types of professional development experiences and, (b) school setting and primary level of teaching assignment. The school setting variables were analyzed for significant influence on music educators’ attitudes towards using technology-assisted assessment tools. Finally, the question concerning the influence of music educator demographic factors of gender, level of educational degree, and years of music teaching experience on teachers’ attitudes was analyzed. Chapter four begins with a discussion of the teacher and school demographic factors. The remainder of the chapter will be devoted to the presentation of the results for each research question.
Demographic Analysis

Teacher demographic variables examined in this study included the following: gender, primary grade level, years of teaching experience, school setting and education background (see Table 1).

Table 1
Demographic Characteristics of Participants

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency</th>
<th>% of Total Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>202</td>
<td>43.3</td>
</tr>
<tr>
<td>Female</td>
<td>259</td>
<td>55.6</td>
</tr>
<tr>
<td>Grade Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary</td>
<td>141</td>
<td>30.3</td>
</tr>
<tr>
<td>Middle Level</td>
<td>78</td>
<td>16.7</td>
</tr>
<tr>
<td>High School</td>
<td>137</td>
<td>29.4</td>
</tr>
<tr>
<td>Multi-Grades</td>
<td>108</td>
<td>23.2</td>
</tr>
<tr>
<td>Years of Teaching Experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 - 10 years</td>
<td>106</td>
<td>22.7</td>
</tr>
<tr>
<td>11 - 20 years</td>
<td>117</td>
<td>25.1</td>
</tr>
<tr>
<td>21 - 30 years</td>
<td>145</td>
<td>31.1</td>
</tr>
<tr>
<td>31+ years</td>
<td>96</td>
<td>20.6</td>
</tr>
<tr>
<td>School Setting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>124</td>
<td>26.6</td>
</tr>
<tr>
<td>Suburban</td>
<td>235</td>
<td>50.4</td>
</tr>
<tr>
<td>Rural</td>
<td>105</td>
<td>22.5</td>
</tr>
<tr>
<td>Level of Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelors</td>
<td>106</td>
<td>22.7</td>
</tr>
<tr>
<td>Masters</td>
<td>298</td>
<td>63.9</td>
</tr>
<tr>
<td>Doctorate</td>
<td>60</td>
<td>12.9</td>
</tr>
</tbody>
</table>

*Note. n = 464*
The stratified, random sample of music educators across the United States (N = 2211) resulted in 492 responses to the survey (22% return rate). Twenty-eight respondents did not fully complete the survey, leaving a total of 464 usable survey responses. Three participants chose not to answer the gender question, therefore were eliminated from analysis concerning gender.

Demographics were relatively balanced between gender, years of teaching, and primary grade level that the teachers were assigned to teach. A fourth category of multi-grades was added to cover those teachers that teach more than one grade level. The number of music teachers that teach multi-grades (ex. 5-12 instrumental music) represented 23.2% of the total. This type of teaching situation is very typical in smaller urban or rural schools.

The response rate (22%) was lower than expected, although two follow-up emails were sent to participants seven and fourteen days after the initial email reminding the music teachers to complete the survey by the assigned deadline. However, a priori power analysis with an alpha level of .05 and a confidence level of ± .05 indicated that a sample size of 327 completed surveys was required to detect significant group differences. Therefore, the decision was made to continue with an analysis of the final 464 survey responses. Non-response bias was addressed by comparing the demographics of participants during each phase of the data collection: initial contact, second email contact, and third email contact. MENC member email contacts, depending on the time of the year when the teacher renews their membership, can be as much as a year old. Therefore, 57 participants were ineligible to participate in the study because they were not currently teaching K-12
music. Some participants in this category elaborated that they have either recently retired or have moved to a teaching position in higher education. Eight participants simply declined to participate in the study.

The primary teaching area of each teacher was classified into four areas: general music, choir, band, and strings with an additional other to include additional teaching assignments. The other category included courses such as music theory or appreciation, music technology, guitar, or mariachi (see Table 2).

Table 2

Demographic Classification of Primary Teaching Area

<table>
<thead>
<tr>
<th>Classification</th>
<th>Frequency</th>
<th>% of Total Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Music</td>
<td>277</td>
<td>60.3</td>
</tr>
<tr>
<td>Choir</td>
<td>205</td>
<td>44.7</td>
</tr>
<tr>
<td>Band</td>
<td>196</td>
<td>42.7</td>
</tr>
<tr>
<td>Strings</td>
<td>59</td>
<td>12.9</td>
</tr>
<tr>
<td>Other</td>
<td>88</td>
<td>—</td>
</tr>
</tbody>
</table>

*Note. n = 464. Other referred to classes that were usually an additional teaching assignment, therefore no percentages were reported.*

Data Analysis

Research Question 1: *How many music educators are using technology-assisted assessment tools and what types of assessment tools are being utilized?*

The frequency and percentage distribution of how many music educators use instructional technology tools to enhance their classroom instruction as well as for assessment of performance skills and music content knowledge is displayed in Table 3. The teachers were asked to select one of four answers that best described
the amount of technology they use under each caption; regularly (every lesson), sometimes (3 to 4 times a week, but not for every lesson), occasionally (a few times a month), and never.

Table 3

Distribution of Participants’ Use of Technology

<table>
<thead>
<tr>
<th>Classification</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology used for instruction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regularly</td>
<td>133</td>
<td>28.7</td>
</tr>
<tr>
<td>Sometimes</td>
<td>191</td>
<td>41.2</td>
</tr>
<tr>
<td>Occasionally</td>
<td>131</td>
<td>28.2</td>
</tr>
<tr>
<td>Never</td>
<td>9</td>
<td>1.9</td>
</tr>
<tr>
<td>Technology used for performance assessments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regularly</td>
<td>41</td>
<td>8.8</td>
</tr>
<tr>
<td>Sometimes</td>
<td>94</td>
<td>20.3</td>
</tr>
<tr>
<td>Occasionally</td>
<td>222</td>
<td>47.8</td>
</tr>
<tr>
<td>Never</td>
<td>107</td>
<td>23.1</td>
</tr>
<tr>
<td>Technology used for content knowledge assessments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regularly</td>
<td>36</td>
<td>7.8</td>
</tr>
<tr>
<td>Sometimes</td>
<td>90</td>
<td>19.4</td>
</tr>
<tr>
<td>Occasionally</td>
<td>202</td>
<td>43.5</td>
</tr>
<tr>
<td>Never</td>
<td>136</td>
<td>29.3</td>
</tr>
</tbody>
</table>

Note: $n = 464$
The data indicated that a larger percentage of music teachers use technology for instructional purposes in order to enhance their lesson plans than for conducting authentic assessment of student learning. A slight difference in technology usage was evident among teachers who use technology-assisted assessment tools for performance-based skills rather than for measuring music content knowledge.

In order to analyze what specific assessment tools were most frequently used by music educators, five areas of assessment tools were established: (1) digital recorders used to record performance tests, (2) music notation software used for the creation of worksheets or quizzes, (3) web-based assessment tools to measure content knowledge (*musictheory.net*), (4) interactive whiteboards (the most common are SmartBoard and Promethean), and (5) web-based portfolio assessment to measure a student's musical growth over time. The frequencies and percentages of assessment tools that were most commonly used by teachers are displayed in Table 4.
Table 4

Distribution of Types of Assessment Tools Most Commonly Used by Music Teachers

<table>
<thead>
<tr>
<th>Classification</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Recordings of Performance Skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>241</td>
<td>51.9</td>
</tr>
<tr>
<td>No</td>
<td>223</td>
<td>48.1</td>
</tr>
<tr>
<td>Music Notation Software</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>327</td>
<td>70.5</td>
</tr>
<tr>
<td>No</td>
<td>137</td>
<td>29.5</td>
</tr>
<tr>
<td>Web-Based Assessments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>159</td>
<td>34.3</td>
</tr>
<tr>
<td>No</td>
<td>305</td>
<td>65.7</td>
</tr>
<tr>
<td>Interactive Whiteboards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>171</td>
<td>36.9</td>
</tr>
<tr>
<td>No</td>
<td>293</td>
<td>63.1</td>
</tr>
<tr>
<td>Web-Based Portfolios</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>51</td>
<td>11.0</td>
</tr>
<tr>
<td>No</td>
<td>413</td>
<td>89.0</td>
</tr>
</tbody>
</table>

Note. \( n = 464 \)

The most commonly used technology-assisted assessment strategy included music notation software and digital recording devices. In reviewing the specific types of technology that were indicated by music teachers, *Finale* (63%) and *Sibelius* (41.2%) were the most widely used software programs in designing music assessments such as notation quizzes or performance exams. Recording performance skilled-based assessments can be accomplished in numerous ways. Handheld digital recorders such as the Olympus Series and Zoom H-2/H-4 models or software programs such as SmartMusic were the most common assessment tools
used by teachers. Handheld recording devices constituted 51.6% of teacher use whereas software programs had a smaller and more specific teacher use: 

*SmartMusic* (32.1%), *GarageBand* (39.1%), *Audacity* (33.5%), and *iPas* (2.9%).

In answering research question one, it was discovered that a larger percentage of music teachers use technology for instructional purposes in order to enhance their lesson plans than they do to conduct authentic assessment of student learning. The most commonly used technology-assisted assessment strategy included music notation software and digital recording devices.

**Research question 2:** *Is the music educator’s general attitude in using technology for assessment positive or negative?*

Section 5 of the teacher survey was the *Perceptions on Music Assessment and Technology* (PMAT) attitude scale. It is noted that all 22 questions within this section intended to measure the unidimensional construct of teacher attitudes. Attitude served as the dependent variable for this study. To test whether the distribution of the PMAT attitude scale deviated from normal, skewness and kurtosis values were examined. The data displayed in Table 5 and Figure 5 indicates a relatively normal distribution.

