Using Technology to Enhance Instruction and Learning
in the Music Classroom

A Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree of
Master of Arts in Music Education

by

Erin Wash

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APPROVAL PAGE

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ABSTRACT

Technology integration is a rapidly growing trend in the field of education today. This study investigates various ways of integrating technology to enhance instruction and learning in the music classroom. In order for technology to be effectively integrated in the music classroom, music educators must not only be aware of the technology available but must also remain informed of the most effective ways of implementing technology into instruction and learning. The scope of this study examines the use of two specific resources, SmartMusic and Teoria, and their effectiveness in teaching and learning sight-singing, ear-training, and rhythm reading, notation, and performance skills in a high school music class setting. Data, in the form of pre- and post-assessment scores, is collected and analyzed to measure learning and mastery of skills. This analysis helps to determine the effectiveness of technology integration during instruction and practice. Additional data is collected through surveys administered to students as well as a group of music educators concerning their experiences with technology in the music classroom. The results drawn from this data are useful in determining effective ways of using technology to enhance instruction and learning in the music classroom.

Keywords: technology integration; SmartMusic; Teoria; sight-singing; ear-training; rhythmic notation; assessments
ACKNOWLEDGMENT

I wish to acknowledge and thank Nancy Buzhardt, my very dear teacher, mentor, and friend. My relationship with Nancy began as a child when I started taking piano lessons from her and has continued and grown throughout the years. Up until very recently (as she has become quite ill), I had the pleasure of working with Nancy in our music ministry at church - she as pianist/accompanist and I as music director. I cannot begin to describe the tremendous amount of love, support, guidance, and friendship I have received from her throughout the years. To tell the truth, I would not be the musician nor teacher that I am today if it were not for her. From a very young age, she inspired a love and passion for music in me. As my teacher, she helped to develop my talent and musicianship. As my mentor, she nurtured and supported me and always gave me the guidance or advice I needed. As my friend, she offered constant love and lots of laughter. (Perhaps my slight obsession with designer handbags came from her, too.)

Though Nancy has not directly helped me with this thesis, she has still played a major role in getting me to this point. For without her, I do not think I would have begun or continued on my journey in music that lead me to where I am today. As I continuously strive to become a better musician and teacher, I wish to dedicate this thesis to her, and say:

“It well may be that we will never meet again in this lifetime,
so let me say before we part:
So much of me is made of what I learned from you.
You’ll be with me like a handprint on my heart.”

- Stephen Schwartz, “For Good”

Thank you, Nancy, for helping to mold me into the pianist, musician, teacher and person that I am today. I will forever thank God for putting you into my life and for all of the music, friendship, and love that we have shared.
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CHAPTER ONE: INTRODUCTION

Introduction

Technology is rapidly becoming one of the most widely-used resources in the field of education today. Music education is no exception to that. The resources available for music instruction, learning, and practice are growing every day and revolutionizing the ways music is being taught. As technology continues to evolve, teaching methods must also evolve in order to remain effective in the classroom. Technology integration can have a wide range of benefits in the music classroom. Effective use of technology has tremendous potential to enhance instruction and learning in the music classroom as various music technology resources are “able to provide a more persistent learning since it allows a drill and practice at desired level and desired amount”.1 While technology integration can be very beneficial in the music classroom, music educators must work to ensure that they integrate technology in ways that are effective and have a positive effect on instruction and learning. Assessing the role of technology in music education and the efficacy of specific technological resources used to teach, drill, practice and assess specific musical skills can be very useful to music educators when determining how to effectively implement technology in the music classroom. Determining the best ways to use technology in the music classroom will benefit not only the music educators who are adventurous enough to incorporate that technology, but also the students that they teach.

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Background

The students of today are not the same as the students in the past. Educators must be aware of that and tailor instruction to reach today’s student. The teaching methods that worked in the past, may not be the most effective methods to use with the students of today. In order to continue to be effective in the classroom, music educators must also be proactive and work to keep up to date with the latest trends in education. Presently, one of the most widely-used resources in the field of education is technology. There is a great push for technology integration for educators in all content areas, music included. All music educators must not only work to remain aware of the music related technology resources that are available but must also be knowledgeable of the most effective ways of implementing that technology into their classrooms. Today’s students are inundated with technology almost every hour of the day. Furthermore, technology has become a huge part of how they carry out their daily lives. Incorporating technology into musical instruction and practice has the potential to encourage engagement from students simply because they tend to be more interested in activities involving some type of technology. Additionally, using technology in effective ways can enhance instruction, support learning in the music classroom and boost mastery of musical knowledge and skills. “Further, the use of technological innovation and the understanding of technology is a necessary skill if students are to become active participants in contemporary society”.2 Clearly, there are a great many rationales for using technology in the classroom. The key to effective technology integration in the music classroom stems from the teacher being aware of various

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available technologies and educated in the most effective ways of incorporating them into instruction and learning in their classrooms.

Problem Statement

Many music educators may not be aware of the various music technologies available for them to incorporate into instruction. Furthermore, those that may be aware of what resources are available may not be prepared, informed, or properly trained to effectively integrate technology into their classrooms in ways that will enhance instruction and learning. This research is important because it can help to determine the effectiveness of several music-specific technologies in teaching, learning, practicing, and mastering musical skills. If technology is implemented into instruction and learning in the music classroom effectively, the mastery of musical knowledge and skills could be enhanced. Additionally, instruction, practice/rehearsal and even assessments could be done in more efficient and, perhaps, more effective ways through the use of technology. Music educators not implementing technology in their classrooms may not understand the ways that it can benefit their teaching and their students’ learning, or they may simply be unsure of how to effectively integrate technology in their classes. While the research is out there to support technology integration and its benefits in the classroom, there are many educators and their students who, for various reasons, have not begun to reap those benefits. This research examines specific music technologies, the ways in which they can be integrated into instruction, and the potential benefits they may have on the mastery of sight-singing, ear-training, and rhythm reading, notation, and performance skills. If music educators become knowledgable on how to use certain technologies and the benefits they have on teaching and learning, they may be more willing to implement technology and more prepared to do so in effective ways.
Purpose

The purpose of this study is to examine the use of various technological resources in the music classroom, establish how they can be used for instruction or practice, and determine how they have the potential to enhance instruction and learning. The results of this study should reveal ways of integrating specific music technology resources into classroom instruction and the ways in which they might enhance learning and the mastery of specific musical skills. Since the abundance of technology that is available can sometimes be intimidating to an educator, this study will serve as informative evidence suggesting a few specific resources as well as effective ways of integrating them into the music classroom.

Significance

A study of the ways in which technology might be used to enhance instruction and learning in the music classroom is sure to be both interesting and beneficial. There is a great push in education to integrate technology into teaching and learning in all content areas. Researching the most effective ways of integrating technology can prove quite valuable to music educators as the effective use of some technology resources has great potential to enhance instruction and learning in the music classroom. “Not only can the right apps help people make [and learn] music...it can also spark creativity”. Any methods an educator might use that enhance learning and spark creativity are certainly worth experimenting. As a music educator, the researcher is particularly interested in studying the efficacy of integrating technology such as SmartMusic and Teoria in the music classroom to teach and learn various skills. This information can be beneficial to other music educators, as well.

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Research Questions

In order to establish the role of technology in the music classroom, select resources that are most beneficial, and determine effective ways to integrate those resources into instruction and learning, several questions must be explored. The first question to be addressed is: “In what ways can specific music technologies be integrated in the music classroom and how might these resources be used to enhance instruction, practice and assessment?” Previous studies have already established the fact that technology, when used effectively in the music classroom, can help to “lead students to be musically skilled, knowledgeable, literate, and independent in the sense that they can continue to be musical away from the environment of the music classroom and the teacher”.4 This study focuses on specific ways of reaching those goals. Today’s field of educational technology is advancing rapidly and new technologies are constantly being developed. While several technology resources will be researched, it is impossible to investigate all of the available resources. For this particular study, the resources to be examined have already been chosen by the researcher. The focus of this study will include SmartMusic and Teoria. For the purposes of this study, the researcher has chosen to use SmartMusic and Teoria to teach and study several specific musical skills. The skills chosen for the study include sight-singing, ear-training, and rhythm reading, notation, and performance. The study will explore various ways of integrating the chosen technology resources in instruction and on the learning of these specific skills.

The next three questions to be addressed in the study are related questions pertaining to each specific technology and skill as well as the benefits they might have on instruction and learning. These questions are: “Based on assessment scores, does the use of SmartMusic have a

positive effect on instruction and learning of sight-singing skills? If so, how?”; “Based on assessment scores, does the use of Teoria have a positive effect on ear-training in the music classroom? If so, how?”; and, finally, “Based on assessment scores, does the use of Teoria have a positive effect on rhythmic notation and performance? If so, how?” The exploration of these questions will establish the validity of the study and offer insight into the benefits each of these music technologies might have on instruction and mastery of the musical skills being studied.

Hypothesis

Before beginning the study, the researcher believes that if technology is integrated effectively to teach, practice, drill and/or assess certain musical skills, then students’ mastery of skills will increase. When compared to pre-assessment scores, the expectation is that post-assessment scores of the students with whom technology is integrated into instruction and learning will show a greater increase than those with whom no technology was used. An assumption being made in this study is that the integration of technology in the music classroom is effective and can improve students’ mastery of skills including sight-singing, ear-training, rhythm reading, rhythmic notation and rhythm performance.

Definition of Terms

To thoroughly understand the study being performed, there are several terms which need to be defined. The first of those terms is technology integration. This term, while rather self-explanatory, needs a brief explanation. Technology integration in its most basic form is the use of technology by teachers and students to learn, explore, and show and understanding of content. According to Edutopia, an educational resource website that offers insight and suggestions to improve K-12 education, technology integration comes at various levels. Those levels of integration can be labeled as:
Sparse: Technology is rarely used;

Basic: One or two technology resources may be used to show understanding of content and/or create projects;

Comfortable: A variety of technology resources are frequently used to show understanding of content and/or create projects; or

Seamless: A variety of technology resources are used on a daily basis in a variety of ways including showing a deep understanding of content, creating projects, and completing assignments.5

Though classrooms may vary in levels of integration throughout the year, the ultimate goal is seamless technology integration to teach and learn content and demonstrate what has been learned.

