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**Researching Technological Advancements Through Alternative Methods of Music
Education to Engage Students in the Digital Age**

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the Faculty of the School of Music
in Candidacy for the Degree of
Master of Arts in Music Education

by

Olivia Thornton Thompson

Lynchburg, VA

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Researching Technological Advancements Through Alternative Methods of Music Education to
Engage Students in the Digital Age

By Olivia Thornton Thompson

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APPROVED BY:

Thomas P. Goddard, D. M. E., Committee Chair

Thomas Wayne Doss, DWS, Thesis Reader

Dr. Stephen Müller, D. Min, Dean

ABSTRACT

While the music industry has significantly incorporated technology into music composition and production, music education is slow to teach how to use these technical methods for students living in the digital age. Current music education methods have established successful results in past music compositions; however, those methods are becoming impractical. Although music education taught in schools has been primarily successful through traditional methods, students learning in the digital age have yet to learn how to strengthen their musical abilities through technology. This secondary analysis aims to look at the different studies on incorporating technology in a music education setting to keep up with the current digital age. Guided by qualitative and quantitative studies, a secondary analysis of the research collectively provides sufficient data to suggest what is missing from the current music curricula in terms of incorporating technology into music education. Perspectives on digital composition, arranging, and digital music instruction have appeared as themes through exploring existing literature.

Keywords: composition, content analysis, digital music, electronic, education, technology, production

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Table 1: Various Methods and Results of Thirteen Music Technology Studies

CHAPTER ONE: INTRODUCTION

Background

Current music curricula have traditionally successfully prepared students to excel in their future careers. However, in the ever-changing digital age, students have begun demonstrating gaps in their music education. Many institutions lack music technology classes for students to learn about digital music, which is now becoming the most popular genre. Curriculum from other disciplines usually involves a technical study, and music is no exception. Music composition and production require more than fundamental skills in technological advancements. This project will discover the gaps in current music education curricula and introduce new alternative approaches to teaching music education by embracing music technological advances in the digital age.

Statement of the Problem

As technology advances in music industry careers, the need for this technological knowledge is becoming more prevalent in educational settings. Students are exposed to more technology in their daily lives than reflected in their classrooms. Due to the fast pace of technology developing each year, the expectations for students in their future music careers are increasing. These high expectations lead to a lack of motivation and engagement among classroom music students. T. A. Regelski addresses this issue and states, “In today’s technological world, also beneficial are musical interests centering on the computer, such as composition software, and especially the apps for smartphones and tablets...Otherwise, acoustic instruments too often go into the closet upon graduation and people stop playing or practicing at home.”¹ Without interest, music programs could cease to exist if there is no student participation.

¹ T. A. Regelski, *A Brief Introduction to A Philosophy of Music and Music Education as Social Praxis*. 1st ed. Routledge, 2015, 105.

As researchers explore this problem, there are immediate challenges in implementing technical aspects in classrooms. These obstacles include topics of preservice teacher training, lack of funding, and access among teachers and programs. In the following project, educators articulate personal experiences and challenges in their music classrooms related to these problems. Although the challenges are present, there are various benefits to implementing types of technology in a music classroom, such as increasing student creativity, exposing students to new composing and songwriting, and allowing them to find new ways of collaborating with their peers. If more opportunities were created that included a technical component in music education, students might be more prepared for success in their future careers.

Statement of the Purpose

The purpose of this secondary data research and analysis is to consider the various studies that have incorporated technology in a music education setting to maintain relevance in the current digital age. Various studies and topics have been explored in academic research regarding this topic. However, the researcher asks if enough studies have been completed to discover why the reasons technical aspects should be put into a music education setting. The amount of technology available to current students in any subject is rising. Change is necessary for students to explore their musical passions and to keep them academically engaged. David A. Williams states, “Change is a worthy goal, but we have to be brave enough to venture into some unknown territory... Opportunities, when taken in combinations, could help us realize interesting, relevant, and meaningful musical experiences for students.”² Educators are responsible for giving students the foundation to thrive in their academic journeys. This study aims to bring attention and normalcy to technology in music classrooms. Guided by multiple studies, a

² David A. Williams, “The Elephant in the Room.” *Music Educators Journal* 98, no. 1 (2011): 53.

secondary research analysis collectively provides sufficient data to suggest what is missing from contemporary music curricula in terms of incorporating technology into music education.