Table 5

<table>
<thead>
<tr>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Skewness Statistic</th>
<th>Skewness Std. Error</th>
<th>Kurtosis Statistic</th>
<th>Kurtosis Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>464</td>
<td>2.59</td>
<td>4.77</td>
<td>3.7890</td>
<td>.38650</td>
<td>-.303</td>
<td>.113</td>
<td>.125</td>
<td>.226</td>
</tr>
</tbody>
</table>
Figure 5. Histogram of Normal Distribution of PMAT (Perception of Music Assessment and Technology)

The questions were based on a five-point Likert scale with an average above three indicating a positive attitude. For this data set, $M = 3.79$ with a $SD = .387$ indicated that the general attitude of the teachers completing the survey was positive towards assessment in music and in utilizing technology to conduct assessments. Differences were examined between the average of responses on the PMAT scale to how the music teachers answered questions in section 2 concerning the use of technology for instruction and assessment (see Table 6).
For the survey question concerning the use of technology to enhance instruction, a one-way analysis of variance (ANOVA) was used (see Table 7). Levene’s Test of Homogeneity-of-variance assumption was met ($F(3, 460) = 1.144, p = .331$) as well as all other ANOVA assumptions of independence, normality, and randomness. The omnibus $F$-test from the ANOVA indicated a statistically significant difference in responses to the PMAT score based on the 4 response options of the question, $F(3, 460) = 30.920, p = .0001$. The partial eta squared effect size for this analysis, $\eta_p^2 = .170$ indicated a large effect size (Cohen, 1988).
Significant differences between groups were examined using a post-hoc test. Employing a post-hoc Tukey’s HSD (Honestly Significant Differences) test, the significant differences occurred between the teachers who responded *regularly* with all other categories, and those who responded *sometimes* with those who responded *occasionally*.

To continue this investigation, the PMAT scores were also compared to both assessment questions. All ANOVA assumptions of independence, normality, randomness, and homogeneity of variances were met for both questions. Levene’s Test of Homogeneity-of-variance assumption was met ($F(3, 460) = 1.976, p = .117$) for the first assessment question. Based on the four response options for question 2.5 about performance skill assessments compared to the PMAT score, there was a significant difference, $F(3, 460) = 44.236, p = .0001$ (see Table 8). The partial eta squared effect size for this analysis, $\eta^2_p = .224$, was larger than Cohen’s benchmark (1988) for a large effect size (.14). Using Tukey’s HSD, the significant differences occurred among teachers who responded *regularly* and *sometimes* with *occasionally*.

---

**Table 7**

*ANOVA Results of PMAT Score by Technology Use for Instruction*

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>11.606</td>
<td>3</td>
<td>3.869</td>
<td>30.920</td>
<td>.000*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>57.556</td>
<td>460</td>
<td>.125</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>69.162</td>
<td>463</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. *p < .05
and never and those who responded with occasionally and never were significant with all three options.

Table 8

ANOVA Results of PMAT Score by Technology Use for Assessment of Performance Skills

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>15.485</td>
<td>3</td>
<td>5.162</td>
<td>44.236</td>
<td>.000*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>53.677</td>
<td>460</td>
<td>.117</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>69.162</td>
<td>463</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. * p < .05

For the survey question concerning technology use for assessment of music content knowledge, Levene’s Test of Homogeneity-of-variance assumption was met ($F(3,460) = .467, p = .706$). An omnibus $F$-test from the ANOVA indicated a statistically significant difference in responses to the PMAT based on the four response options of the question about music content knowledge ($F(3,460)= 31.413, p = .0001$) (see Table 9). The partial eta squared effect size for this analysis, $\eta^2_p = .170$, indicated a large effect size. Once again using Tukey’s HSD, a post-hoc analysis indicated that the differences occurred among teachers who responded regularly and sometimes with occasionally and never, and those who responded with occasionally and never were significant with all three options.
The researcher conducted an additional analysis comparing the PMAT scores with specific assessment approaches. Independent sample $t$-tests were conducted comparing PMAT scores with each question concerning the use of a specific technology-assisted assessment (see Table 10). All $t$-tests were significant disclosing that music teachers' relative positive perception in using technology to assist with assessment is not being realized in actual day-to-day assessment strategies.

**Table 10**

*t-Test Comparison of PMAT Score with Use of Technology Assessment Tools*

<table>
<thead>
<tr>
<th>Assessment Approach</th>
<th>$M$</th>
<th>$SD$</th>
<th>$t$</th>
<th>$p$</th>
<th>LL</th>
<th>UL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handheld Digital Recorders</td>
<td>3.85</td>
<td>.382</td>
<td>3.766</td>
<td>.0001*</td>
<td>.06376</td>
<td>.20293</td>
</tr>
<tr>
<td>Music Notation Software</td>
<td>3.86</td>
<td>.360</td>
<td>6.400</td>
<td>.0001*</td>
<td>.16736</td>
<td>.31568</td>
</tr>
<tr>
<td>Web-based Assessments</td>
<td>3.95</td>
<td>.343</td>
<td>6.812</td>
<td>.0001*</td>
<td>.17488</td>
<td>.31667</td>
</tr>
<tr>
<td>Interactive Whiteboards</td>
<td>3.89</td>
<td>.386</td>
<td>4.215</td>
<td>.0001*</td>
<td>.08219</td>
<td>.22580</td>
</tr>
<tr>
<td>Web-Based Portfolios</td>
<td>3.93</td>
<td>.374</td>
<td>2.827</td>
<td>.0050*</td>
<td>.04908</td>
<td>.27285</td>
</tr>
</tbody>
</table>

Note. * $n = 464$. CI = confidence interval; LL = lower limit; UL = upper limit.

* $p < .05$
In answering research question 2, it was determined by the data that music educators have a general positive attitude towards using technology for assessment \((M = 3.79, SD = .387)\). Additional analysis determined that there is a significant difference between music teachers' positive perception and the types of technology that are actually used and how often the technology is implemented.

**Research question 3:** How do school setting factors influence music educator's attitudes regarding the use of technology in the assessment of music learning? This question was divided into two parts:

3a. Do certain types of professional development experiences influence music educators' attitudes towards using technology-assisted assessment tools?

3b. Do school setting and primary level of teaching assignment influence music educators' attitudes towards using technology-assisted assessment tools?

This question was split into two parts in order to provide a clear indication of the impact of professional development opportunities. First, professional development was categorized into four types of experiences; *school mandated*, *school voluntary*, *personal voluntary*, and *pre-service teacher training*. The responses included *yes*, *no*, or *not sure* to participating in professional development on technology. Descriptive data of the means and standard deviations are displayed in Table 11.
Table 11

Descriptive Statistics for Technology Professional Development Participation

<table>
<thead>
<tr>
<th>Professional Development</th>
<th>Yes</th>
<th></th>
<th>No</th>
<th></th>
<th>Not Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M (SD)</td>
<td>n</td>
<td>M (SD)</td>
<td>n</td>
</tr>
<tr>
<td>School Mandated</td>
<td>368</td>
<td>3.82 (.389)</td>
<td>83</td>
<td>3.72 (.355)</td>
<td>13</td>
</tr>
<tr>
<td>School Voluntary</td>
<td>370</td>
<td>3.83 (.377)</td>
<td>88</td>
<td>3.63 (.382)</td>
<td>6</td>
</tr>
<tr>
<td>Personal Voluntary</td>
<td>367</td>
<td>3.85 (.359)</td>
<td>93</td>
<td>3.56 (.402)</td>
<td>4</td>
</tr>
<tr>
<td>College Pre-service</td>
<td>126</td>
<td>3.85 (.368)</td>
<td>334</td>
<td>3.76 (.393)</td>
<td>4</td>
</tr>
</tbody>
</table>

All ANOVA assumptions of independence, normality, randomness, and homogeneity of variances were met for the following four one-way ANOVAs. Levene’s Test of Homogeneity-of-variance assumption was met ($F(2, 461) = .529, p = .589$) for the first statistical test. An omnibus $F$-test from the one-way ANOVA conducted on the question concerning the school mandatory professional development and PMAT attitude score was significant, $F(2, 463) = 5.653, p = .004$ (see Table 12).
Table 12

**ANOVA Results of PMAT Compared to School Mandated Professional Development**

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>1.656</td>
<td>2</td>
<td>.828</td>
<td>5.653</td>
<td>.004*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>67.507</td>
<td>461</td>
<td>.146</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>69.162</td>
<td>463</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. *p < .05

The partial eta squared effect size for this analysis, $\eta_p^2 = .024$, is a considerable small effect size based on Cohen's (1988) benchmarks of effect size. A post hoc test using Tukey's HSD indicated that the significant difference occurred among teachers who responded Yes with teachers who responded Not Sure.

For the survey question about school voluntary professional development, Levene's Test of Homogeneity-of-variance assumption was met ($F(2, 461) = .292, p = .747$). An omnibus $F$-test from the one-way ANOVA indicated a significant difference between PMAT score and school voluntary professional development participation, $F(2, 463) = 12.310, p = .001$ (see Table 13).
The partial eta squared effect size for this analysis, $\eta_p^2 = .051$, was a small effect size.

Using Tukey's HSD, the significant differences occurred among teachers who responded Yes with respondents that indicated No.

For the third one-way ANOVA, Levene's Test of Homogeneity-of-variance assumption was met ($F(2, 461) = .2.517, p = .082$). Table 14 displays the omnibus $F$-test data that indicated a statistically significant difference in responses to question 3.4 on personal voluntary professional development to the PMAT score, $F(2, 463) = 23.454, p = .0001$. The partial eta squared effect size for this analysis, $\eta_p^2 = .092$, reflected a medium effect size (Cohen, 1988).