The next terms needing to be defined are SmartMusic and Teoria. These are the technology resources being incorporated for this study. According to its website, SmartMusic is a “web-based music education platform that connects students and teachers” and has the potential to “transform student practice from passive repetition to active learning”.6 SmartMusic is a popular tool already being used by a great deal of music educators. SmartMusic offers tools for effective practice including a library of repertoire, immediate feedback, various practice tools and direct communication between the teacher and student. It also offers assessment support including gradebooks and rubrics as well as curriculum reinforcement with professional reference recordings and a sight reading builder. Access to SmartMusic is available through


yearly subscriptions. *Teoria* is also a web-based music instruction and practice platform. This site offers Music Theory Tutorials, Music Theory and Ear Training Exercises, Music Theory References, and Articles on various music topics. Teoria can be accessed online for free and offers a multitude of learning and practice activities.

The next group of terms needing to be defined refer to the various music skills being examined throughout the study. These terms include: *sight-singing, ear-training, and rhythmic notation*. The first skill, *sight-singing*, refers to the ability to sing music at first sight. “Learning how to sight read well is a key to good musicianship” and “has many incredible benefits for musicians, both musically and professionally”.⁷ There are various methods for teaching sight-singing, but the ultimate goal of all of them is musical literacy and independent musicianship. The next skill, *ear-training*, refers to aural skills where a person works to develop their musical ear and learns to identify, pitches, rhythms, intervals, or melodies by ear. Ear-training goes hand-in-hand with developing sight-singing skills. Developing a musical ear and being able to hear pitches, intervals and rhythms in one’s head strengthens sight-singing abilities. The third skill, *rhythmic notation*, refers to the ability to recognize note values and analyze the patterns created by the various combinations of musical notes as well as the ability to hear rhythmic patterns, analyze the combination of notes heard and write the pattern being heard.

Another term that will be used quite frequently in this study is *assessments*. According to The Glossary of Education Reform, “the term assessment refers to the wide variety of methods or tools that educators use to evaluate, measure and document the academic readiness, learning

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progress, skill acquisition, or educational needs of students”. Assessments can come in many different forms including: pre- and post-assessments, standardized assessments, common assessments, formative assessments, and summative assessments. Assessments may be designed to measure specific learning elements, determine skill levels, or reveal student strengths and weaknesses. For the purposes of this study, pre- and post-assessments are being used to measure knowledge and/or skill levels before and after each unit is taught.

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CHAPTER TWO: LITERATURE REVIEW

Introduction

The availability of literature concerning music education and technology is abundant due to the significant role that technology plays in today’s society, especially in the field of education. The abundance of these resources is often intimidating when conducting research and making decisions that concern implementing them in the classroom. Many recurring topics of interest that can be found in the literature published concern the benefits of utilizing technology in music education, the benefits and impacts that technology has upon educators, varying rationales that support the implementation of technology, effective ways to implement technology, and the limitations of technology. These areas of focus addressed in the existing literature provide many different perspectives concerning technology and its place in music education. These recurring themes that are seen in today’s literature are important to consider when planning to implement technology in the music classroom and exploring the possible learning outcomes it will produce in a specific music classroom setting.

Benefits of Utilizing Technology in Music Education

The available literature suggests that there are a variety of benefits associated with using technology in the music classroom. The article, “Tech in the Music Classroom Creates Efficiencies, Improves Accessibility” highlights how creativity and accessibility can be increased as a result of technology. It can be said that “thanks to technology, even the most amateur musicians can learn about composition. A variety of apps have a simple interface that can teach a lot about music while making use of typical classroom devices”. As a result of this simple interface, students at all levels can participate. Students and educators have the ability to

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9 Cortez, 1.
establish and track progress towards certain learning outcomes with the software that is available
today. This greatly benefits students and gives them opportunities and learning outlets that were
not available in the past.

Nart elaborates upon this in his article “Music Software in the Technology Integrated
Music Education”, which suggests that the student’s role is important to consider. The benefits
mentioned are derived from an approach that includes “student centered; multiple sense organs
involving; creativity and productivity targeted are developed for teachers and learners who are
following the technological developments and open to develop”.10 The benefits that can be
developed according to Nart are a result of educational outcomes that can be seen when
technology is implemented and directly meets the needs of individual students. As a result, the
student is at the center of the learning process and technology is used in a way that is effective
for all individuals in the classroom.

Another perspective concerning the benefits of implementing technology can be found in
the article “Media as an Invitation to Rethink Music Education” written by Matthew Thibeault.
This article takes into account the enhancements that can be made to education as a result of new
and evolving methods. Thibault focuses on and examines two different perspectives concerning
technology. It can be stated that “The implications of various media for music education deserve
more attention than they have received, and philosophy can help make sense of the changing
wants, needs, values, and practices as we change and are changed by technology”.11 These
various technologies help to create a way for music educators to meet the needs of students while

10 Nart, 78.

11 Matthew Thibeault, “Media as an Invitation to Rethink Music Education”, General Music Today 27,
using new resources. This further evolves the learning process for all students and changes how the needs of individual students are met.

Technology has also benefited the field of music education through the creation of resources that are able to give students and all musicians a place to network and share their skills. In the article “Connecting Music Education and Virtual Performance Practices from Youtube”, Cayari discusses this idea of sharing and networking and explains how “various online musical communities have emerged that allow people to interact through discussing, learning, and performing music”.

Platforms such as Youtube allow students to explore and learn more about musical performance on their own and can promote interests in specific areas of music. This can certainly benefit an individual student and help them to discover more about specific musical interests and skills they hope to achieve as a result of their music education.

This idea of networking and connection is further elaborated upon on the SmartMusic website, which demonstrates ways that students are able to stay connected outside of the classroom as a result of today’s new technologies. These tools often make it easier for students to collaborate and share new ideas as “they practice together using FaceTime, play along with computer music programs like SmartMusic, and create backing tracks on GarageBand”. These tools are beneficial and help students that want to practice with their peers outside of the classroom. Software such as SmartMusic, FaceTime, and GarageBand give students an outlet and guidance for collaborative music making outside of the music classroom walls. This can change where and how students learn and practice new skills and techniques with their peers.

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Benefits and Impacts of Utilizing Technology for Educators

As a result of examining relevant literature, it becomes quite evident that it is essential for music educators to stay up to date on the technologies available to them. This is revealed by Stuart Wise, Janinka Greenwood, and Niki Davis in the article “‘Teachers’ Use of Digital Technology in Secondary Music Education: Illustrations of Changing Classrooms”. While the specific technologies and the ways in which they are implemented may vary based on location, educators can share their knowledge, experiences, and collected data with one another in today’s digital world. According to this publication, “data from the questionnaires suggested a general acceptance that computer-mediated, such as composition, result in a high level of student engagement and achievement”.¹⁴ This information is insightful for all educators and can aid them in the process of determining how to implement technology in an engaging and effective way. Educators see these benefits today as “fast internet connections, via broadband, have made it easier to access varied music-related software and files”.¹⁵ The changes seen within the field of technology are significant and have made it possible for music educators to implement technology in the classroom in ways that are both efficient and effective for learning.

Useful data and information centered around how aware educators are concerning the topic of technology and the trends it is creating can be seen in Eunjin Kim’s article “Music Technology-Mediated Teaching and Learning Approach for Music Education: A Case Study From an Elementary School in South Korea”. These changes have impacted ideological elements of education. Values of reason and order emphasized in the previous age are “now replaced by


¹⁵ Wise, Greenwood, & Davis, 119.
those of sensibility and creativity”.16 This is important to consider when thinking about learning outcomes and goals in today’s evolving classroom setting.

These previously mentioned changes and advancements that educators must be aware of were discussed further in the article “Performing Arts Schools Go High-Tech” written by Melissa Delaney. It is essential that educators educate themselves about the many resources that can be implemented to enhance the learning experience for students and evolve their current methods of instruction. This article discusses a school where “the staff is exploring the transition to digital classrooms, looking at new ways of teaching, learning, and assessment”.17 The exploration taking place is a way for educators and administrators to evaluate their options for making the school more technologically-centered. Considering and evaluating the impact that technology will have on a particular setting and environment is critical in order for effective implementation to occur.

Being knowledgeable when it comes to technology assists individual educators in making significant impacts as a result of their specific instruction. This is demonstrated in Catherine Applefeld Olsen’s article, “Staying in Step”. Educators must explore ways to incorporate technology. This article describes a particular classroom being observed and explains that “during a typical 50-minute period, it’s not unusual for his students to be divided into sub-groups with one group on electric keyboards, another playing traditional string instruments, and a third group learning to write music on the computer using Harmonic Vision’s Music Ace Software”.18

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This creates a setting that is unique, where instruction is targeted at various goals and standards. Furthermore, students are very engaged in this particular classroom setting. Technology here is being used to benefit the educator, as multiple standards are being taught at once.

While educators must be knowledgeable about technology, they must also be trained properly in order to implement these tools in a way that is effective. There are many ways in which professional development can take place and there are further implications for this, which are discussed by Rena Upitis and Julia Brook in their article “How Much Professional Development is Enough? Meeting the Needs of Independent Music Teachers Learning to Use a Digital Tool”. According to their research concerning the professional development program for a software called iSCORE, “there was clear evidence that the face-to-face workshops, webinars, and other forms of personalized instruction, including the studio mentoring visits, were the most successful means of reaching teachers”. Through personalized instruction that is effective, educators are able to implement technologies and software in ways that provide students with effective and meaningful experiences. Educators become knowledgeable about certain software and programs as a result of more individualized instruction and professional development. The changing classroom environment must include technology; however, educators must be equipped to handle and address challenges students might come in contact with when using these new resources.