Significance of the Study

Although music technology has become a prominent forefront in undergraduate and graduate levels of music education, the primary and secondary levels are insufficient. The newer generations of students are beginning to rely on technology for much of their studies; therefore, music education should be no different from any other subject. Regelski discusses the topic of “breaking 100 in music.”³ This term refers to students becoming serious about musical practice because of its musical, social, and personal pleasures.⁴ Once students commit to their musical craft, they will explore different aspects of music, including concerts, listening to recordings, composing and arranging their music, and finding others with similar interests. Regelski states:

The Internet, therefore, is filled with self-help sites of all kinds devoted to forms of musicking not often addressed by school music. However, with direct help and a curricular focus (including learning how to access the Internet, use apps, locate resources in libraries, transpose, and so on), far more people could be enjoying the benefits of “breaking 100 in music.” They would be more able and more inclined to include music in their lives in significant ways, to a more significant degree, or with greater rewards and pleasures.⁵

Students should be able to become inspired in a music classroom and discover their potential talents in a learning setting. Educators who expose music to students allow them to combine it with their personality and self, finding peers and mentors who share the same passions.

Technology must be inserted into the music education curriculum to foster exposure for students to learn and stay relevant to technological advancements. Young music students should be

³ Regelski, *A Brief Introduction*, 108.

⁴ *Ibid.*, 108.

⁵ *Ibid.*, 109.

exposed to the instruments and tools that technology offers in the music industry. This study will show the need for technology in the early music education setting.

Research Questions

This analysis seeks to prove that digital proficiency in music education is necessary for today's curriculum. The following questions are discussed:

Question One: To understand the present need for digital proficiency, what research methods are required to study primary music education?

Question Two: If music education varied in multiple American states, is making digital proficiency not necessary in some places?

Question Three: How is music education being taught due to technological advances?

Question Four: To become digitally proficient in music education, what are some new approaches to teaching while keeping students both current and engaged?

Question Five: Amidst the previous inquiries, one still asks, what technical methods need to be implemented for students to learn in the music education field successfully?

Chapter Summary

Technology in the music education environment has become a growing necessity. Through this project, the researcher will discover the gaps in current music education curricula and introduce new alternative approaches to teaching music education by embracing music technological advances in the digital age. This analysis seeks to prove that digital proficiency in music education is necessary for today's curriculum. The process will involve secondary research analysis from previous studies to conduct the conclusions. Students' need for technical knowledge increases as they learn throughout the constantly changing digital world. In the music industry, technological advancements are rapidly increasing, specifically in composition and

production. Therefore, teachers should educate students on essential music equipment and technology to aid their success in the music industry. Students exposed to technology classes in higher education have a more significant advantage in enriching their musical knowledge.⁶ The researcher will introduce, research, and analyze previous studies completed by multiple sources. This secondary analysis will allow access to a conclusion based on alternatives for musical technology in education settings.

⁶ Rebecca M. Rinsema, *Listening in Action: Teaching Music in the Digital Age* (London: Taylor & Francis Group, 2016), ProQuest Ebook Central.