Table 13

ANOVA Results of PMAT Compared to School Voluntary Professional Development

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>$F$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>3.506</td>
<td>2</td>
<td>1.753</td>
<td>12.310</td>
<td>.000*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>65.656</td>
<td>461</td>
<td>.142</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>69.162</td>
<td>463</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. * $p < .05$

Table 14

ANOVA Results of PMAT Compared to Personal Voluntary Professional Development

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>$F$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>6.388</td>
<td>2</td>
<td>3.194</td>
<td>23.454</td>
<td>.000*</td>
</tr>
<tr>
<td>Within Groups</td>
<td>62.775</td>
<td>461</td>
<td>.136</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>69.162</td>
<td>463</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. * $p < .05$
Using Tukey's HSD, the significant differences occurred once again between teachers who responded Yes with teachers that indicated No.

The final omnibus $F$-test from the one-way ANOVA conducted on the question concerning the PMAT score and college pre-service teacher training was not significant, $F(2, 463) = 2.451, p = .087$ (see Table 15).

Table 15

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>$F$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>.728</td>
<td>2</td>
<td>.364</td>
<td>2.451</td>
</tr>
<tr>
<td>Within Groups</td>
<td>68.435</td>
<td>461</td>
<td>.148</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>69.162</td>
<td>463</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. $p > .05$*

The second part of research question 3 focused on school setting (urban, suburban, rural) and primary level of teaching assignment (elementary, middle school, high school, and mixed grade). A 3 x 4 factorial ANOVA was used to examine the effects between school setting and primary level of teaching on teachers' attitude (see Table 16). There was no significant difference observed, $F(11, 463) = 1.342, p = .198$).
Table 16

**Factorial ANOVA (3 x 4) Results of School Setting and Grade Level**

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>2.187</td>
<td>11</td>
<td>.199</td>
<td>1.342</td>
<td>.198</td>
</tr>
<tr>
<td>Within Groups</td>
<td>1.001</td>
<td>6</td>
<td>.167</td>
<td>1.125</td>
<td>.346</td>
</tr>
<tr>
<td>Total</td>
<td>69.162</td>
<td>463</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. p > .05*

In order to further examine the role of professional development in learning technology-assisted assessment tools, simple descriptive statistics were employed. Table 17 displays a comparison of actual participation in technology professional development by school setting.

Table 17

**Descriptive Statistics of Technology Professional Development Participation by School Setting**

<table>
<thead>
<tr>
<th>Professional Development</th>
<th>Urban</th>
<th>Suburban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M (SD)</td>
<td>n</td>
</tr>
<tr>
<td>School Mandated</td>
<td>95</td>
<td>3.84 (.385)</td>
<td>214</td>
</tr>
<tr>
<td>School Voluntary</td>
<td>99</td>
<td>3.88 (.366)</td>
<td>216</td>
</tr>
<tr>
<td>Personal Voluntary</td>
<td>96</td>
<td>3.89 (.341)</td>
<td>213</td>
</tr>
<tr>
<td>College Pre-service</td>
<td>34</td>
<td>3.82 (.394)</td>
<td>71</td>
</tr>
</tbody>
</table>
It is noted that the number of teachers responding Yes to participating in school mandated, school voluntary, and personal voluntary professional development were consistent. However, the number of teachers that indicated they participated in college pre-service training on technology and technology-assisted assessment tools was significantly lower. Regardless of this disparity, attitude scores were consistently positive across all four types of professional development categories regardless of school setting.

In answering question 3, school district professional development options for in-service teachers, whether mandatory or voluntary, tend to have a significant difference on attitude scores. Also, when teachers take the initiative to participate in workshops and clinics on their own time, there is a significant difference on their attitude towards using technology-assisted assessments. The effect sizes were small to medium on all three tests. There was no significant difference on attitude scores based on college pre-service training even with fewer teachers indicating they had technology training in college. The second part of this question determined that the factors of school setting and grade level taught had no significant difference on attitude scores.

**Research question 4:** To what extent do music educator demographic factors of gender, level of educational degree, and years of music teaching experience influence their attitudes about technology-assisted assessment tools?

A 2 x 3 x 4 factorial ANOVA was used to examine the interactions between all teacher variables of gender (male and female), highest academic degree earned (bachelors, masters, doctorate), and years of teaching experience (1-10 years, 11-20
years, 21-30 years, and more than 30 years) with the PMAT attitude score. Table 18 displays the means for the design cells.

Table 18

*Frequency, Means, and Standard Deviations of Gender, Highest Degree Earned, and Years of Teaching Experience Compared to PMAT Score*

<table>
<thead>
<tr>
<th>Gender</th>
<th>M</th>
<th>SD</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelors</td>
<td>3.92</td>
<td>.358</td>
<td>43</td>
</tr>
<tr>
<td>Masters</td>
<td>3.82</td>
<td>.386</td>
<td>125</td>
</tr>
<tr>
<td>Doctorate</td>
<td>3.75</td>
<td>.379</td>
<td>33</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelors</td>
<td>3.77</td>
<td>.376</td>
<td>61</td>
</tr>
<tr>
<td>Masters</td>
<td>3.75</td>
<td>.399</td>
<td>170</td>
</tr>
<tr>
<td>Doctorate</td>
<td>3.77</td>
<td>.362</td>
<td>27</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-10 years</td>
<td>3.92</td>
<td>.340</td>
<td>56</td>
</tr>
<tr>
<td>11-20 years</td>
<td>3.81</td>
<td>.362</td>
<td>56</td>
</tr>
<tr>
<td>21-30 years</td>
<td>3.78</td>
<td>.346</td>
<td>52</td>
</tr>
<tr>
<td>30+ years</td>
<td>3.81</td>
<td>.493</td>
<td>37</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-10 years</td>
<td>3.80</td>
<td>.262</td>
<td>50</td>
</tr>
<tr>
<td>11-20 years</td>
<td>3.82</td>
<td>.394</td>
<td>59</td>
</tr>
<tr>
<td>21-30 years</td>
<td>3.80</td>
<td>.388</td>
<td>92</td>
</tr>
<tr>
<td>30+ years</td>
<td>3.58</td>
<td>.432</td>
<td>57</td>
</tr>
</tbody>
</table>

*Note. n = 459*
Levene’s test of equality indicated that homogeneity of variances assumption was met ($F = 1.277, p = .177$). A statistically significant interaction was observed for the full model, $F = 1.997, df = 23, p = .004$, as shown in Table 19. The partial eta squared effect size for the interaction effect ($\eta^2 = .096$) indicated that only 9.6% of the variability of the responses to the PMAT could be explained by the three independent variables. Based on Cohen’s (1988) benchmark values, this represents a medium effect size.

Table 19

**Factorial ANOVA (2 x 3 x 4) Results of Gender, Degree, and Years of Teaching**

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>$df$</th>
<th>Mean Square</th>
<th>$F$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>6.541</td>
<td>23</td>
<td>.284</td>
<td>1.997</td>
<td>.004*</td>
</tr>
<tr>
<td>Gender-Year</td>
<td>1.247</td>
<td>3</td>
<td>.416</td>
<td>2.919</td>
<td>.034*</td>
</tr>
<tr>
<td>Gender-Degree</td>
<td>.173</td>
<td>2</td>
<td>.086</td>
<td>.607</td>
<td>.546</td>
</tr>
<tr>
<td>Year-Degree</td>
<td>2.203</td>
<td>6</td>
<td>.367</td>
<td>2.579</td>
<td>.018*</td>
</tr>
<tr>
<td>Gender-Degree-Year</td>
<td>.481</td>
<td>6</td>
<td>.080</td>
<td>.533</td>
<td>.760</td>
</tr>
<tr>
<td>Total</td>
<td>68.477</td>
<td>458</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* *p* < .05, Gender-Degree interaction was *ns* and third order interaction of Gender-Degree-Year was *ns*.

Following the significant interaction, simple main effects tests were conducted to examine the differences among gender and years of teaching, gender and degree, year and degree. This analysis indicated a statistically significant difference between gender and year, $F(3,458) = 2.919, p = .034, \eta^2 = .020$. There was also a significant difference between year and degree, $F(2,458) = 2.579, p = .018, \eta^2 = .034$). However, no significant difference was observed between gender
and degree, $F(2, 458) = .607, p = .546$ and there were no third order interaction between gender, degree, and year, $F(2,458) = .533, p = .760$.

To further examine the differences among the three independent variables, pair-wise Tukey's LSD (Least Significant Difference) follow-up tests were conducted. This analysis yielded one statistically significant pair-wise difference (see Figure 6). For female teachers that have taught for thirty plus years tend to have a lower perception of using technology for assessment than younger female teachers and compared to male teachers. There was no significant difference based on years of teaching for male teachers. The level of educational degree had no impact on the teachers' attitudes in using technology-assisted assessment tools.

Figure 6. Differences of Mean PMAT score by gender compared to years of teaching.
To answer question 4, the variables of gender, level of degree earned, and years of teaching did provide a statistically significant interaction; however, the effect size for the interaction effect ($\eta^2 = .096$) indicated only a medium effect. A closer examination determined a significant interaction based on PMAT scores between gender and years of teaching as well as years of teaching and degree level. There was no difference between gender and degree.

**Additional Analysis**

Based on the data analysis of research questions 3 and 4, the impact of certain teacher and school variables were minimal on the impact of teachers' attitudes towards technology-assisted assessment tools. Within the PMAT portion of the survey, three questions were closely examined to determine two other possible confounding variables: time and resources. Refer to Table 20 for the descriptive statistics of the three questions.