Through professional development that is effective, educators can often develop skills that last. This is discussed in the article “Transforming Music Teaching Via Technology: The
Role of Professional Development” by William Bauer, Sam Reese, and Peter McAllister. In this article, the authors explain that the results of their study “indicate that that three indicators of effectiveness - teacher knowledge, teacher comfort, and frequency of teacher use - can all be significantly improved in these settings. Furthermore, 9-10 months later, these indicators of effectiveness all remained significantly higher than they were prior to the training”. Educators can gain useful skills through professional development that can be utilized for long periods time. An educator’s knowledge about specific software, applications, and programs that are implemented can help them to utilize a specific program for an extended period of time, so the benefits and outcomes of using these tools can be seen clearly.

Professional development within the field of music education is often needed. The article “Educational Affordances and Learning Design in Music Software Development” written by Lee Cheng and Samuel Leong addresses this by explaining that “although music software is widely used in classrooms today, concerns have been raised about a lack of consideration for users’ needs during the software development process”. Educators are often left out of this process which is why the need for professional development is so significant. When no professional development is offered, a myriad of problems may arise. Until educators at all levels play an active role in the creation of technology that is aimed at music education, professional development must occur in order to ensure that they are knowledgeable about the program that is being implemented. Challenges and obstacles sometimes occur when using a new resource and

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educators are tasked with the responsibility of helping and guiding students in an effective manner so that these problems and obstacles can be eliminated.

Another area of interest concerning educator training, pertains to how today’s undergraduate students are being prepared in order to use technology in their classrooms. Marshal Haning’s article, “Are They Ready to Teach With Technology? An Investigation of Technology Instruction in Music Teacher Education Programs,” addresses this topic and found that “nearly half (43%) of the participants indicated that they believed their degree program had not prepared them to use technology successfully”.22 This is concerning considering the importance of technology in everyday life and the role it will play in the future. After reading this piece, it is evident that certain programs need to do more to prepare future teachers to use technology both effectively and properly. Furthermore, when technology is implemented the role of the educator often changes.

Educators must also be more informed and aware of the technologies that they are implementing as introduced by Mark Minott in the article “Teaching Tasks and the Composition of a ‘Piece’ Using Music Technology in the Classroom: Implications for the Education and Training of Teachers”. Minnot explains the role of educators and highlights that training “will aid their ability to not only manipulate the various software but to make an informed decision when selecting one for use in a school”.23 These skills are both useful and practical for music educators in today’s climate. Educators today are faced with many choices that must be made


concerning when and how it is appropriate to utilize these new technological resources in the music classroom setting. Without the necessary knowledge concerning this process, educators can become lost and unaware of how to select the most effective software that relates to the musical standards and outcomes they would like to see for their students.

Varying Rationales that Support the Implementation of Technology

There are numerous techniques and rationales that support the use of technology within the field of music education today. Renee Crawford introduces an interesting perspective in the article “The Evolution of Technology: Landmarking Australian Secondary School Music”. One outcome of the implementation “includes encouraging an interchangeable learning environment for experiential learning”. This calls for students to gain an understanding of technology that can be applied to experiences outside of the classroom as a result of working with the technology that has been implemented. If this is accomplished, students will be able to become more technologically fluent as a result of their experiences and encounters with technology in the music classroom setting. This allows students to gain skills that are practical for application and will be useful in many ways for an extended period of time.

The article “Online Music Collaboration Project: Digitally Mediated, Deterritorialized Music Education” by Cremata and Powell further elaborates on this by offering another perspective for utilizing technology in the music classroom that is focused around a practical use outside of the classroom. This perspective concerns student-centered learning and more specifically “independent musicianship in democratic ways that might have potential for contexts

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within and beyond school”. The way in which technology is implemented, how effective it is, and the content on which it is focused can lead to engaging and motivating students to pursue music in a setting that is outside of the classroom. This is a real possibility for all students today because of the technologies available to them. Technology can serve as an outlet for individual musicians, if they know how to effectively utilize the tools that are available to them.

In the article, “Handheld Technology as a Supplemental Tool for Elementary General Music Education,” Katie Carlisle discusses a new perspective that is focused on how creativity can be enhanced when technology is utilized. The article explains the benefits that can be seen as a result of using handheld devices in the music classroom. The feedback process becomes more individualized. This new level of engagement by students in the learning process occurs because “handheld technology may enhance self-expression when children are overwhelmed with the physical instrument set-up or a music teacher may not have access to all chromatic percussion bars.” This article brings to light the benefits that can be seen when technology is presented, and all students have access to a handheld device. It also discusses the many apps that are available for these through both Apple and Google’s software. Access to this software is becoming increasingly more common for students in various learning environments.

How students can become engaged and more active in the learning process is explored by Luc Nijs and Marc Leman in the article “Interactive Technologies in the Instrumental Music Classroom: A Longitudinal Study with the Music Paint Machine”. While technology can include


many functions that are traditional in music education, it can also incorporate new elements. In
the article the authors explain that “in addition to being a mirror or a monitoring device of
general musical parameters (e.g. pitch, loudness, rhythm, and movement), this system focuses on
musical creation and on an assisted travelling into unknown territories of music making”.27
While general concepts are a part of this software, new concepts can also be explored at the pace
in which the student is comfortable. This is beneficial and can help students who may struggle to
become engaged when standards are being taught and traditional teaching methods are being
used to teach these standards. Although this software focuses on general standards, new elements
are introduced and students are able to come in contact with them.

Lastly, a technique discussed in the available literature that supports the implementation
of technology within music education is known as the hybrid approach. This is demonstrated in
the article “Hybrid Spaces and Hyphenated Musicians: Secondary Students' Musical
Engagement in a Songwriting and Technology course,” by Evan Tobias. Through this process,
students have the ability to experience many roles as a musician. As a result of this, students are
given practical and useful experiences as musicians. Tobias stated in the article that “to some
extent the participants who approach the project sequentially and cumulatively as in first as
acting as songwriters, then as performers, recordists and mix engineers were able to move
between roles, though they could not separate themselves from being the creators of the song”.28
The roles that students played in this classroom model left them with experience that was broad
and covered a variety of areas that would not have been done if the traditional classroom setting

27  Luc Nijs & Marc Leman, “Interactive Technologies in the Instrumental Music Classroom: A
Longitudinal Study With the Music Paint Machine”, Computers & Education 73, (2014), 42, accessed March 12,

28  Evan Tobias, “Hybrid Spaces and Hyphenated Musicians: Secondary Students’ Musical Engagement
in a Songwriting and Technology Course”, Music Education Research 14, no. 3 (2012), 340, accessed March 12,
in music education was used. This hybrid approach can be utilized in a classroom setting, allowing students to gain knowledge about various standards and skills while still incorporating traditional and general skills for students.

Effective Ways to Implement Technology in the Music Classroom

There are a variety of ways in which implementing technology can be effective for music education. This has been the topic of many recent publications. One of the benefits of integrating technology into teaching and learning in the music classroom is its ability to engage students. This is discussed in the article “Valuing Technology in the Music Classroom: Results from a Recent Case Study Indicate Why Technology Should Be Used in Education Online” by Renee Crawford. The engagement invoked in students as a result of technology can occur when students are allowed to “take some control of their learning or at times, at least feel as though they were in control of their own decisions and music making”. Through this control that students are given, effective student-centered learning can be created. With this comes the notation of a more individualized learning process that is often the focus. This can occur as a result of technology being implemented in the classroom and playing a role in the instructional process.

It was then found through available sources that technology is often regarded as effective when it is implemented in a holistic manner. In the article, “In Harmony: A Technology-Based Music Education Model to Enhance Musical Understanding and General Learning Skills” by Portowitz, Peppler, and Downton, the approach and goals considered to make technological

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resources effective in the classroom were discussed. This resource “sought to create a holistic
environment sensitive to the preferences of today’s students and to their individual modes of
learning”. The environment described is one that takes into account the individual needs of all
students. The preferences of today’s students are important to consider, as technology is evolving
and these preferences are becoming more varied for individual students in the classroom setting.

Once again, this idea of effectiveness being achieved through a holistic approach is
brought up by Popovych in the article “The Role of an Integrated Approach in Music Education
Technology”. The perspective concerning an integrated method is useful and this approach is
described as a “complex holistic formation, which comprises the closely related various
components of methodological and didactic structures”. By combining elements from both the
methodological and didactic structure, a more effective way to implement technology can be
achieved. This holistic approach is ultimately seen when this combination is achieved by music
educators, no matter the level that they are instructing.

Using Technology to Create a Variety of Skills

When SmartMusic is implemented in the music classroom there are many different
learning outcomes and pedagogical outcomes that can be seen in students. Its variety of features
can be useful for students as “it offers instructor-designed, transposable guidance (both notated
and rural); a set of practice tools such as a metronome; and an easy-to-use recording platform”.

30 Adena Portowitz, Kylie Peppler, & Mike Downton, “In Harmony: A Technology-Based Music
Education Model to Enhance Musical Understanding and General Learning Skills”, International Journal of Music

31 Natalia, Popovych, “The Role of an Integrated Approach in Music Education Technology”, European

32 Michael Callahan, “Teaching and Learning Undergraduate Music Theory at the Keyboard: Challenges,
Solutions, and Impacts”, Music Theory Online, 21, no. 3 (2015), 3, accessed March 13, 2019,
When students are tasked with completing assignments with the SmartMusic software, they are responsible for their work and are then given a score upon completion. This form of software provides activities for all individual students, creating different learning outcomes based upon skill level. The SmartMusic software offers benefits for educators such as making individualized learning easier in a large classroom setting where students have a variety of interests and skills.