CHAPTER TWO: LITERATURE REVIEW

History of Traditional Music Education

Early Childhood Music Education Research: An Overview by Susan Young

Susan Young discusses the art of early childhood music education in her article, with perspectives from an international view using examples from several different countries. The author examines two “paradigm shifts” in music education, the first being the study of infancy to three years old in childhood. The second shift Young discusses is “a move away from attempting to identify and define normative models of musical development that can apply universally to all children, to a view that recognizes that children develop in individually nuanced ways.”⁷ Music education begins in early childhood, as Young supports her writing. She states, “To compound this complexity, the places where young children engage with music are also varied. Mainstream music education is primarily concerned with music learning and teaching in schools, but music for preschool children takes place in a wide range of places and situations.”⁸ Because music education is focused on being taught strictly at the elementary, secondary, and collegiate levels, preschool settings lack experience. Therefore, the potential for learning core elements as early as preschool ages have been lost.

A Brief Introduction to A Philosophy of Music and Music Education as Social Praxis by T. A. Regelski

In the book written by T. A. Regelski, he explores the philosophy of music and music education as a social praxis. As a professor and distinguished scholar, Regelski discusses his main goal for the book as he states, “My intent is to provide a clear basis by which a praxial

⁷ Susan Young, “Early Childhood Music Education Research: An Overview.” *Research Studies in Music Education* 38, no. 1 (June 2016), 12.

⁸ *Ibid.* 10.

philosophy of music and music education can be applied in a variety of foundation and methods courses and contexts in music education.”⁹ The following themes categorize the two main parts of the book: ideology critique and theory into practice and praxis informed by theory.¹⁰ Each chapter explores a different branch of music practice under the aesthetic and praxis theories. Chapter six explores the concept of praxis in music and music education by defining praxis within three categories, a noun, an action, and knowledge.

In the sixth chapter, “Praxis in Music and Music Education,” Regelski explores the meaning of the term “praxis” in a musical context.¹¹ For the first definition, Regelski discusses praxis as a noun, promoting a notable result accomplished or produced.¹² In this context, music is the end result or product that serves different social and practical needs.¹³ Therefore, when the needs of society and culture change, music should change to match and evolve those needs over time. Music is popular based on the surrounding culture in a given area and time. Furthermore, each group of individuals will use music as a noun in various environments. Regelski states, “For music educators, praxis as a noun requires conceiving of curriculum goals, outcomes, and end results that will be tangibly *observable* and notably *pragmatic* in nature. Curriculum is therefore calculated on the need to make a difference in the ‘value added’ sense of the ‘goods’ or values that curriculum exists to enhance or improve.”¹⁴ As society evolves, educators must update

⁹ T. A. Regelski, *A Brief Introduction to A Philosophy of Music and Music Education as Social Praxis*. 1st ed. Routledge, 2015, xix.

¹⁰ *Ibid.*, vii.

¹¹ *Ibid.*, 84.

¹² *Ibid.*, 85.

¹³ *Ibid.*, 86.

¹⁴ *Ibid.*, 86.

curricula to keep students interested. For students, the music curriculum defines what students can and want to do musically.¹⁵ Regelski discusses the concept of music praxis for students in a performative sense, as they will see the achievement and reward as a result of instruction.

The second definition Regelski focuses on is praxis as action, referring to an action or acting.¹⁶ In music, this refers to trying or doing something musically. For students, the active form of praxis refers to their learning to improve musical skills in and out of applied lessons. Regelski states, “The verb form also involves reflecting on their musical actions with the conscious intention of maintaining or increasing competence and pleasures or of extending competence to new applications or musical domains.”¹⁷ Next, he discusses the verb form of praxis for students as actively adapting to their changing musical needs. For a musical setting, this pertains to each student’s personal needs involving their musical choices. Examples of this idea may include transposing their piece in new keys, composing new types of songs, and performing their repertoire in different keys. As the students progress, their musicianship will adapt to their social, cultural, and personal identities.

Regelski highlights the third definition of praxis in the background of knowledge and refers to praxis as generating practical knowledge.¹⁸ The author notes that praxial knowledge takes the form of skill and continues to embellish the definition of practical knowledge. He states, “Praxial knowledge is the pragmatic ‘know how,’ ‘how to,’ and ‘can do’ that arise only from the verb form of praxis—from musicking.”¹⁹ For musicians, practical knowledge embodies

¹⁵ Regelski, *A Brief Introduction*, 86.