Two questions asked teachers about time needed for professional development to learn technology-assisted assessment tools and instructional time in order to implement assessment strategies that use technology. A larger number of the survey participants indicated that this was a definite need in order for the teacher to put technology into practice. Professional development workshops require time not only to learn the technology, but also to learn how to implement technology into already established curriculum and lesson plans. The third question addressed the lack of resources and the need for software to implement the assessment strategies at their school. Teachers indicated this was even more of a concern than the factor of time.
Table 20

Responses Concerning Time for Professional Development, Instructional Time, and Resources

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>No Opinion</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Rating Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>I wish I had more professional development time devoted to learning technology-assisted assessment tools</td>
<td>8</td>
<td>36</td>
<td>117</td>
<td>208</td>
<td>97</td>
<td>3.75</td>
</tr>
<tr>
<td>I wish I had more time to learn and implement technology for assessment</td>
<td>4</td>
<td>29</td>
<td>51</td>
<td>237</td>
<td>145</td>
<td>4.05</td>
</tr>
<tr>
<td>I would use technology if I had the resources / equipment available</td>
<td>2</td>
<td>3</td>
<td>21</td>
<td>151</td>
<td>289</td>
<td>4.55</td>
</tr>
</tbody>
</table>

Note. n = 464

The researcher was interested if there was any difference of resources available based on the size of school. When comparing the availability of resources based on school setting (urban, suburban, rural), there was no significant difference, $F(2, 463) = .768, p = .465$ (see Table 21).

Table 21

One-way ANOVA of Urban, Suburban, and Rural to Technology Resources Available

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>.660</td>
<td>2</td>
<td>.330</td>
<td>.768</td>
<td>.465</td>
</tr>
<tr>
<td>Within Groups</td>
<td>198.200</td>
<td>461</td>
<td>.430</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>198.860</td>
<td>463</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. $p > .05$
Summary

The data collected for the four research questions in this study were analyzed by comparing the dependent variable score of teachers’ attitude (PMAT) to actual technology and assessment practices. In order to describe the demographics of the teacher participants for this study, descriptive statistics involving central tendency, frequencies and percentages were utilized. The demographical categories were gender, grade level, primary teaching assignment, years of teaching experience, and level of education.

In examining the first research question, descriptive statistics were employed to investigate which music teachers were using technology to assist with daily classroom instruction and assessment practices. The data indicated that a larger percentage of music teachers use technology to enhance instruction than teachers who use technology to assist with assessment of student learning. Teachers are also more inclined to use technology for assessment of performance skills than of music content knowledge. Also, the most commonly used technology-assisted assessment strategy included music notation software and digital recording devices.

Research question two determined if music teachers' attitude in using technology for assessment tends to be positive or negative. In using the PMAT score, it was discovered that the general perception by music teachers in utilizing technology to conduct assessments was positive. Using t-tests, a statistical significant difference was evident between a positive attitude score on the PMAT to a low actual use of technology for instruction and assessment tools. There seems to be a discrepancy between music teachers' positive perception of technology to the actual
use of technology in day-to-day assessment strategies.

Research question three explored the factors of school setting, primary grade level of teaching assignment, and professional development opportunities on the PMAT attitude score. No significant differences were found on a one-way ANOVA between school setting and grade level on attitude scores. In analyzing the effect of professional development on attitude scores, four one-way ANOVA tests were used. A significant difference was found that teachers that have participated in mandatory or voluntary school in-service training scored higher on the PMAT attitude scale compared to teachers that have not participated or were not sure if they participated. The PMAT attitude score was also higher if a teacher voluntarily participated in technology workshops or sessions or they had an opportunity to learn how to use technology in their pre-service training. However, there was a noticeable smaller number of research participants that indicated they learned how to use technology for instruction and assessment in their pre-service music education degree.

For the final research question, a 2 x 3 x 4 factorial ANOVA was used to examine the effects between gender, highest academic degree earned, and years of teaching experience. This analysis indicated a statistically significant difference between gender and year, and year and degree. However, no significant difference was observed between gender and degree.

Additional descriptive analysis examined time for professional development on learning technology-assisted assessment tools, instructional time in order to implement assessment strategies that use technology, and resources available to
music teachers. A larger number of survey participants indicated that more time and availability of the needed technology resources are needed in order for music teachers to feel comfortable in implementing technology-assisted assessment strategies. When comparing the availability of resources based on school setting (urban, suburban, rural), there was no significant difference.
CHAPTER FIVE

SUMMARY, DISCUSSION, AND RECOMMENDATIONS

Summary

Educational reforms over the last two decades have refocused educators to use data-driven decisions in developing best practices in teaching. Assessment is a key component of the instructional process; however, some educators still struggle with using reliable and valid methods that provide accurate assessment of student learning. Assessment data is indispensable to the teacher, student, parents, school, and community not only in providing an objective measurement of acquired knowledge and skill, but also in developing future learning experiences to enhance student learning (Asmus, 1999). Outcomes are not always focused on individual achievement; it also is a way to evaluate the effectiveness of a music program. Other advocates for music assessment have emphasized that proper assessment may provide evidence of musical growth, identify talented students, validate music programs and teacher effectiveness, motivate students to learn, and provide evidence of accountability (Boyle, 1992; Brophy, 2000).

The use of technology for teaching and learning has become an inquiry of increased relevance in educational research. Debates about the effectiveness of instructional technology on academic achievement and in the transformation of teaching and learning techniques have spearheaded important discussions on this subject (Cuban, 2001; Becker, 2000). Becker (2000) argued that when constructivist-oriented teachers have the necessary resources and have a
reasonable level of experience and skill in using computers, computers have proven to be a valuable and well-functioning instructional tool in the classroom.

Colwell (2002) noted that computer use in assessment holds considerable potential if the music educator is willing to devote the time and resources in developing assessment strategies that connect instruction, learning, and testing. The use of technology for assessment can be useful to the teacher if the assessment tool meets the goal of authentic assessment. However, the current literature does not contain a body of research on the use of technology-assisted tools for the purpose of assessing music learning. Time, technology resources, and professional development opportunities are just a few of the hurdles facing music educators in using technology-assisted assessment tools. The researcher’s goal was to bridge the gap between two bodies of current research concerning attitudes on assessment and attitudes on music technology, and to investigate the factors that influence music teachers’ use of technology-assisted assessment tools.

**The Purpose**

The purpose of this study was to examine K-12 music educators’ attitudes regarding the use of technology in the assessment of music learning.

**Review of the Literature**

The rationale for assessment is to determine how well students are learning. Evidence of student learning will occur if instruction and assessment are integrally related. The empirical research studies that have been conducted on music assessment in elementary music (Barkley, 2006; Carter, 1986; Nightingale-Abell, 1994; Tally, 2005) and secondary music (Hanzlik, 2001; Hill, 1999; Kancianic, 2006;
Kotora, 2005; McClung, 1996; McCoy, 1988; Russel & Austin, 2010; Sears, 2002; Sherman, 2006; Simanton, 2000; Tracy, 2002) have characterized the usual trends of music assessment approaches. Teacher demographics of teaching experience and training have shown to have an influence on the use of different assessment strategies (McCoy, 1991; Simanton, 2000) as well as teaching level and specialization (Russell & Austin, 2010).

A common trend in music education indicates that assessment practices tend to focus on informal and subjective grading standards including participation, effort, attendance, and attitude (Barkley, 2006; Carter, 1986; McCoy, 1991; Nightingale-Abell, 1994; Russel & Austin, 2010). One of the challenges facing music educators is the large size of classes that are quite typical, especially in a performance-based class. Consequently, performance-based classes tend to grade on attendance, practice records, and other non-achievement standards whereas general music classes in elementary and middle levels tend to focus on knowledge-based and achievement practices. However, the general literature in music education suggests that assessing achievement based on extra-musical skills should not be encouraged (Abeles, Hoffer, & Klotman, 1994; Boyle & Radocy, 1987; Colwell, 2008; Hoffer, 1988; Lehman, 1992).

With the renewed focus on assessment and accountability, recent studies have shown that there has been little progress in assessment strategies in music (Russell & Austin, 2010; Johnson, 2008). Based on the fundamental principle of learning theory, specific and prompt feedback needs to be provided to engage student motivation and learning. The dichotomy between assessments of learning
typically used for grading and accountability purposes, and *assessments for learning* used to engage and help students learn is at the heart of the issue (Stiggins, 2007). It is crucial to have a balance of objective measures of student achievement as well as a process that promotes student engagement in their own learning and self-reflection. Unfortunately, teachers tend to teach and assess the way they were taught. Boyle and Radocy (1989) suggested, "with the increasing concern for quality education in schools, there has been a growing need to identify quality teachers" (p. 221). Consequently, there is a real need for continued assessment training and support in the music profession (Assey, 1999; Brookhart, 2001; McMunn, Schenck, & McColskey, 2003; Mertler, 2004). This kind of training should occur in the pre-service teacher’s undergraduate education, and it should also be evidenced in the pre-service sessions offered educational professionals in K-12 school districts.

Music educators are experiencing a time of increasing technological advancements in instructional and assessment methods. Recent studies in the use of technology in music teaching have described trends in music educators' use of technology (Bauer et al., 2003; Reese & Rimington, 2000; Taylor & Deal, 2000). Research has shown that although there is a desire by the music teacher to learn and use technology, there are a moderately low number of teachers that are actually using technology in their classrooms. Two specific studies (Reese & Rimington, 2000; Taylor & Deal, 2000) found that most music educators using technology in school (a range between 75% and 92%) are primarily doing so to complete administrative tasks. Less than 30% of the music teachers indicated that they were using technology for classroom instruction.
Based on the research by Bauer, Reese, and McCallister (2003) on technology professional development, the factors of years of experience, academic degrees, and areas of music teaching were found to be fairly neutral with some slight differences in the gender variable. The authors explained that the differences in gender might be related to self-efficacy (Bauer, 2003) and familiarity (Fung, 2003) with technology.

Investigations on technology training revealed a large majority of music teachers (94%) displayed a desire to learn about technology (Reese & Rimington, 2000). However, only 25% of in-service teachers indicated that technology training was a part of their university teacher training programs and that only 13% of school districts were offering more than one technology training session per year. Taylor and Deal (2000) also found that there is a real need by music educators to participate in technology training.