As a result of numerous technological resources and software available today, many skills can be enhanced and taught in the music classroom. The SmartMusic website focuses on skills such as sight-reading. This program helps to make sight-singing more individualized for students at all skill levels. The SmartMusic approach for sight-reading is one that suggests a “great technique for developing sight reading is to push students by having them sight read material that is more challenging. With that in mind, we’ve built a lesson plan that uses medium level band repertoire to develop musicality alongside sight reading practice”.33 The SmartMusic plan incorporates standards with sight-reading, helping to make this procedure more useful and relevant in the music classroom. This software helps to engage students in learning a traditional skill that is a part of music education by offering a new way for it to be accomplished. This form of instruction can help to engage and meet the preferences of more students than previously seen using only traditional methods of instruction.

Implementing technology in the classroom can help develop listening skills. This gives students an interactive experience while listening to musical compositions. Ann Marie Lane utilizes Google Forms in her article, “A Practical Application of Technology in the Music

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Classroom.” Using this technology, “provides music students with a quality listening experience that allows for an individual approach to learning. It also assists with developing the students’ listening skills, and helps to focus the students’ learning and listening”.34 Implementing technology in the classroom can be both simple and practical. This form of application gives students the freedom to listen on their own, while also providing guiding questions that can be useful for developing their listening skills. This can be utilized by educators in the music classroom for students at all grade and skill levels.

Using technology in the music classroom can also help to address the concept of notation. There are numerous softwares that are designed for this as Nart discusses in his article, “Softwares like Sibelius, Finale, Encore, Autoscore, Overture, Rhapsody, Music Time, and Magic Score School can be given as examples for notation software”.35 Programs such as the ones mentioned allow students to edit and rearrange works, which helps to create and maintain a setting where learning can take place. This technology makes it possible for the user to listen to what they have created almost instantly, which is helpful for the editing process.

Limitations of Technology in the Music Classroom

While technology plays a large role in education today, there are still limitations that can be seen and associated with technology. Implementing technology into the classroom is something that is often encouraged, however, this is not always preferred by students as Greenwood, Wise and Davis found, “the teachers in Schools A and D also discussed the fact that

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35 Nart, 80.
some of the students preferred to work with real instruments when completing composition tasks”. Taking into account how all individual students view technology and its role in their learning process is something that educators must consider when implementing technology into the music classroom.

Another factor that can limit the effectiveness of the implementation of technology is its availability to students. Crawford mentions this problem in the article “Secondary School Music Education: A Case Study in Adapting to ICT Resource Limitations”. ICT is an acronym for information and communications technology, which can be implemented and utilized to some degree in music education. Crawford explains early on that, “For teachers to include technology in their teaching, resources need to be accessible and maintained, appropriate technological support provided and professional development encouraged”. In order for educators to implement technology in an effective manner, this articles maintains the idea that professional development and support should be available and when they are not, limitations can be seen and the outcomes of implementing technology may not be successful or beneficial. This study included limitations seen by students and it was said that, “The inadequacy of school resources was highlighted by student awareness of the lack of computers and technology available and their unreliability”. The resources available in a certain environment, as well as their reliability, can limit the extent to which students and educators alike are able to utilize technology and specific resources as a part of the learning process.

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36 Wise, Greenwood, & Davis, 130.


There are often further limitations of technology that students do not or are unable to identify. This is mentioned in the article, “3D Virtual Anatomy Virtual Technology in the Voice Studio: A Pilot Study to Evaluate the Functionality and Limitations of Visible Body” by Susan Williams and Daniel George. While in this study there are some limitations identified by students, these were not: “At the start-up the program can take considerable time to load. There is no ‘undo’ or ‘redo’ function, which can be frustrating if a user accidentally alters something for forgets the most recent alteration”. The limitations identified are only a few that were found, however, they demonstrate significant limitations related to the software used. These problems can be seen in software and must be addressed by the instructors so that students are aware and can be proactive when working with certain technologies.

Limitations involving technology also arose in Reese’s article, “Online Status: Virtual Field Experiences and Mentoring During an Elementary General Music Methods Course”. The limitations occurred when technology was implemented to observe and evaluate elementary music courses. While the research does describe some benefits, there are also limitations. These limitations occurred and “Challenges included limitations of the technology and virtual experiences and difficulty scheduling experiences”. It is difficult to account for how and when certain virtual experiences will occur. Students move at different paces making this even more challenging to consider. The study also described technical limitations that were seen, “Many reported a lack of aural and visual clarity, and problems with the internet connection that caused

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the sound and or video to freeze, and in some cases, stop entirely”. Limitations that are associated with technology can occur in many forms, making it difficult to address them all at once.

Limitations that impact the implementation of technology in the music classroom also occur as a result of educational policies. Crawford examines these limitations in the article “Evolving Technologies Require Educational Policy Change: Music Education for the Twenty First Century”. The policies of the past are credited with limiting the ways in which technology can be utilized in the classroom. Crawford explains that “the education policy restrictions need to change accordingly and allow access to interactive information exchange technology platforms and many applications and resources currently unavailable to schools due to access restrictions”. The obstacles created by these policies are a reality that many educators face when planning to implement technology into the music classroom.

Websites that would be beneficial for students to access, such as YouTube, are often restricted and students are unable to view content that is appropriate for the classroom. While teaching methods are currently evolving so is the internet, “The Web has shifted from just being a medium in which information is transmitted and consumed, to a platform where content is created, shared, remixed, and repurposed”. As technology’s role and purposes continue to change, so should educational policies. These policies can be shifted and appropriate information

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41 Reese, 36.


needs to be filtered so that students and educators can have access to it. While there are often solutions to some of the limitations associated with technology, it is often difficult to address these issues in a way that causes effective change quickly. Funding limitations, access to reliable resources, and policies must all be considered before technology can implemented in a way that is beneficial and effective.

Conclusion

The role that technology plays in the music classroom is one that varies greatly and depends upon many factors. This is seen in the literature that has been explored for this study. This literature addresses and concerns technology in this realm. The benefits of utilizing technology in music education, the benefits and impacts that technology has upon educators, varying rationales that support the implementation of technology, effective ways to implement technology, and the limitations of technology are all critical to consider and understand before determining the desired role for technology in any music classroom. This literature also suggests that the role of technology will continue to evolve, impacting how it is regarded in the classroom by students and educators. It is important to consider the intended outcomes of technology’s implementation and how it will be utilized. While technology can enhance instruction in music education and make the learning process more individualized for students, a tedious selection process must occur in order to determine which resources are suited for specific music classroom settings.
CHAPTER THREE: METHODOLOGY

Introduction

The research performed in this study examines how technology can be used in the music classroom to enhance instruction and maximize student learning. This research seeks to provide information on specific music technologies, how they might be integrated into instruction, and the potential effects they might have on students’ growth and/or mastery of sight-singing, ear-training, and rhythm reading, notation, and performance skills. The music technologies that are the focus of the study are SmartMusic and Teoria. Through this research, music educators can learn whether the use of SmartMusic and Teoria in the music classroom is effective and actually increases student learning and mastery of skills. The sources used to support this study establish that there are benefits and impacts of integrating technology in the music classroom and present several rationales to support the implementation of technology. Other sources used discuss effective ways of implementing technology in the music classroom, using technology to create a variety of skills, and some limitations of technology in the classroom.

Overview of Approach

One approach to this study is to survey music educators and music students on their personal experiences with technology in the music classroom to determine the effects they felt that technology had on teaching and learning. Though that method is being used as part of this study, the bulk of the research is being done through a first-hand experimental study in a music classroom. This research is being performed as a quantitative study involving high school students in intermediate-level choral music classes. The study will consist of experimentation with human subjects through musical instruction and practice on sight-singing, ear-training, and rhythm with and without technology integration. Pre- and post-assessments are the main methods
of data collection. The expectation of the study is that the use of technology will enhance instruction and benefit students by boosting understanding and skill mastery.

Design of Study

The participant population for the survey part of the study comes from a group of music educators currently teaching in Lexington, Aiken, Saluda and Richland counties in South Carolina. This population consists of music educators of all levels, K-12. These educators are contacted by email and invited to participate in a survey on their experiences with technology in their own classrooms. Surveys are collected anonymously on google forms and their replies are analyzed.

The participant population for the experimental study is made up of a group of students enrolled in Spring semester Chorus classes at Batesburg-Leesville High School. All students involved are in grades 9-12 and are members of an intermediate-level “Concert Choir” class. Previous experience and skill levels of these two classes are comparable. This participant group includes 29 music students, divided into two classes - 13 in one class and 16 in another. One class serves as the experimental group, the other as the control group.

This experimental study with music students is an investigation of the various ways of integrating technology to enhance instruction and learning in the music classroom. The study focuses specifically on the musical skills of ear-training, sight-singing, and rhythm reading, notation and performance. Two web-based resources, SmartMusic and Teoria, are used with students in the experimental group. In the control group, no technology is integrated into instruction and practice of these skills. In order to collect data from the student groups, pre- and post-assessments are administered before and after each unit of instruction. Additionally, at the
conclusion of the study, students in the experimental group are surveyed on their experiences with technology in musical instruction and practice.

Data is collected both before and after the experimental study. Other than survey results, most of the data is in the form of skill assessment scores. Pre-assessments are given to both the experimental and control groups prior to each unit of instruction. These pre-assessment scores help to determine each student’s skill level at the beginning of the study. At the conclusion of each unit, following instruction and practice, post-assessments are given to all students. The post-assessment scores determine the skill level after instruction and practice has been provided.

The data collected from pre- and post-assessment scores is collected from each group and analyzed. First the data is analyzed to find each student’s growth in their mastery of skills. Then, the data is combined with other students in the same study group to determine the overall percentage of growth for the group. Finally, the percentage of growth for each skill is compared between the experimental and control groups to determine the effect the integration of technology had on mastery of skills.