¹⁶ *Ibid.*, 86.

¹⁷ *Ibid.*, 88.

¹⁸ *Ibid.*, 89.

¹⁹ *Ibid.*, 89.

the feeling of making music. Regelski gives the example of learning the functional knowledge of key signatures or time signatures as a praxial skill that is never forgotten once regularly used. He argues that sometimes educators make the mistake of lecturing concepts that would be learned more effectively by doing, such as counterpoint, melody, or rhythm.²⁰ This argument matches the book's central theme: the praxial perspective of learning, learning by doing. Another essential concept within this chapter involves musical intentionality. This idea aligns with practicing music, essential to stress as young musicians learn their instruments and musical knowledge. Musical intentionality refers to intending to learn, progress, or solve musical problems or achieve musical aspirations, such as performances, new repertoire, etc.²¹ Regelski finalizes this thought and states, "From a praxial perspective, musical intentionality is a matter of intending to learn, to progress, or to solve a musical problem or achieve a musical inspiration."²² The chapter further explores the idea of music teaching within the praxial perspective to offer ideas for music educators to implement in their classrooms.

This book written by T. A. Regelski aims to offer insight into the praxis philosophy of music education against the aesthetic approach. For this project, this book acts as a guideline for how music education approaches are viewed from different perspectives of educators and students. By learning various music education philosophies, the researcher can compare this to other literature and the thirteen research studies to see if other approaches vary or align with these ideas. This comparison could reveal what is expected in music education today and be

²⁰ Regelski, *A Brief Introduction*, 90.

²¹ *Ibid.*, 91.

²² *Ibid.*, 91.

compared to what has succeeded in past curricula. Therefore, the researcher can draw a conclusion based on what is needed to change and update within music education.

A Concise History of American Music Education by Michael Mark

Michael Mark discusses the history of music education in America from the early 1800s to the twenty-first century. The book is categorized into six parts: music education in the early 1800s, music as a curricular subject, professional education organizations, broadening of the music curriculum, music education as it expands, and music education in the twenty-first century.²³ Specifically, in the first chapter, Mark focuses on music education in the early new world. The origins of American music education of that time period began with the two groups of English colonists, Puritans, and Pilgrims. The Northern colonies significantly differed from the Southern colonies in musical life. Mark states, “the musical life of the colonial South was somewhat brighter than that of the North, where psalmody was the most common type of music.”²⁴ Even though the Pilgrims brought *The Book of Psalms* with them, one of the most popular types of music in the South was secular music. The book continues to map American music education history by looking at the beginnings of New England music.

What’s So Important About Music Education? By J. Scott Goble

J. Scott Goble considers the significance of music education and why it is necessary for students. The six chapters in these text cover concepts such as music education in United States public schools in the United States, conceptions of music in the United States, a brief historical survey of music education in the United States, and music as a sign of worldview. The book aims to answer the inquiry about the significance of music education. Throughout the book, two

²³ Michael Mark, *A Concise History of American Music Education*. Lanham: R&L Education, ProQuest Ebook Central.

²⁴ Ibid. 11.

problems are identified impacting music education programs in the United States. Goble states, “First, we noted that the influx of students from diverse cultural backgrounds and the appearance of music from many different cultural traditions in the public forum has raised a quandary among music educators over what music should be included in the music education curriculum of the nation’s public schools. Second, we observed that support for school music classes has been lukewarm and often inconsistent throughout the history of the nation...”²⁵ The book gives examples throughout each chapter of why music education is essential.

“Music Education in the United States” by Richard Colwell, James W. Pruett, Pamela Bristah, Richard J. Colwell, and David G. Woods

This article’s authors discuss music education’s role in the United States. The section within the article is categorized by eras, such as the 19th century, 1900-1940, 1980-present, etc. The article then examines professional organizations, higher education, academic institutions, conservatories, and administration. Each historical period section explores statistics and trends in American schools and provides an overview of how music education has developed in elementary and secondary education.