The theoretical model for this study was based on the conceptual framework regarding attitudes and behavior developed by Fishbein and Ajzen (1975). This framework was rooted in the concept that attitudes are based on established beliefs and that beliefs are formulated by the experiences and knowledge of the individual. The theory of reasoned action (TRA) was a continuation of Fishbein and Ajzen's original work and has had considerable implications on consumer behavior research especially in the area of information technology (Davis, 1989). This model focused on a person's individual perception of the technology and its value and ease of use. Davis (1989) defined perceived ease of use as the degree to which a person believes that using a particular system or tool would be free from effort. Kaasinen
(2005) expanded the above framework to include trust and ease of adoption in the Technology Acceptance Model for Mobile Services (TAMM). Trust indicated a positive belief about the reliability of a technological tool. Ease of adoption was another stage that the researchers found to have an effect on the decision to use technology. A parallel statement can be made about music teachers’ decision to use technology-assisted assessment tools in his or her music classroom. The perceived ease of use and perceived value are two key factors in the decision-making process of determining to use an assessment tool. A teacher must also trust that the assessment tool will do what it is intended to do. All these elements formed the theoretical model for this study. (see Figure 7).

![Figure 7. Theoretical model: Factors influencing the decision to use Technology-Assisted Assessment Tools.](image-url)
Between the two bodies of literature of assessment and technology, the researcher discovered a gap in the research that specifically focused on technology-assisted assessment tools. There are a variety of technology-assisted tools available for music educators, but it is unclear how many educators are actually utilizing these tools and whether they are incorporating these tools with instruction in order to provide authentic assessment of music learning.

**Procedure**

This study was classified as a non-experimental, quantitative method. An online survey was developed and piloted by the researcher. A survey approach is a frequently used research method designed to use data gathered from a group of people to describe relationships (Abeles & Conway, 2010). The researcher designed survey included six sections in the following order: (1) research study consent, (2) use of instructional technology in music, (3) use of technology-assisted assessment tools (4) professional development, (5) teacher perceptions on music assessment and technology (PMAT), and (6) demographics. Section two and three asked questions about current and past experiences of using instructional technology and assessment strategies. The attitude assessment portion of the survey was entitled *Perceptions of Music Assessment and Technology* (PMAT) and it included 22 belief statements with questions stated in both the negative and positive context. Participants were asked to indicate their feelings about each belief statement on a Likert scale ranging from *Strongly Disagree* to *Strongly Agree*. The score of five was considered a high score for a question. A mean score higher than three was considered a high score on the PMAT section.
The survey questions were modeled after other assessment studies found in the literature in order to establish content validity. An initial pilot study of the survey tool was conducted with a population of music educators from a local school district \((n = 38)\). The pilot participants were asked to provide feedback about the survey. This helped establish both the reliability of the instrument and face validity of the survey instrument. A panel of music education experts reviewed the final version of the survey, and a second pilot study was run with a second group of music teachers \((n = 21)\). A factor analysis was conducted to examine the internal consistency reliability of the instrument. The estimated coefficient of reliability \((\alpha = .74)\) was found to be in the threshold of acceptability. Due to the fact this was a one time pilot administration of the instrument that included a small sample of participants, the reliability coefficient is an estimation of its internal consistency. However, the data did provide the researcher with information about three statements that had relatively low values. In comparing the three belief statements to the feedback by the panel of experts, two statements were eliminated from the survey increasing the estimated coefficient of reliability to \((\alpha = .76)\). Based on further feedback by the panel concerning the third statement, it was determined that it was an important statement to include within the PMAT section. Therefore, with some changes in wording, it was included in the survey creating a final version of the PMAT portion of the survey that included 22 belief statements.

The subjects for this study included 2,211 music educators that were MENC members. MENC: The National Association of Music Education provided the researcher a stratified, random sampling of K-12, elementary, middle level, and high
school teachers that teach general music, vocal music, or instrumental music classes. An *a priori* calculation of the required sample size was conducted with an alpha level of .05 and a confidence level of ± .05. Assuming a normal response rate, it was determined that a sample size of 327 completed surveys was needed.

After the researcher obtained campus Institutional Review Board approval for this survey study, an email contact was initiated with each participant, which included the description and purpose of the study as well as an invitation to participate. At the completion of the survey, 492 responses were recorded. Twenty-eight respondents did not fully complete the survey, leaving a total of 464 usable survey responses. After further investigation of the non-response participants, 57 people were ineligible to participate in the study because they were no longer teaching K-12 music. Some of the participants emailed the researcher stating they were no longer teaching at the K-12 level because of a new teaching position at a college or university or the teacher had recently retired. Eight participants simply declined to participate and 152 participant emails were undeliverable.

**Design and Results of the Study**

In designing the study, the following four research questions were formulated:

1. How many music educators are using technology-assisted assessment tools and what types of assessment tools are being utilized?

2. Is the attitude of music educators generally positive or negative toward using technology in the assessment process?

3. How do school setting factors influence music educator's attitudes regarding the
use of technology in the assessment of music learning? This question was divided into two parts

3a. Do certain types of professional development experiences influence music educators’ attitudes towards using technology-assisted assessment tools?

3b. Do school setting and primary level of teaching assignment influence music educators’ attitudes towards using technology-assisted assessment tools?

4. To what extent do music educator demographic factors of gender, level of educational degree, and years of music teaching experience influence their attitudes about technology-assisted assessment tools?

A summary of the demographic information described the population of music teachers that utilize technology-assisted assessment tools in music instruction. The description of the music content areas that the participants were teaching was very typical of a large school district with 60.3% participants teaching elementary general music, 44.7% teaching choir, 42.7% teaching band, and 12.9% teaching strings. Participants described additional teaching areas such as guitar and music appreciation classes on a free-response question. The grade level classification was fairly uniform with 30.3% of the participants teaching elementary, 16.7% teaching middle level, 29.4% teaching high school, and 23.2% of the participants indicated they were teaching multiple grades. School setting included 26.6% teaching in an urban school, 50.4% teaching in a suburban school, and 22.5% teaching in a rural school. Personal teacher demographical information included
gender, 43.3% were males and 55.6% were females; and the number of years of
teaching experience included 22.7% teaching 1-10 years, 25.1% teaching 11-20
years, 31.1% teaching 21-30 years, and 20.6% teaching 30 or more years. The
highest professional degree earned by individual participants was Bachelors at
22.7%, Masters at 63.9%, and Doctorate at 12.9%.

**Research Question 1**: How many music educators are using technology-assisted assessment tools and what types of assessment tools are being utilized?

Simple descriptive statistics determined the number of music educators using
technology as a part of their assessment strategies as well as described the types of
assessment tools the teachers were actually using in their music classroom. Based
on the data of Table 3 in Chapter 4, it was evident that music teachers tend to feel
more comfortable in using technology for instruction than for assessment strategies.
Only 20.4% of the respondents indicated their school required the use of some type
of technology-assisted assessment tool. It was unclear based on this question
whether that response indicated only the use of an online grade book or an actual
assessment tool.

In an open-ended question, the music teachers indicated the types of
technology most commonly used for assessment: (a) digital recordings of
performance skills, 51.9%; (b) music notation software, 70.5%; (c) web-based
assessments, 34.3%; interactive whiteboards, 36.9%; and (d) web-based portfolios,
11%. Finale (63%) and Sibelius (41.2%) were the most widely used software
programs in designing music assessments. Recording performance skilled-based
assessments were achieved by using handheld digital recorders such as the
Olympus Series and Zoom H-2/H-4 models or software programs such as SmartMusic. Handheld recording devices constituted 51.6% of teacher use whereas software programs had a smaller and more specific teacher use: SmartMusic (32.1%), GarageBand (39.1%), Audacity (33.5%), and iPas (2.9%).

**Research question 2:** *Is the general attitude of music educators positive or negative toward using technology for assessment?* Descriptive and inferential statistics were used to answer this baseline question. Responses over the set of 22 perception questions on the PMAT provided a cumulative attitude score, which served as the dependent variable for this study. It is noted that all 22 questions within this section intended to measure the unidimensional construct of teacher attitudes. For this data set, the $M = 3.79$ with a $SD = .387$ indicated that the general attitude of the teachers completing the survey was positive towards assessment in music and in utilizing technology to conduct assessments.

Three questions were asked regarding whether the music teacher uses technology to enhance instruction, uses technology to assist with performance-based skill assessments, and uses technology to assist with the assessment of music content knowledge. The teachers were asked to select one of four answers that best described the amount of use of technology under each caption; *regularly* (every lesson), *sometimes* (3 to 4 times a week, but not for every lesson), *occasionally* (a few times a month), and *never*.

For each question, a one-way analysis of variance (ANOVA) was used. All ANOVA assumptions of independence, normality, randomness, and homogeneity-of-variance were met. The omnibus $F$-test from the ANOVA indicated a statistically
significant difference between the PMAT attitude score and technology use to enhance instruction \( (F(3, 460) = 30.920, p = .0001) \). The partial eta squared effect size for this analysis, \( \eta_{p}^2 = .170 \) indicated a large effect size (Cohen, 1988).

Significant differences between groups were examined using a post-hoc test. Employing a post-hoc Tukey’s HSD (Honestly Significant Differences) test, the significant differences occurred between the teachers who responded regularly with all other categories, and those who responded sometimes with those who responded occasionally.

For the question concerning technology use to conduct performance skill assessments compared to PMAT score, there was a significant difference \( (F(3, 460) = 44.24, p = .0001) \). The partial eta squared effect size for this analysis, \( \eta_{p}^2 = .224 \), is larger than Cohen’s benchmark (1988) for a large effect size (.14). Using Tukey’s HSD, the significant differences occurred among teachers who responded regularly and sometimes with occasionally and never and those who responded with occasionally and never were significant with all three options.