Research Questions

In order to determine whether the integration of technology in the music classroom is effective and does, in fact, enhance teacher instruction and student learning, this study seeks to answer the following questions:

1. In what ways can specific music technologies be integrated in the music classroom?
2. How might these resources be used to enhance instruction, practice and assessment?
3. Based on assessment scores, does the use of SmartMusic have a positive effect on instruction and learning of sight-singing skills? If so, how?
(4) Based on assessment scores, does the use of Teoria have a positive effect on ear-training in the music classroom? If so, how?; and, finally,

(5) Based on assessment scores, does the use of Teoria have a positive effect on rhythmic notation and performance? If so, how?

Music Educator Technology Survey

Part of the information gathered in this study is derived from surveys administered to music educators from the surrounding school districts. The surveys are administered to music educators in primary, elementary, middle and high schools in order to obtain information on various technologies and uses of technology in the music classroom. These surveys were created on Google Forms and are sent to educators through school district email. The surveys are not set to collect names and/or email addresses of participants and will remain anonymous.

*Using Technology to Enhance Instruction and Learning in the Music Classroom*

**Educator Survey/Questionnaire**

1. Do you have a computer and/or other technology resources readily available to you in your classroom? *

   Mark only one oval.

   Yes   No

2. Do your students have access to their own devices during your classes? *

   Mark only one oval.

   Yes   No
3. Do all/most of your students have access to their own devices when they are not at school? *

Mark only one oval.

Yes   No

4. What are some specific technology resources that you have integrated into your instruction and classroom activities? (ie: SmartMusic, sightreadingfactory.com, Teoria, Garage Band, Finale, MusicTheory.net, etc.) *

5. What are some other educational resources that you have integrated into your instruction and classroom activities? (ie: Quizlet, Kahoot, EdPuzzle, Flipgrid, Story Board, etc.) *

6. In what ways have you integrated technology into your teaching during this current school year? *

7. What specific skills/standards have you taught with the integration of technology? What technology resources did you use to do so? *

8. What are some of the limitations of using that technology that you have experienced? (ie: cost, access, etc.) *

9. What successes/failures have you experienced with the integration of technology in your classroom? *

10. Do you feel that the integration of technology has, in any way, enhanced your teaching? If so, how? *

11. Do you feel that the use of certain technology resources has, in any way, enhanced student learning and mastery of skills? If so, how? What resources/skills? *
12. What other thoughts/feelings (positive or negative) can you share about experiences with technology integration in the classroom? *

Student Technology Survey

In addition to analyzing student assessment scores on each musical skill being studied, this study uses student surveys to gather information about the students’ experiences with technology in the music classroom. At the conclusion of the experimental component of the study, the survey is administered to students in the experimental group. The survey is not administered to students in the control group as they will not have experience using some of the technology resources being referenced in the survey. These surveys are shared on Google Classroom as a Google Form. No names or email addresses are collected with the submission of this survey, so replies and information will remain anonymous.

Using Technology to Enhance Instruction and Learning in the Music Classroom

Student Technology Use Survey

1. On average, how frequently do you use technology in school? *

Mark only one oval.

every day

every 2-3 days

once a week

less than once a week

hardly ever
2. **I use technology to:** (check all that apply) *

*Check all that apply.*

- access class materials
- create presentations
- collaborate with other students
- communicate with others
- stay organized
- play games
- engage with others on social media
- practice skills such as sight-singing, ear-training or rhythm reading when not in class
- watch movies and/or shows for entertainment or educational purposes
- stay connected to what is happening in the world
- listen to music through the internet (streaming)
- check my grades
- create/edit photos and videos
- compose music
- download and/or play music
- take notes
- record/mix music
- take tests and/or quizzes

3. Please describe any other ways you may use technology.

4. **Using technology in school:** (check all that apply) *

*Check all that apply.*

- Makes me a better student
- Makes my classes more interesting
- Makes it easier to keep track of my assignments and work
- Helps me to learn
- Makes me waste a lot of time
- Makes my classes more fun
- Makes my classwork more challenging
- Easily distracts me
5. Personal Thoughts on Technology *

Mark only one oval per row.

Strongly Agree ... Agree ... Disagree ... Strongly Disagree

- I am familiar with the ways that I can use SmartMusic in my music class.
- I am familiar with the ways that I can use Teoria in my music class.
- My teachers use technology in ways that enhance their teaching.
- I am comfortable with using technology in my classes.
- I feel that the use of SmartMusic has helped to improve my sight-singing skills.
- I feel that the use of Teoria has helped to improve my ear-training skills.
- I feel that the use of SmartMusic and Teoria has helped to improve my rhythm recognition,
  dictation and performance skills.
- I find classes in which technology is integrated more interesting.

6. Please share any additional thoughts about your experiences with technology in the music classroom. Include any suggestions you may have to improve technology integration in the music classroom. *
CHAPTER FOUR: RESEARCH FINDINGS

Introduction

In addition to an in-depth study of available literature on technology use in the music classroom, this research is conducted through an investigation of the efficacy of musical instruction (with and without technology), assessment analyses, and interpretation of surveys given to students in a high school music class setting. Additional data is gathered through surveys given to a small group of music educators to provide general experiences and thoughts of technology integration in the music classroom. This study is both quantitative and qualitative in nature. The research questions discussed in Chapters 1 and 2 were answered through this study. The following information and data was collected throughout the course of the study.

Music Educator Technology Survey Thoughts and Experiences

As part of gathering data for this study, a group of South Carolina music educators who currently teach in Lexington, Aiken, Saluda and Richland counties were surveyed. These surveys pertain to their thoughts and experiences with technology in their own classrooms. Twenty music educators were emailed and asked to participate; however, only 8 of them responded to the survey. This list of music educators included those teaching general music, instrumental music and vocal music classes in the primary through high school levels. Several of the questions are quantitative in nature and results are shown in a pie chart. Other questions are qualitative in nature and include open-ended, free response questions. The following data was gathered from that survey.
Educator Survey Questions 1 - 3: Technology Availability

Do you have a computer and/or other technology resources readily available to you in your classroom?
8 responses

Figure 1 - Question 1

Do your students have access to their own devices during your classes?
8 responses

Figure 2 - Question 2
Educator Personal Experience Responses

The remainder of the survey questions pertain to each educator’s personal experiences with technology. Most of these questions are qualitative in nature and ask educators questions about specific ways in which they use technology, limitations of technology, and their personal thoughts based on their experiences with technology in their classrooms. The first two questions of this group (Questions 4 and 5) ask educators about technology resources that they currently use in their classrooms. Question 4 pertains to music specific technology resources that educators have integrated into instruction and classroom activities. Question 5 asks what general education resources that educators have integrated. Table 1 shows a breakdown of what those responses were. The most frequent responses about music specific technology resources being integrated include SmartMusic and Quaver Music, both web-based programs available through yearly subscriptions for educators and students. The most popular general educational resources being integrated include Quizlet, Kahoot, Google Classroom and Flipgrid.
Table 1 - Questions 4 - 5

<table>
<thead>
<tr>
<th>Question:</th>
<th>Technology Resources Listed as Responses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>4: What are some music specific technology resources that you have integrated into your instruction and classroom activities?</td>
<td>SmartMusic; Screencastify; MuseScore; MusicTheory.net; Teoria; Smartboard Tools for AP Music Theory; Quaver Music; Musicplay; MusicAce; Garage Band; Piano Lab through Melodics; and Sightreadingfactory.com</td>
</tr>
<tr>
<td>5: What are some other educational resources that you have integrated into your instruction and classroom activities?</td>
<td>Google Classroom; Google Docs; Google Forms; Google Drawings; Quizlet; Kahoot; Incredibox; EdPuzzle; Flipgrid; and Youtube</td>
</tr>
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</table>

Questions 6 and 7 of this survey ask music educators about technology use in their classrooms. Question 6 pertains to ways in which they have integrated technology into their teaching during this current school year. Question 7, on the other hand, asks about specific skills and standards that they teach with technology integration and which specific resources they use to do so. Table 2 shows educator responses to these two questions. These questions prompted a variety of responses including different uses of technology in the music classroom.

Table 2 - Questions 6 - 7

<table>
<thead>
<tr>
<th>Question:</th>
<th>Specific Responses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>6: In what ways have you integrated technology into your teaching during this current school year?</td>
<td>“Playing tests are all done via screencastify recordings”; “an Incredibox project, allowing students to create their own songs”; “We use kahoot to get ready for term quizzes and auditions”; “I use musictheory.net to help with note identification and key signatures in band and orchestra classes”; “I use musictheory.net, teoria and the smartnote app during my AP Music Theory classes”; “Composer and Listening Activities”; “I use Quaver music a lot”</td>
</tr>
</tbody>
</table>
Within that curriculum there are numerous interactive whiteboard activities for student response. If my students had devices there would be even more activities we could engage in.”; and “purchased a classroom set of electronic metronomes”

| 7: What specific skills/standards have you taught with the integration of technology? What technology resources did you use to do so? | “recording themselves and listening to how they play”; “Creation and improvisation - Incredibox & Soundtrap”; “Music Performance, Music Literacy, Critical Response to Music, History and Culture”; “Mostly reading notes and identifying key signatures. We also use some websites to practice fingerings.”; “Reading & Writing Music Notation (Note Name Identification, Rhythms, Composing) - MusicACE, Quaver Music Resources, Smart Notebook Activities”; “Responding and Connecting to Music of various genres - Youtube”; “Singing - Posture, diction, etc. - Youtube”; “Instruments - Learning how instruments produce sound/learning about instruments - Makey Makey”; “Analyzing and Evaluating music”; and “I have used the technology to teach all of the anchor standards to the appropriate skill level (Novice low med or high in elem school)” |