As discussed in the article, music education roots begin with European influences with concepts such as choirs and traditional vocal instruction. The authors state, “Thus, early on, music was taught at the urging of pastors who perceived a need for more skillful performances of worship music in the church. As communities grew and became more widespread, secure, and prosperous, the growth of music in schools was part of the growth and predictability of the school as a part of every community.”²⁶ The concept of singing in schools was a priority in early

²⁵ J. Scott Goble, *What’s So Important About Music Education?* Routledge Research in Education. New York: Routledge, 2010, 248.

²⁶ Colwell, Richard, James W. Pruett, Pamela Bristah, Richard J. Colwell, and David G. Woods, "Music Education in the United States." *Grove Music Online*. 25 Jul. 2013, 1.

music education. The instruction books used, called tune books, primarily focused on performance accuracy. These tune books introduced skills such as shaped note heads, the seven-syllable do-re-me system, and shape note harmony. Instrumental music was less documented than vocal music but became known in the 17th century.

A book published around the early 1800s by Samuel Holyoke titled *Instrumental Assistant, A Selection of Favorite Airs, Marches, Etc. Arranged and Adapted for the Use of Learners* introduced musical instruction on various types of instruments.²⁷ The authors state, “It included instruction in violin, German flute, clarionett, bass viol, and hautboy, giving fingering charts, scales, simple exercises, and examples of ornamentation. The publication represented a major advance in the provision for instrumental education.”²⁸ As military music became more prevalent during the Revolutionary war, the use of fifes and drums emerged. These are just some of the things in early music education that shaped how musicians are taught today. This article discusses the progression of music education from the very beginning through different eras to explore the trajectory and origins that it has taken. With this knowledge, researchers, musicians, and educators can better understand how they teach their students today.

“Is Music Education in tune with the Pursuit of Equity? An Examination of Access to Music Education in Michigan’s Schools” by Ryan D. Shaw and Amy Auletto

In an article written by Ryan D. Shaw and Amy Auletto, they explore the accessibility of music education within schools in the state of Michigan. Within the Michigan administrative data provided to them, the authors described the state’s population of music educators and

²⁷ Colwell et. al, "Music Education," 5.

²⁸ Ibid., 5.

student accessibility to music education.²⁹ The authors discuss the pressures of accessibility within music school programs and how arts programs were commonly susceptible to less instructional time and curricula narrowing. They note that even though music programs have survived these issues, that does not express the quality of the program's quality.³⁰ The article continued by introducing the state of music education policy in Michigan. Although not strictly enforced, Michigan has a one-credit arts graduation requirement. It also does not require music education classes at the K-5 or middle school level.³¹

The results revealed that music teachers differed from nonmusic teachers in the following ways: demographics, teaching certificate attainment, and specific job details. For example, data showed that music teachers were twice as likely to be male. The authors also found that music teachers were more likely to hold two job assignments that involved both music and nonmusical subjects, while they were less likely to work music teachers full-time.³² Among other findings, the authors stated that the differences between music and nonmusic teachers could contribute to a less favorable working environment. The article concluded by referencing the original question of the accessibility of music education in Michigan. The second data table addressed categories such as the distribution of music teachers across the state. They state, "Collectively, these findings indicated substantial disparities in access to music education in Michigan. Across nearly every measure we considered, particular populations were disadvantaged in their access to music

²⁹ Ryan D. Shaw, "Is Music Education in Tune With the Pursuit of Equity? An Examination of Access to Music Education in Michigan's Schools." *Journal of Research in Music Education*, 2021, 1.

³⁰ Ibid., 2.

³¹ Ibid., 4.

³² Ibid., 6.

teachers.”³³ The authors discover that there is neither an improvement nor a worsening of access to music education for these students. This research can aid in proving the current gap in music education teachers face in the United States and show what needs improving.