For the question concerning technology use for assessment of music content knowledge, an omnibus \( F \)-test from the ANOVA indicated a statistically significant difference in responses to the PMAT based on the four response options of the question \( (F(3, 460) = 31.412, p = .0001) \). The partial eta squared effect size for this analysis, \( \eta_{p}^2 = .170 \) indicated a large effect size. Once again using Tukey’s HSD, a post-hoc analysis indicated that the differences occurred among teachers who responded regularly and sometimes with occasionally and never, and those who responded with occasionally and never were significant with all three options.
The researcher conducted an additional analysis comparing the PMAT scores with specific types of technology that teachers indicated on the survey. Independent sample t-tests were conducted using the PMAT score with each question in section three of the survey about the types of assessment tools most commonly used. All t-tests were significant disclosing that music teachers' relative positive perception in using technology to assist with assessment is not being realized in actual day-to-day assessment strategies.

**Research question 3:** How do school setting factors influence music educator's attitudes regarding the use of technology in the assessment of music learning?

3a. Do certain types of professional development experiences influence music educators' attitudes towards using technology-assisted assessment tools?

3b. Do school setting and primary level of teaching assignment influence music educators' attitudes towards using technology-assisted assessment tools?

This question was divided into two parts: the influence of professional development on attitude, and the influence of the factors of school setting and primary level of teaching assignment on attitude. A one-way ANOVA was conducted for each question concerning professional development participation. All ANOVA assumptions of independence, normality, randomness, and homogeneity of variances were met. An omnibus F-test determined a statistically significant difference on three of the four professional development options.

It was determined that teachers who participated in mandatory or voluntary school in-service training scored higher on the PMAT attitude scale compared to
teachers who have not participated or were not sure if they participated. The PMAT attitude score was also higher if a teacher voluntarily participated in technology workshops or sessions or they had an opportunity to learn how to use technology in their pre-service training. However, there were a noticeable smaller number of research participants that indicated they learned how to use technology for instruction and assessment in their pre-service music education degree.

The second part of research question three focused on school setting (urban, suburban, rural) and primary level of teaching assignment (elementary, middle school, high school, and mixed grade). A 3 x 4 factorial ANOVA was used to examine the effects between school setting and primary level of teaching on teachers' attitude. There was no significant difference observed, $F(11, 463) = 1.342, p = .198$.

**Research question 4:** To what extent do music educator demographic factors of gender, level of educational degree, and years of music teaching experience influence their attitudes about technology-assisted assessment tools? This question had three main subsets: (a) years of music teaching experience, (b) level of educational degree, and (c) gender. A 2 x 3 x 4 factorial ANOVA was used to examine the influences between all teacher variables: gender (male and female), highest academic degree earned (bachelors, masters, doctorate), and years of teaching experience (1-10 years, 11-20 years, 21-30 years, and more than 30 years). Levene's test of equality indicated that homogeneity of variances assumption was met ($F = 1.277, p = .177$). A statistically significant interaction was observed for the full model, $F = 1.997, df = 23, p = .004$.

The partial eta squared effect size for the interaction effect ($\eta^2 = .096$)
indicated that only 9.6% of the variability of the responses to the PMAT could be explained by the three independent variables. Based on Cohen’s (1988) benchmark values, this represents a medium effect size.

In utilizing a pair-wise Tukey’s LSD follow-up test, one statistically significant pair-wise difference was discovered. Female teachers that have taught for thirty plus years tend to have a lower perception of using technology for assessment than younger female teachers. There was no significant difference based on years of teaching for male teachers. Finally, the level of educational degree had no impact on the teachers’ attitudes in using technology-assisted assessment tools.

Based on the data analysis of research questions 3 and 4, the impact of certain teacher and school variables were minimal or non-existent in the impact of teachers’ attitudes towards technology-assisted assessment tools. Within section five, three questions were closely examined to determine two other possible confounding variables; time and resources.

Two questions asked the teacher about required time for professional development on learning technology-assisted assessment tools and instructional time in order to implement assessment strategies that use technology. A larger number of survey participants indicated that this was a definite need in order for the teacher to put technology into practice. The third question addressed the lack of resources, the need for technology to implement the assessment strategies at their school. This goes without saying that without the appropriate technological equipment, teachers will not be able to implement the variety of assessment strategies that would enhance their curriculum. However, the variable of resources
is impacted by various outside factors such as budget constraints or school policies, which are simply out of the control of a teacher's influence unless the teacher is willing to spend the time researching alternative funding options.

**Discussion**

The participant response rate to this survey study was small; therefore, caution must be exercised in generalizing the results. It is also noted that even though steps were implemented to reduce survey response bias, it is quite possible for teachers who feel comfortable using technology in their daily lives to be more willing to complete a survey about technology. On the other hand, teachers that are extremely uncomfortable with the use of technology might conclude they would have nothing to offer, therefore, chose to not participate in the survey. But in context of the research questions for this study, the researcher is confident that the attitude scores on the PMAT reflect the participants' perceptions on technology-assisted assessment tools.

The music teachers' overall attitude towards assessment and in using technology tools to assist with assessing students was positive. By comparing what factors might influence their attitude scores, it was discovered that specific school and teacher factors had a generally small influence on their perceptions.

**Research Question 1**

With regard to the findings of research question 1, it was evident that music teachers are utilizing technology for daily instruction more than for assessment. The actual use of technology by music teachers is still moderately low; a trend that has not significantly changed from previous research (Reese & Rimington, 2000; Taylor
& Deal, 2000). Unless the music teacher has established the role of formative assessments as *checking for understanding*, the number of teachers using technology for assessment on a regular basis (every lesson) will be low. However, the last two categories of *occasionally* (only a few times a month) or *never* were considerably higher for assessment than for instruction indicating that very few music teachers are using technology to help with assessment. The types of assessment tools that are utilized by music teachers tend to be notation software and digital recording devices. Teachers described using notation software in making quizzes or tests based on music knowledge content as well as performance excerpts either for a face-to-face assessment or in conjunction with *SmartMusic*. Implementation of new technologies, such as interactive whiteboards or web-based tools such as rubrics and e-portfolios, is still developing within the music education profession.

**Research Question 2**

The second research question about the perceptions of music teachers towards assessment and music technology compared to the actual use of technology indicated positive relationships. As might be expected, music teachers that tend to use instructional technology and technology-assisted assessment tools on a regular basis had a higher score on the PMAT. Even so, teachers that indicated that they never use technology scored above the attitude mean. In general, music teachers positively perceive the value of using certain technology-assisted assessment tools to assist them in assessing students. However, the actual implementation is not being realized in the music classroom. The function of assessment is to gather data about whether students are learning. There are various methods of achieving this
purpose, but with the wealth of technology available to teachers, the goal is to use the technology-assisted tools that can effectively and efficiently gather student data. The perceived value of using technology-assisted assessment tools by teachers is at odds with the actual implementation. This is a contradiction to earlier research in which teacher beliefs were stronger predictors of decisions and behavior than skills and knowledge (Pajares, 1992). A probable cause of this phenomenon is the lack of resources and training on how to effectively incorporate available technology tools to enhance instruction and assessment.

**Research Question 3**

The third research question pertained to the school factors that influence teacher's attitudes. In-service teachers who participate in professional development either within their school or on personal time scored significantly higher than those teachers that have not participated in technology workshops. When teachers have the option to select and participate in workshops that they are interested in, their attitude score tends to be higher. The technology workshops that are the *one topic fits all* design, which is the case in most school staff development workshops, usually will not meet the needs of all teachers. The cafeteria plan in which teachers are able to voluntarily enroll in workshops that serve their specific needs in learning technology will more likely have a larger impact on whether or not the specific technology will be incorporated into daily teaching strategies (Frank, Zhao, & Borman, 2004; Riel & Becker, 2000). There is also a level of creativity that must occur on part of the teacher in designing assessments using the resources that are available to them. Innovative approaches of using technology to fit the specific goals
of instruction should be encouraged as well as shared as a best practice strategy with other educators.

The number of teachers indicating that they participated in a college pre-service training on technology was significantly lower than in-service training. It is obvious teachers that have taught fifteen or more years would have experienced different technological trends in college music education courses compared to present trends. Based on recent graduate responses, there seems to be a lack of music technology classes that include using technology-assisted assessment tools in college music education curricula. This is not to say that a dedicated music technology course is absent in the requirements for baccalaureate graduation, but the connection of utilizing technology to enhance music instruction and to assist with assessment does not appear to receive the emphasis.

The second part of question three focused on the effects of school setting and grade level in which there was no significant effect. The school setting and primary grade level of teaching assignment had little impact on a teacher’s attitude towards using technology for assessment, which supports previous research concerning instructional technology (Bauer et al., 2003).

**Research Question 4**

The final research question addressed the teacher factors of gender, highest degree earned, and years of teaching experience on attitude scores. There was a significant difference between all three factors, however, it is important to note that the effect size was less than .10, which suggests that only a small portion of the variability is based on these contextual variables. There was a significant difference
between male and female attitude scores. Nonetheless, that trend has continued to narrow over time between gender, as was stated by Folkestad (2007). A closer look at the data indicated that the significant difference occurred between female teachers that have taught the longest with younger female and male teachers. There were no significant differences in attitude scores for males based on years of experience. In addition, the influence of the highest educational degree had no influence on the teachers' attitude scores. This supports previous research by Bauer, Reese, and McCallister (2003) in which technology professional development, the factors of years of experience, academic degrees, and areas of music teaching were found to be fairly neutral with some slight differences in the gender variable. The absence of these relationships could be considered good news for instructional leaders in designing technology workshops. Since the findings from this study confirms that the variables mentioned above have little impact on teachers' attitudes, future studies should focus more on the development of effective models and frameworks in the learning of instructional and assessment technologies.