Question 8 asks educators being surveyed about some of the limitations to using technology that they experience. Though this question is meant to be qualitative in nature by asking educators to list limitations that they had experienced, the responses to the questions are somewhat quantitative in nature as they were overwhelming the same, listing similar, basic limitations. Figure 4 shows the responses recorded. Cost seems to be the most frequent response to limitations of technology use followed by access. The responses about access include teacher access, student access, student access to their own devices, and student access away from school.
The remainder of the survey, including Questions 9 - 12, asks music educators about their own, personal experiences, opinions, and thoughts about technology integration in the music classroom. Question 9 asks participants to share personal successes and/or failures that they have experienced with integrating technology in their classrooms. The responses to this question are shown in Table 3. Questions 10 and 11 are related and ask participants if they feel that technology integration has enhanced instruction and learning in their classrooms and, if so, how? Question 10 pertains to instruction/teaching and Question 11 to student learning and mastery of skills. The responses to these questions are shown in Table 4. All participants responding to the survey agreed that technology enhances their teaching as well as student learning, even if just a little bit.
Table 3 - Question 9

<table>
<thead>
<tr>
<th>Question:</th>
<th>Personal Responses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>9: What successes/failures have you experienced with the integration of</td>
<td>“student devices have faulty internet connections which prevents video uploads”; “Students getting off task and browsing the web.”; “Choice boards big success.”; “I find with kahoot, some kids do not participate because they do not have phones, data or service to play along in class.”; “Student engagement is higher when they have quality visuals. However, the projector is not always portraying the visual to the students.”; and “I as a teacher have a learning curve in this area. Having time to really learn how to use the tech is an issue. Usually the district says here it is and it is up to you to really learn how to use it.”</td>
</tr>
<tr>
<td>technology in your classroom?</td>
<td></td>
</tr>
</tbody>
</table>

Table 4 - Questions 10 - 11

<table>
<thead>
<tr>
<th>Question:</th>
<th>Participant Responses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>10: Do you feel that the integration of technology has, in any way,</td>
<td>“Yes, a little, but I believe the more you &quot;overdo&quot; the plumbing the easier it is to stop up the drain. (Meaning technology should not be what your curriculum revolves around.) I believe students are more likely to be engaged at first.”; “Yes because it reaches the student on a level in which they understand.”; “Yes technology has enhanced my teaching by allowing students to have ownership of their learning.”; “Yes, it makes some things easier to monitor, like note identification on MusicTheory.net.”; “Student engagement and buy in is higher with the use of technology. Students perform better when they are given experiences of being able to watch recorded performances and respond to them.”; “Yes, more creative form to express their ideas.”; and “Technology has definitely enhanced my teaching. I have been in the classroom over 20 years and I wish we would have had Smartboards and the internet when I started</td>
</tr>
<tr>
<td>enhanced your teaching? If so, how?</td>
<td></td>
</tr>
</tbody>
</table>
11: Do you feel that the use of certain technology resources has, in any way, enhanced student learning and mastery of skills? If so, how? What resources/skills?

<table>
<thead>
<tr>
<th>Resource/skill</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spotify playlist</td>
<td>“perhaps not mastering but becoming more engaged.”;</td>
</tr>
<tr>
<td></td>
<td>“Spotify playlist has allowed me to gather information about the types of music that my students enjoy listening to in their free time. This allows me to better understand what musical genres, forms, and styles that can relate to their learning.”;</td>
</tr>
<tr>
<td>Research in Google and Google Classroom</td>
<td>“Research in google and google classroom allow the students to gain a better understanding of the standards being taught in class.”;</td>
</tr>
<tr>
<td>Research in Google and Google Classroom</td>
<td>“Yes, music note reading and key signature identification using the websites I listed earlier.”;</td>
</tr>
<tr>
<td>MusicACE and activities on the internet that quiz students on note names</td>
<td>“MusicACE and activities on the internet that quiz students on note names has helped students with mastery of the skill.”;</td>
</tr>
<tr>
<td></td>
<td>“The students have increased their ability to correctly identify notes quickly.”;</td>
</tr>
<tr>
<td></td>
<td>“The use of the smartboard and projector have enhanced all areas of learning.”;</td>
</tr>
<tr>
<td></td>
<td>“Yes, students are more independent.”;</td>
</tr>
<tr>
<td></td>
<td>“I definitely think technology has helped, especially in the areas of music literacy and vocabulary.”</td>
</tr>
</tbody>
</table>

Finally, question 12 of the music educator survey asks participants to share any other thoughts or feelings that they might have about technology integration. These responses included positive thoughts about technology as well as a few negative thoughts about limitations and drawbacks. Participant responses are show in Table 5. Overall, participants agree that the use of technology is of some benefit in the classroom, but it comes with its own set of issues, drawbacks, and limitations.
<table>
<thead>
<tr>
<th>Question:</th>
<th>Participant Responses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>12: What other thoughts/feelings (positive or negative) can you share about experiences with technology integration in the classroom?</td>
<td>“I don’t believe curriculum should revolve around technology. Just like anything else, students get bored after anything new.”; “Technology is the greatest thing, until it doesn’t work. It can put an end to an entire lesson!”; “Technology is a great tool to utilize when the opportunity arises to incorporate into a music lesson.”; “It would be nice to have more technology.”; “The integration of technology in the elementary general music classroom creates a positive impact on student engagement and student learning. The only downside to most technology is internet access. When the internet goes out it can create problems with lessons and the teacher must be prepared to present the lesson in a different way/with different resources.”; “I think that technology changes have impacted all areas of music from performance, to composing, and to education. However, music still starts with the individual experiencing a variety of musical experiences in their daily lives and sharing those experiences in the real world not cyberspace. Children need to be sung too and they need to sing on the playground etc.”</td>
</tr>
</tbody>
</table>

Technology Integration in Classroom Study

Though there is a great deal of technology available for use in the music classroom, only two technology resources were integrated into classroom instruction and activities for this particular study. These are both web-based resources. One of those resources, SmartMusic, requires a paid subscription. The other, Teoria, can be accessed for free online. For the purposes of this study, SmartMusic was used in instruction for sight-singing and rhythm performance, mostly for practice purposes. The pre- and post-assessments for each were performed and scored on a one-on-one basis with the teacher. Teoria was used for practice purposes in ear training and rhythm notation/performance. Pre- and post-assessments for these were performed as a whole class with student recording their own individual responses.
In this study, none of the technology was used to actually teach or introduce the content or skills. Instead, these resources were used as reinforcement, practice, and/or drill in order to enhance the instruction. Through the use of SmartMusic and Teoria, students had the opportunity for individual practice where they receive immediate feedback. This was beneficial for both the students and the teacher as it gave the teacher more opportunities to counsel and work with students on an individual basis. Another benefit of this technology was that, with it, students were able to continue practice outside of their class time because they could access these resources from their own school-issued devices. Because of this, students were able to further reinforce the skills being studied in class and practice to better prepare for assessments. The results of technology integration in this study are explained in depth in the sections below.

**SmartMusic and Sight-Singing Skills**

The web-based SmartMusic is used in this study to enhance classroom instruction and student practice of sight-singing skills. A control group for the study develops sight-singing skills without the use of SmartMusic or any other technology, while the experimental group uses SmartMusic to practice and develop sight-singing skills. For the purposes of this study, SmartMusic is not used as an instructional means to *teach* sight-singing, merely as a way for students to practice sight-singing on an individual basis and receive immediate feedback on their performance. Sight-singing skills were measured through performance assessments. These were performed at the beginning and end of the study through one-on-one sight-singing pre- and post-assessments. Overall, the use of SmartMusic had a positive effect on student development of sight-singing skills. Table 6 is the rubric used to score both pre-and post-assessment performances.
Table 6 - Sight-singing Assessment Rubric

<table>
<thead>
<tr>
<th>Sight-singing</th>
<th>Assessment</th>
<th>Rubric</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exemplary</strong> (5 points)</td>
<td><strong>Proficient</strong> (4-3 points)</td>
<td><strong>Needs Improvement</strong> (2-1 points)</td>
</tr>
<tr>
<td><strong>Solfege Syllables</strong></td>
<td>All notes are identified with the correct solfege syllable.</td>
<td>Most notes are identified with the correct solfege syllable.</td>
</tr>
<tr>
<td><strong>Pitch</strong></td>
<td>All notes are sung correctly (pitches are accurate).</td>
<td>Most notes are sung correctly.</td>
</tr>
<tr>
<td><strong>Rhythm</strong></td>
<td>Rhythm is performed accurately.</td>
<td>There are few incorrect rhythms.</td>
</tr>
<tr>
<td><strong>Hand Signals</strong></td>
<td>All hand signals are correct.</td>
<td>Most hand signals are correct.</td>
</tr>
<tr>
<td><strong>Tempo</strong></td>
<td>The melody is performed with a steady tempo throughout.</td>
<td>The tempo is mostly consistent.</td>
</tr>
</tbody>
</table>

COMMENTS:  

TOTAL POINTS: /25  

FINAL SCORE:
Tables 7 and 8 show individual student pre- and post-assessment scores for both the control and experimental groups. Figure 5 compares the average of the pre- and post-assessment skills assessments as well as the average number of points of improvement for the experimental group to those of the control group.