Once the main contextual variables of certain school and teacher factors were found to have little to no impact on attitude scores, alternative factors of time and resources were examined. There are two influences of time that seem to impact a teacher's actual use of technology for assessment; time to learn the technology and class time to implement the technology. Various methods of professional development have been researched on general educational topics. Moore (2009) indicated that teacher participants in a technology workshop reported what was personally applied and individually practiced was learned best. Furthermore,
teachers who have successfully integrated technology in the classroom have reported experiencing professional development opportunities that provided a sound pedagogical approach to understanding how to use technologies to connect curriculum and standards (Penuel, 2006).

Besides instructional technology training and support, the availability of financial resources in schools has had an obvious impact on teachers’ use of technology (Bauer, et al, 2003). Participants of this study also indicated that this is a major hurdle in the infusion of technology into music instruction. Teachers that are utilizing various technologies sometimes find outside financial resources to do so either by grants from local support groups such as PTO or music booster organizations, or by competitive state and national grants for innovative teaching practices. An example of a common financial resource for technology projects is state lottery funds. In many cases, music teachers are unaware of simple assessment strategies that may be implemented using free or already existing software programs. Consequently, professional development training should include not only best practices of technologies that are free or relatively inexpensive, but also funding suggestions and grant writing resources.

**Implications for Music Education**

In order to narrow the gap between the positive perceptions by teachers in using technology-assisted assessment tools and the actual day-to-day integration of the technology, continued training and support is required. This need for professional development on music assessment has been supported by previous research (Assey, 1999; Brookhart, 2001; McMunn, Schenck, & McColskey, 2003;
With the current technological trends, however, professional training must expand to include useful and available technology that will support the teachers’ efforts in assessment. Best practices of various technology supported assessment strategies must be researched, modeled, and implemented.

Assey (1999) provided one of the first models of technology training used for in-service teachers. He asserted that arts educators must first learn how to use the hardware and software followed by training on how to enhance lesson plans that integrate this new technology. This is assuming there is a well-designed curriculum established and the goal of the teacher is to discover ways to teach and assess by incorporating technology. Learning technology tools in music should not be any different than how a musical instrument is learned. The key component of this framework is the amount of time provided in between workshop sessions to practice using the new technologies. Once the teacher has developed a sense of familiarity with the new software/hardware, the next crucial step is to train teachers how to use technology to support the goals of the lesson plan and assessment method. Teachers must work to develop, utilize, and evaluate technology-enhanced authentic assessments that are aligned to the learning goals of the lesson. In order for the actual use of technology to occur, the following must be present: (1) time to learn, (2) time to practice, (3) time to develop, and (4) time to evaluate for effectiveness.

Considering the low number of music teachers that indicated they received training on the use of technology for assessment in their undergraduate pre-service training, a reevaluation of how music technology is taught in higher education is
warranted. For teacher training programs in higher education, a pedagogical shift from the stand-alone technology classes to incorporating technology with the general methods courses is a possible solution. One particular model provides a music technology class or instructional technology class as a singleton, a separate course that focuses solely on learning how to use various technology tools. Another model incorporates the use of instructional and assessment technology strategies into the method courses so that teachers learn how particular technology tools may support the teaching and assessment of music concepts. This will establish a sense of familiarity with how to use technology in conjunction with teaching and assessment, not as an additional and separate component. Finally, student teachers should demonstrate their understanding of assessment practices with support of technology in their practicum experiences. Future teachers must understand the potential of various technologies, have opportunities to learn how to use them, and be given time to experiment enhancing instructional and assessment strategies with technology prior to entering the profession.

Although younger teachers tend to be more comfortable in the use of a variety of technologies, it is during their formative years as a new teacher that they tend to rely on the way they were taught when they were in public school. In light of the social networking phenomenon of recent years, new teachers must shift their thinking on how technologies are used from a personal setting to an educational and professional setting. Therefore, deciding what type of framework in pre-service training would provide a long-lasting commitment and understanding of how to use technology to enhance instruction and assessment is important. Developing
confidence within teachers is an important construct between professional development and the implementation of various types of technology in assessment (Russel & Austin, 2010). If the music teaching profession is to evolve technologically, undergraduate music education programs must also be willing to evolve to focus on technology-enhanced instruction. It is essential that higher education take the lead in modeling technology-supported music instruction in preparing future teachers.

**Suggestions for Future Study**

The ubiquitous nature of technology within music instruction combined with the necessity to provide authentic assessment of student learning requires that music educators be engaged in both professional learning and curriculum development that incorporates technology-assisted assessment tools into the curriculum. Suggestions for future study on this topic include the following:

1) Due to the fact that assessment research and the development of new technology will continue, future research on best practices of technology-assisted assessment tools will be warranted.

2) Continued development of the *Perception on Music Assessment and Technology* (PMAT) survey instrument used for this study will help establish test-retest reliability of the instrument for future studies.

3) Replication of this study with a new sampling of music teachers will be essential to substantiate the results as well as track trends in teacher training and infusion of technology-assisted assessment tools into music instruction.
4) Longitudinal study exploring a pre-service training model that provides a sustained use of technology in the classroom by in-service teachers is needed to develop a theory of sustained technology use.

5) Studies on effective in-service technology training models is needed to promote full-time technology integration and usage by music educators.

Technology can change the way content is delivered in the classroom and increase teachers’ ability to individualize instruction and engage students (Pitler, Hubbell, Kuhn, and Malenoski, 2007). A consistent effort in developing best practices in the use of technology-assisted assessment tools in music is needed to guide teachers from a positive perceived value and intended use of technology to the actual use of the technology in classroom instruction. This effort should include the collection and analysis of data to determine best practice effectiveness. Further, the effort should be led by innovative teachers and forward-thinking educational leaders in both K-12 schools and in higher education in order to prepare effective teachers for the ever-changing challenges of the 21st century.
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APPENDIX A

February 22, 2011

Lance Nielsen
School of Music
220 Cottonwood Dr Lincoln, NE 68510

Brian Moore
School of Music
358 WMB, UNL, 68588-0100

IRB Number:
Project ID: 11276
Project Title: The Effect of Selected Teacher and School Setting Variables on K-12 Music Educators' Attitudes Toward the Use of Technology in the Assessment Process.

Dear Lance:

The Institutional Review Board for the Protection of Human Subjects has completed its review of the Request for Change in Protocol submitted to the IRB.

1. It has been approved to change the title of your project. The new title is reflected above. The title has also been changed on emails to participants.

We wish to remind you that the principal investigator is responsible for reporting to this Board any of the following events within 48 hours of the event:
* Any serious event (including on-site and off-site adverse events, injuries, side effects, deaths, or other problems) which in the opinion of the local investigator was unanticipated, involved risk to subjects or others, and was possibly related to the research procedures;
* Any serious accidental or unintentional change to the IRB-approved protocol that involves risk or has the potential to recur;
* Any publication in the literature, safety monitoring report, interim result or other finding that indicates an unexpected change to the risk/benefit ratio of the research;
* Any breach in confidentiality or compromise in data privacy related to the subject or others; or
* Any complaint of a subject that indicates an unanticipated risk or that cannot be resolved by the research staff.

This letter constitutes official notification of the approval of the protocol change. You are therefore authorized to implement this change accordingly.

If you have any questions, please contact the IRB office at 472-6965.

Sincerely,

[Signature]

Becky R. Freeman, CIP
for the IRB
APPENDIX B

Instrument Assessment Form

Perceptions on Music Assessment and Technology (PMAT)

Instructions: Please provide feedback about the survey by checking your answer for the following questions and rating scales:

1. Are the survey directions clear? □ Yes □ No

2. Will the participants fail to answer any question? □ Yes □ No

3. Are there errors in the words? □ Yes □ No

If yes, explain where:

4. Does the format of the survey seem logical? □ Yes □ No

5. Do the questions serve the appropriate purpose? □ Yes □ No

Section 5 (Questions 1-24, Refer to the Table of Specifications)

6. Are the twenty-four belief statements related to the five constructs associated with music educators’ perceptions about music technology and assessment?

□ Not Related

□ Moderately Related

□ Closely Related

7. If you feel there is a statement that is NOT placed under the correct construct, please list the statement number below by the construct you feel better represents that statement.

Five constructs
1) Technology 'Ease of Use'
2) Beliefs about Assessment
3) Familiarity of Assessment and Technology Strategies
4) Beliefs about Technology
5) Endorsement by the Experts

8. Please share any other comments you have about the survey:
APPENDIX C

Email Script

Dear Music Educator -

My name is Lance Nielsen, a PhD student at the University of Nebraska-Lincoln. I would like your assistance in conducting a research project. The purpose of this study is to describe current trends of practicing K-12 music educators in the use of technology-based assessment of music learning, to determine music educators' attitudes in using technology, and to determine to what extent do certain demographic factors influence a teacher's decision to use technology.

The title of the project will be **A Study of K-12 Music Educators’ Attitudes Toward Technology-Assisted Assessment Tools**

Your identity throughout this process will be kept strictly confidential. Participation in this study will require that you complete an online survey that will take you approximately 15 minutes to complete. There are no known risks to participating in this study. To participate in this study, simply proceed to the following weblink. 

<INSERT WEB LINK>

The first question will ask for your consent to participate. Then, simply answer the rest of the questions and click on submit when completed. Deadline to complete to the survey will be <INSERT DATE>. A reminder email to complete the survey will be sent in two weeks.

If you have any questions about the research project, please contact Lance Nielsen at ldniels@gmail.com. If you have any questions about your rights as a research participant or to report any concerns, please contact the UNL Institutional Review Board at 402-472-6965 or irb@unl.edu. (IRB# 20101111276). The results will be shared with all participants at the conclusion of the study. Thank you for your consideration in participating in this research study.

Sincerely,

Lance D. Nielsen  
Doctoral Student  
University of Nebraska–Lincoln  
220 Cottonwood Dr.  
Lincoln, NE 68510  
lancenielsen@me.com

Dr. Brian Moore  
Associate Professor of Music Education  
University of Nebraska–Lincoln  
358 Westbrook Music Building  
Lincoln, NE 68588–0100  
Email: bmoore1@unl.edu  
Telephone: (402) 472–2537
APPENDIX D

Follow-Up Email Contact

Dear Music Educator,

One week ago, I sent you an email asking for your participation in a research study entitled A Study of K-12 Music Educators’ Attitudes Toward Technology-Assisted Assessment Tools.