*Table 7 - Sight-singing Pre- and Post-Assessment Scores (Control Group)*

<table>
<thead>
<tr>
<th>Student:</th>
<th>Pre-Assessment Level:</th>
<th>Post-Assessment Score:</th>
<th>Number of Points Improved:</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>0</td>
<td>68</td>
<td>68</td>
</tr>
<tr>
<td>C2</td>
<td>80</td>
<td>96</td>
<td>16</td>
</tr>
<tr>
<td>C3</td>
<td>84</td>
<td>100</td>
<td>16</td>
</tr>
<tr>
<td>C4</td>
<td>36</td>
<td>80</td>
<td>44</td>
</tr>
<tr>
<td>C5</td>
<td>56</td>
<td>88</td>
<td>32</td>
</tr>
<tr>
<td>C6</td>
<td>80</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>C7</td>
<td>0</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>C8</td>
<td>68</td>
<td>84</td>
<td>16</td>
</tr>
<tr>
<td>C9</td>
<td>0</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>C10</td>
<td>52</td>
<td>84</td>
<td>32</td>
</tr>
<tr>
<td>C11</td>
<td>60</td>
<td>84</td>
<td>24</td>
</tr>
<tr>
<td>C12</td>
<td>68</td>
<td>80</td>
<td>12</td>
</tr>
<tr>
<td>C13</td>
<td>0</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>C14</td>
<td>64</td>
<td>84</td>
<td>20</td>
</tr>
<tr>
<td>C15</td>
<td>0</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>C16</td>
<td>24</td>
<td>76</td>
<td>52</td>
</tr>
</tbody>
</table>
Table 8 - Sight-singing Pre- and Post-Assessment Scores (Experimental Group)

<table>
<thead>
<tr>
<th>Student</th>
<th>Pre-Assessment Level</th>
<th>Post-Assessment Score</th>
<th>Number of Points Improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>52</td>
<td>96</td>
<td>44</td>
</tr>
<tr>
<td>E2</td>
<td>0</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>E3</td>
<td>40</td>
<td>88</td>
<td>48</td>
</tr>
<tr>
<td>E4</td>
<td>32</td>
<td>64</td>
<td>32</td>
</tr>
<tr>
<td>E5</td>
<td>84</td>
<td>100</td>
<td>16</td>
</tr>
<tr>
<td>E6</td>
<td>0</td>
<td>68</td>
<td>68</td>
</tr>
<tr>
<td>E7</td>
<td>0</td>
<td>84</td>
<td>84</td>
</tr>
<tr>
<td>E8</td>
<td>36</td>
<td>84</td>
<td>48</td>
</tr>
<tr>
<td>E9</td>
<td>64</td>
<td>96</td>
<td>32</td>
</tr>
<tr>
<td>E10</td>
<td>80</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>E11</td>
<td>12</td>
<td>72</td>
<td>50</td>
</tr>
<tr>
<td>E12</td>
<td>0</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>E13</td>
<td>60</td>
<td>100</td>
<td>40</td>
</tr>
</tbody>
</table>
According to the data, SmartMusic has a positive effect on the development of sight-singing skills. The average pre-assessment score for the control group was 42. Following the instructional and practice period of the study, the average post-assessment scores for that group ends up being 71.25 with an average point increase of 29.25 points. The average of the pre-assessment scores for the experimental group was actually lower than that of the control group. That pre-assessment average for the experimental group is 35.4. Following the study, the post-assessment average for that group increased to 85.5 with an average point increase of 49.4 points. Based on this data, there was a significantly greater increase in scores for the experimental group than there was for the control group. The use of SmartMusic for practice and reinforcement purpose appears to have enhanced instruction/practice and student learning.
Teoria and Ear Training

Teoria, a free website offering a series of music theory tutorials, music theory and ear training exercises, music theory references, as well as articles about music concepts, skills and education, is used in classroom instruction and practice of ear-training/aural skills for the purposes of this study. The music theory and ear training exercises portal, in particular, was used to assist students in the experimental group in developing their ear and improving aural pitch recognition skills. Again, much like the use of SmartMusic for sight-singing skills, Teoria was not used to necessarily teach these skills, but for individual practice and drill opportunities to develop the skill. The students in the control group practiced and drilled ear training without the assistance of technology. Ear training and aural skills were measured through aural/written assessments. These were performed at the beginning and end of the study through listening/aural pre- and post-assessments where the teacher would play notes and students would identify and write the notes that they heard. Overall, the use of Teoria had a positive effect on student development of ear training and aural skills.

Tables 9 and 10 show individual student ear-training pre- and post-assessment scores for the control and experimental groups. Figure 6 compares the average of the pre- and post-assessment skills assessments as well as the average number of points of improvement for the experimental group to those of the control group.

Table 9 - Ear-training Pre- and Post-Assessment Scores (Control Group)

<table>
<thead>
<tr>
<th>Student</th>
<th>Pre-Assessment Level</th>
<th>Post-Assessment Score</th>
<th>Number of Points Improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>56</td>
<td>84</td>
<td>28</td>
</tr>
<tr>
<td>C2</td>
<td>76</td>
<td>97</td>
<td>21</td>
</tr>
<tr>
<td>C3</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>C4</td>
<td>58</td>
<td>99</td>
<td>41</td>
</tr>
<tr>
<td>C1</td>
<td>76</td>
<td>100</td>
<td>24</td>
</tr>
<tr>
<td>C2</td>
<td>53</td>
<td>84</td>
<td>31</td>
</tr>
<tr>
<td>C3</td>
<td>75</td>
<td>92</td>
<td>17</td>
</tr>
<tr>
<td>C4</td>
<td>78</td>
<td>79</td>
<td>1</td>
</tr>
<tr>
<td>C5</td>
<td>80</td>
<td>98</td>
<td>18</td>
</tr>
<tr>
<td>C6</td>
<td>95</td>
<td>93</td>
<td>-2</td>
</tr>
<tr>
<td>C7</td>
<td>58</td>
<td>38</td>
<td>-20</td>
</tr>
<tr>
<td>C8</td>
<td>85</td>
<td>80</td>
<td>-5</td>
</tr>
<tr>
<td>C9</td>
<td>58</td>
<td>63</td>
<td>5</td>
</tr>
<tr>
<td>C10</td>
<td>90</td>
<td>97</td>
<td>7</td>
</tr>
<tr>
<td>C11</td>
<td>86</td>
<td>93</td>
<td>7</td>
</tr>
<tr>
<td>C12</td>
<td>67</td>
<td>97</td>
<td>30</td>
</tr>
<tr>
<td>C13</td>
<td>5</td>
<td>72</td>
<td>67</td>
</tr>
<tr>
<td>C14</td>
<td>25</td>
<td>67</td>
<td>42</td>
</tr>
<tr>
<td>C15</td>
<td>39</td>
<td>96</td>
<td>57</td>
</tr>
<tr>
<td>C16</td>
<td>19</td>
<td>55</td>
<td>36</td>
</tr>
</tbody>
</table>

Table 10 - Ear-training Pre- and Post-Assessment Scores (Experimental Group)
Upon review of this data, one can conclude that the use of Teoria for ear-training purposes in the music classroom does enhance instruction and student learning/mastery of skills. The average pre-assessment score for the control group was 62.3. Following the instructional and practice period of the study, the average post-assessment scores for that group increased to 83.1 with an average point increase of 20.75 points. The average of the pre-assessment scores for the experimental group were, once again, lower than that of the control group. The pre-assessment average for the experimental group was 57.9. Following the study, the post-assessment average for that group increased to 87.9 with an average point increase of 29.9 points. Based on this data,
the use of Teoria was successful at boosting mastery of skill and assessment scores with the experimental group.

Teoria and Rhythm Reading, Dictation, and Performance

Teoria, the same website used for ear training, is used in this study to enhance development of rhythm reading, notation and performance skills. Both the “Music Theory Tutorials” and “Music Theory and Ear Training Exercises” portals were integrated into instruction and practice of rhythm skills. Once again, these technological resources were not used to teach these skills, but instead used to reinforce, practice, and drill rhythm reading, notation, and performance skills. Through the use of Teoria, students have opportunities to review and practice skills at their own pace and on their own time. Students can also access Teoria on their devices away from school for additional practice time. Based on the data collected from this study, one must conclude that, while the use of Teoria proved to be helpful in several ways, no great increase in skill mastery was seen with the integration of Teoria versus learning rhythm skills without technology.

Tables 11 and 12 show individual student rhythm skills pre- and post-assessment scores for the control and experimental groups. Figure 7 compares the average of the pre- and post-assessment skills assessments for the experimental group to those of the control group.

<table>
<thead>
<tr>
<th>Student</th>
<th>Pre-Assessment</th>
<th>Post-Assessment (Reading)</th>
<th>Post-Assessment (Dictation)</th>
<th>Post-Assessment (Performance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>0</td>
<td>84</td>
<td>52</td>
<td>92</td>
</tr>
<tr>
<td>C2</td>
<td>74</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>C3</td>
<td>80</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Student</td>
<td>Pre-Assessment</td>
<td>Post-Assessment (Reading)</td>
<td>Post-Assessment (Dictation)</td>
<td>Post-Assessment (Performance)</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>----------------------------</td>
<td>----------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>E1</td>
<td>64</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>E2</td>
<td>0</td>
<td>96</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>E3</td>
<td>54</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>E4</td>
<td>48</td>
<td>68</td>
<td>72</td>
<td>60</td>
</tr>
<tr>
<td>E5</td>
<td>90</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>E6</td>
<td>0</td>
<td>84</td>
<td>80</td>
<td>76</td>
</tr>
<tr>
<td>E7</td>
<td>0</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>E8</td>
<td>48</td>
<td>92</td>
<td>88</td>
<td>80</td>
</tr>
<tr>
<td>E9</td>
<td>78</td>
<td>100</td>
<td>90</td>
<td>98</td>
</tr>
</tbody>
</table>

**Table 12 - Rhythm Skills Pre- and Post-Assessment Scores (Experimental Group)**
Only a slight difference in post-assessment scores can be seen between the control and experimental groups. The greatest difference in scores is found in the post-assessment scores for rhythmic dictation. Here, it was still only a difference of an average of approximately 8 points between the control and experimental groups. Based on this data, no great advantage was gained through the use of Teoria; however, Teoria did allow greater flexibility in individual practice and freed the teacher to work with students on more of a one-on-one basis. Though Teoria did not prove any more effective than regular classroom teaching at increasing mastery of rhythm skills,
the convenience and flexibility that comes from the incorporation of this technology makes it worth using.

Student Technology Survey Thoughts and Experiences

To conclude the study, a technology use survey was administered to students in the experimental group. The purpose of this survey was to collect general information about students’ uses of technology both in and out of school as well as a chance for them to evaluate their experiences with technology. The majority of the questions were quantitative; however, a few short response questions were included in the survey to give students an opportunity to share their thoughts. Based on this survey, the students’ overall feelings and responses to technology are positive.

This survey begins by asking students about the frequency with which they use technology in school as well as the tasks for which they generally use it. All students agreed that they use technology in school at least every 2-3 days, with 84.6% of those responding that they use technology every day in school. The top reasons listed for using technology during the school day included: to create presentations (92.3%); to access class materials (84.6%); to take tests and/or quizzes (84.6%); to check grades (76.9%); and to practice skills such as sight-singing, ear-training, or rhythm reading when not in class (76.9%). Additionally, 76.9% of students surveyed agreed that technology helps them to learn. Only a very small number of students claimed that technology distracts them or makes them waste time throughout the school.

The next section of the survey is designed to gather students’ personal thoughts on technology in a quantitative manner. The survey lists 8 statements about technology. Some of the statements are specific to technology use in music class, others are not. Students are given the choice of deciding whether they strongly agree, agree, disagree, or strongly disagree with each
statement. Figures 8 and 9 illustrate the results of this section. The data for this shows that all students either agreed or strongly agreed with each statement. No student disagreed or strongly disagreed with any of the statements. This data leads one to believe that students’ experiences with technology in the classroom are positive.

![Student Survey, Personal Thoughts - Pt. 1](image)

*Figure 8 - Student Survey, Personal Thoughts on Technology - Pt. 1*
The final question of the survey asks students to share any additional thoughts about their experiences with technology in the music classroom. In addition, students are asked to share any thoughts or suggestions they have to improve technology integration in the music classroom. Overall, student responses were positive. These positive student responses included remarks such as: “I think that technology in music class is very helpful, [the teacher] isn't around all the time so I can always go online to teoria to practice sight singing or rhythms if I need extra help.”; “Using teoria helped me with ear listening/training and helped me see and recognize different notes and how to identify different notes.”; “At first I didn't like SmartMusic, but the more I used it the more I liked it. I see how it can help us to sight sing better.”; and “I really like using SmartMusic and Teoria to practice. I think it has really helped me to get better”. One student,
however, made the remark: “I think technology in the classroom should be minimal since students get easily distracted along with the fact that students retain information more when they write things by hand”. Unfortunately, students participating in the survey offered no suggestions for improving technology integration in the music classroom.

Being able to quantify student experiences and thoughts on technology integration through a survey conducted after the study offers great insight into the ways technology is being perceived. The results of pre- and post-assessments for each skill show the efficacy of the integration of the technology. The survey, however, shows how well (or not) the technology integration is being received by students. The results of this survey are encouraging because, unless students “buy into” the technology being used and the rationales behind them, these methods for teaching are ineffective.

Conclusion

The results of this study are convincing when it comes to the integration of these technologies in the music classroom. For each skill, there was a greater increase in post-assessment scores for the experimental group with whom technology was integrated than that of the control group. The results prove that the integration of SmartMusic and Teoria is effective in increasing sight-singing, ear-training, and rhythm skill mastery. The data gathered is certainly in favor of the fact that these technologies, when used effectively, do enhance instruction and learning in the music classroom.
CHAPTER FIVE: DISCUSSION

Summary

This study examines methods for integrating technology into instruction and learning in the music classroom in ways that are effective and promote learning. A variety of relevant research questions were proposed at the beginning of the study and investigated throughout. Two programs, SmartMusic and Teoria, were integrated into instruction and skill development in a high school music classroom. Throughout the study, students in the experimental group worked with these web-based programs, pre- and post-assessments were administered, and scores were recorded. Students who were members of the control group did not work with SmartMusic or Teoria, however, their pre-assessment and post-assessment scores were considered during the findings of this study. Examining these scores is essential for understanding the implications that can be seen when technology is used to enhance instruction. As a part of this study design, surveys were also administered to students participating in the experimental group as well as a group of music educators. These surveys provided varying perspectives that accounted for the experiences that students and educators have had when using technology in the music classroom. The data collected from this study is useful for determining effective ways of integrating specific music technologies to enhance instruction and learning in the music classroom.

Recommendations for Future Study

This study addresses several research questions pertaining to music education and technology. The study design used could be modified and adjusted in order to conduct research in a variety of music classroom settings. Although useful data was collected as a result of the design of the study, a study carried out in the future should consider the long-term effects, impacts, and outcomes of implementing technology in the music classroom. More extensive data
could be collected if individual student progress was tracked for a longer period of time. By following students for an extended period of time, long-term effects of integrating technology into instruction and learning in the music classroom could be revealed.

A study conducted in the future could also benefit from selecting a sample of students that are all on the beginner skill level. It would then be beneficial to examine the data collected to assess how this sample’s skill level changes as a result of using technology to enhance instruction. Furthermore, a future study could also consider following and tracking the progress made by students that all entered the study with limited knowledge and beginner skill levels over the course of an extended period of time.

Finally, studies of the same nature could be performed using other technology resources. Music skills, standards, or content knowledge could be chosen as the focus of the study just as they were in this study. Other applications, software, or web-based programs can be explored to determine their efficacy at enhancing instruction and learning. A study such as that would offer insight into the effective use of technology resources other than SmartMusic and Teoria.

Validity of the Literature

The availability of published literature that is relevant to music education and technology is abundant due to the significant role that technology plays in today’s society. Many significant topics that can be found in the literature published focus on the benefits of utilizing technology in music education, the benefits and impacts that technology has on educators, varying rationales that support the implementation of technology, effective ways of implementing technology, and the limitations of technology. These topics and themes found in the reviewed literature are all critical to understanding technology’s role in the music classroom.
The validity of the selected literature is further established by the credentials and credibility of the authors of these sources. Research conducted by Renee Crawford, a senior lecturer in the faculty of education for Monash University, was among the contributing authors of the literature reviewed. These articles include “Evolving Technologies Require Educational Policy Change: Music Education for the Twenty First Century,” “Secondary School Music Education: A Case Study in adapting to ICT Resource Limitations,” “The Evolution of Technology: Landmarking Australian Secondary School Music” and “Valuing Technology in the Music Classroom: Results from a Recent Case Study Indicate Why Technology Should Be Used in Education”. The validity of the literature that was reviewed is also established by credibility associated with the magazines, websites and journals that published these sources. In addition, literature utilized for this study comes from a variety of reputable scholarly journals, such as: The Journal of Research in Music Education, The International Journal of Music Education, The Journal of Music Teacher Education, The Journal of Music, Technology and Education, The Turkish Online Journal of Educational Technology, The Journal of Singing, and The British Journal of Music Education.

Limitations of the Study

The individuals who comprised the sample of students that was studied only consisted of high school students. The sample of music educators who participated in the survey that was administered via email was limited to educators who all teach in public schools in the state of South Carolina; however, these participants included those who teach at various levels of music education, including k-12. The resources that were studied were limited to only SmartMusic and Teoria. The musical skill areas in which SmartMusic and Teoria were implemented to enhance was also limited as a result of music standards and skills that must be focused on at the high
school level. Furthermore, this study did not attempt to utilize technology as a means of teaching or introducing new concepts; SmartMusic and Teoria were used to reinforce, practice, and drill skills in order to enhance traditional instruction methods in the music classroom.

Applications for Music Educators

Music educators can utilize the findings of this study in a variety of ways. This particular design could be implemented in numerous music classroom settings, which would help educators identify the outcomes that individual students experience when using certain technological resources. Educators will become more familiar with both SmartMusic and Teoria and how these resources can be utilized as practice methods to enhance instruction. The outcomes seen in this study provide examples of useful encounters with technology, as perspectives concerning both educators and students are shared.

Furthermore, other educators will find the results of student and educator surveys to be useful when considering the role that technology should play in the music classroom. While what resources are available to both students and educators varies greatly, the study identifies skill areas that can be enhanced through the implementation of technology. Educators may not be able to implement SmartMusic and Teoria in their classroom’s, however, other resources could be utilized in a similar manner, which would incorporate technology into instruction. By applying this same study design, educators could discover other data that is relevant to their specific music classroom setting.

Conclusion

The research questions that were addressed, the study design that was followed, and the data obtained are all useful when considering the role that technology can play in the music
classroom. The validity of the literature that was reviewed adds to the credibility of this study. The multiple applications for educators that this investigation establishes helps to make this design plan even more practical. In today’s world, technology plays a significant role in almost all aspects of daily life; traditional teaching and learning methods must evolve and utilize technology in order to enhance the experiences that students have in the music classroom.

Through this study, resources such as SmartMusic and Teoria are identified as practice tools that can be used and incorporated into instruction. Pre-assessment and post-assessment data that was obtained, concerning both the control group and the experimental group, is essential to consider when determining if integrating technology can have a positive effect in the music classroom. The survey data is critical to this study design, as it allows educators and students to share their personal experiences with technology. The findings of this study demonstrate the ways in which successful integration of technology within the music classroom can enhance instruction and skills.
Bibliography


March 11, 2019

Erin Wash
IRB Approval 3685.031119: Using Technology to Enhance Instruction and Learning in the Music Classroom

Dear Erin Wash,

We are pleased to inform you that your study has been approved by the Liberty University IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases were attached to your approval email.

Your study falls under the expedited review category (45 CFR 46.110), which is applicable to specific, minimal risk studies and minor changes to approved studies for the following reason(s):

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects, 45 CFR 46.101(b)(2) and (b)(3). This listing refers only to research that is not exempt.)

Your study involves surveying or interviewing minors, or it involves observing the public behavior of minors, and you will participate in the activities being observed.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

Research Ethics Office