If you have completed the survey, I want to thank you for your participation and time. If you have not completed the survey, I ask that you please reconsider your participation in the survey on technology-based assessment tools by <DATE>. Click on the link below to access the survey. The survey will take approximately 15 minutes to complete.

Thank you for your assistance and participation in this study.

Sincerely,

Lance D. Nielsen
Doctoral Student
University of Nebraska-Lincoln
lancenielsen@me.com
402-817-8217

Dr. Brian Moore
Associate Professor of Music Education
University of Nebraska – Lincoln
358 Westbrook Music Building
Lincoln, NE 68588–0100
Telephone: (402) 472–2537
Email: bmoore1@unl.edu
Technology-Assisted Assessment Tools in Music Education

1. Introduction to the study

IRB# 2010111276

The purpose of this study is to examine K-12 music educators’ attitudes regarding the use of technology in the assessment of music learning.

If you are willing to participate in this study, read the consent statement below and select your response. If you are NOT currently a K-12 music educator, please select the third option.

Please complete this survey and submit. The survey should take less than 15 minutes to complete. THANK YOU for your willingness to participate in this study.

1. I give my consent to participate in this survey study about technology-assisted assessment tools. I understand my identity will be kept strictly confidential and there are no known risks to participating in this study.

☐ Yes, I give my consent to participate in this study.

☐ No, I have decided to not participate in this study.

☐ I decline to participate because I am not currently a K-12 Music Educator.
Technology-Assisted Assessment Tools in Music Education

2. Instrucational Technology in Music

1. How comfortable do you feel using technology in your classroom instruction?

<table>
<thead>
<tr>
<th>Rating</th>
<th>Very Uncomfortable</th>
<th>Uncomfortable</th>
<th>Neutral</th>
<th>Comfortable</th>
<th>Very Comfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Rating</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

2. How comfortable do you feel using technology for assessment?

<table>
<thead>
<tr>
<th>Rating</th>
<th>Very Uncomfortable</th>
<th>Uncomfortable</th>
<th>Neutral</th>
<th>Comfortable</th>
<th>Very Comfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>My rating</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

3. How comfortable do you feel using technology for your daily administrative tasks (grades, email, inventory, etc.)?

<table>
<thead>
<tr>
<th>Rating</th>
<th>Very Uncomfortable</th>
<th>Uncomfortable</th>
<th>Neutral</th>
<th>Comfortable</th>
<th>Very Comfortable</th>
</tr>
</thead>
<tbody>
<tr>
<td>My rating</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

4. I use a variety of instructional technology tools to enhance my music teaching.

- On a regular basis (every lesson)
- Sometimes (3 to 4 times a week but not for every lesson)
- Occasionally (a few times a month)
- Never

5. I use technology to assess students' music performance skills.

(This may include both formative and summative assessments)

- On a regular basis (every lesson)
- Sometimes (3 to 4 times a week but not every lesson)
- Occasionally (a few times a month)
- Never

6. I use technology to assess students' music content knowledge.

(This may include both formative and summative assessments. Ex. of content knowledge would include definitions of music terms; What does con moto mean?)

- On a regular basis (every lesson)
- Sometimes (3 to 4 times a week but not every lesson)
- Occasionally (a few times a month)
- Never
<table>
<thead>
<tr>
<th>3. Use of Technology Assessment Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>* 1. I use handheld digital recorders to record student performance tasks.</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>* 2. I use music notation software to create worksheets or quizzes.</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>* 3. I use web-based assessments to assess student’s music knowledge.</td>
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<tr>
<td>* 4. I use an interactive whiteboard for instruction and assessment.</td>
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<tr>
<td></td>
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<tr>
<td>* 5. I use a web-based portfolio assessment to measure student’s musical growth.</td>
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</tr>
</tbody>
</table>
Technology-Assisted Assessment Tools in Music Education

6. I use the following music software programs for instruction and assessment strategies.
(Select all that apply):

- Sibelius
- Groovy Muse
- Finale
- SmartMusic
- iPAS
- Band-in-a-box
- Logic
- GarageBand
- Audacity
- Sequel
- MIE - Yamaha Music In Education
- iTunes
- Quicktime
- Practea Musica
- Print Music!

Other (please specify):
## Technology-Assisted Assessment Tools in Music Education

### 4. Technology Professional Development

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>1.</strong> My school district requires that I use technology-assisted assessment tools.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Not Sure</td>
</tr>
<tr>
<td><strong>2.</strong> I have participated in required school district technology professional development sessions.</td>
<td></td>
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<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Not Sure</td>
</tr>
<tr>
<td><strong>3.</strong> I have voluntarily participated in school district technology professional development sessions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Not Sure</td>
</tr>
<tr>
<td><strong>4.</strong> I have voluntarily participated in technology professional development sessions presented at state or national conferences / clinics.</td>
<td></td>
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<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Not Sure</td>
</tr>
<tr>
<td><strong>5.</strong> My undergraduate music education courses included instructional technology.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Not Sure</td>
</tr>
</tbody>
</table>

6. Please describe a lesson plan or assessment strategy in which you used technology. 
(If you have no experiences to share, simply type NONE)
### Technology-Assisted Assessment Tools in Music Education

#### 5. Perceptions on Music Assessment and Technology (PMAT)

Please read each opinion statement below and indicate your choice ranging from “Strongly Disagree” to “Strongly Agree” on the use of technology in assessment strategies.

1. I believe it is important to assess the musical growth of my students.

<table>
<thead>
<tr>
<th>My rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>Disagree</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

2. I do NOT have enough class time to assess my students properly.

<table>
<thead>
<tr>
<th>My rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>Disagree</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

3. I feel assessment can be helpful in promoting student’s musical growth.

<table>
<thead>
<tr>
<th>My rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>Disagree</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

4. My colleagues are using technology in their music classrooms.

<table>
<thead>
<tr>
<th>My rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>Disagree</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

5. I believe technology is too unreliable to be used for assessment.

<table>
<thead>
<tr>
<th>My rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>Disagree</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>Strongly Agree</td>
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</tbody>
</table>

6. I become frustrated when learning how to use new technology tools.

<table>
<thead>
<tr>
<th>My rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
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<tr>
<td>Disagree</td>
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<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>Strongly Agree</td>
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</table>

7. There are often technology sessions at the conferences I attend.

<table>
<thead>
<tr>
<th>My rating</th>
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<tbody>
<tr>
<td>Strongly Disagree</td>
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<tr>
<td>Disagree</td>
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<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>Strongly Agree</td>
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</tbody>
</table>

8. I would use technology-assisted assessment tools if I had more professional development time devoted to learning how to use it.

<table>
<thead>
<tr>
<th>My rating</th>
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<tbody>
<tr>
<td>Strongly Disagree</td>
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<tr>
<td>Disagree</td>
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<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

9. I have not had any experience in learning to use music technology assessment tools.

<table>
<thead>
<tr>
<th>My rating</th>
</tr>
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<tbody>
<tr>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>Disagree</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>
Technology-Assisted Assessment Tools in Music Education

10. I feel that many of the technology-assisted assessment tools that are available for music are too expensive.

<table>
<thead>
<tr>
<th>My rating</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
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<tbody>
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</tbody>
</table>

11. I would ONLY use technology-assisted assessment tools if it was required by my school district.

<table>
<thead>
<tr>
<th>My rating</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
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12. I wish I had more time to learn and implement technology into my assessment practices.

<table>
<thead>
<tr>
<th>My rating</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
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13. It takes too much time to learn how to use technology.

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<thead>
<tr>
<th>My rating</th>
<th>Strongly Disagree</th>
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14. I would NOT use technology even if I had the resources available.

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<thead>
<tr>
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<th>Strongly Disagree</th>
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<th>Neutral</th>
<th>Agree</th>
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15. Technology saves me time in assessing individual student’s musical growth.

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<tr>
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16. If my school district offered to pay my expenses to attend a technology workshop, I would attend.

<table>
<thead>
<tr>
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<th>Agree</th>
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17. I feel technology would NOT help me when assessing my students.

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18. I feel comfortable in using contemporary technologies in my classroom.

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19. I am willing to search for additional funding (grants, fundraising) to purchase music technology for my classroom.

<table>
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## Technology-Assisted Assessment Tools in Music Education

*20. Most technology workshops are NOT helpful to me based on my comfort level with technology.*

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<thead>
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*21. I think teacher workshops on assessment are boring.*

<table>
<thead>
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*22. I use prior assessment data of my students in making instructional decisions.*

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6. Teacher Demographics

1. My primary teaching responsibility includes:
   (Select all that apply)
   - [ ] General Music
   - [ ] Choir
   - [ ] Band
   - [ ] Strings

   Other (please specify)

2. The following descriptor best represents the primary grade level that I teach:
   (Select the category that best describes your teaching situation)
   - [ ] a) Elementary
   - [ ] b) Middle School
   - [ ] c) High School
   - [ ] d) Multiple Grade Levels (ex. K-8 or K-12)

3. The number of years that I have been teaching:
   - [ ] 1-10 years
   - [ ] 11-20 years
   - [ ] 21-30 years
   - [ ] 30+ years

4. My gender:
   - [ ] Male
   - [ ] Female

5. My highest professional degree that I have received:
   - [ ] Bachelor's
   - [ ] Master's
   - [ ] Doctorate
Technology-Assisted Assessment Tools in Music Education

6. The following descriptor best describes my school:

- [ ] Urban
- [ ] Suburban
- [ ] Rural
7. Conclusion

You have successfully completed this survey.
Thank you for your time and valuable input.