“Music Education Opportunities in Ohio K-12 Public and Charter Schools” by Brian P. Shaw

In the article written by Brian P. Shaw, he discusses the music education opportunities in K-12 public and charter schools in the state of Ohio. The study aimed to explore which Ohio schools offered music courses and the participation rates of students in those courses.³⁴ The authors discussed the history of past music education programs in both large and smaller school environments. They note the difference in charter schools being independent funding for various programs, claimed to be completely different entities than public schools.³⁵ The article continued by exploring the state size and population of schools. After giving a detailed background on the differences between public and charter school demographics, the authors state, “Two questions guided the research: (1) What factors affect the rates at which Ohio K-12 public and charter schools offer music courses? And (2) What factors predict rates of music enrollment at these schools?”³⁶ The authors chose to focus on a sample size of 3,222 schools in Ohio. They separated the schools by typology: charter, small town, rural, suburban, and urban. They were then categorized by elementary, middle, and high school levels to see the proportion of public and charter schools that offered curricular music courses.³⁷

³³ Shaw, “Is Music Education,” 8.

³⁴ Brian P. Shaw, “Music Education Opportunities in Ohio K–12 Public and Charter Schools.” *Journal of Research in Music Education* 69, no. 3 (2021): 303–20.

³⁵ *Ibid.*, 304.

³⁶ *Ibid.*, 305.

³⁷ *Ibid.*, 308.

The results revealed that nearly every public school offered some type of music instruction in their curriculum, but only half of the charter schools offered music programs. However, despite this, the results showed that charter school music courses had more students enrolled than those in public schools. In this section, the authors continued to break down the data into categories: urban elementary/middle/high schools, music subjects offered, race, ethnicity, and access to curricular music.³⁸ As an example of a subject of data found, the authors state, “In contrast to public schools, very few charter schools offered either choral or instrumental music.”³⁹ The article concluded with discussions of both music course availability and enrollment rates. Results revealed that charter schools’ music participation rates dramatically differed due to the lack of availability. In conclusion, the researcher discovered multiple variances across the two different categories of schools regarding music enrollment and access. Although it did not reflect the entire country, it gave pause and warning signals to something happening in current music education.

Teaching Music-The Urban Experience by Lisa C. DeLorenzo

Professor Lisa C. Lorenzo wrote the book titled *Teaching Music-The Urban Experience*, which discusses her experiences as a music educator in the urban school system paired with teachers currently teaching music in New Jersey. She divides the book into eight chapters to support her new ideas of teaching music education in urban school environments. Each chapter illustrates a different topic regarding how to teach subjects such as nurturing pedagogy, narrowing the opportunity gap, and what defines a good teacher.⁴⁰ Five chapters are split into

³⁸ Shaw, “Music Education Opportunities,” 310.

³⁹ Ibid., 312.

⁴⁰ Lisa C. DeLorenzo, *Teaching Music the Urban Experience*. Abingdon, Oxon; New York, NY: Routledge, 2019.

two parts with these topics coexisting with a personal classroom experience from teachers in New Jersey to gain their perspectives. She begins the text and states, “This book is written for music education students and beginning music teachers who believe that all children have a right to powerful music experiences but may not know how to engage with the complexities of an urban setting.”⁴¹ DeLorenzo states that she wrote this text to discover the meaning of teaching music in urban schools.

The book begins by explaining the meaning of urban in a school context. Citing H. Richard Milner, the author lists the three categories that urban environments fall under: significantly large population, similar issues but smaller in population, and smaller communities encountering issues in larger cities.⁴² In music education, some urban schools are fortunate enough to have highly valued programs that offer numerous resources and materials. Many of these programs are seen as art-intensive to give students the most opportunities possible. However, there are urban schools that often have little funding for ensembles and equipment, as their teachers work hard to find those resources themselves. The author continues the text by describing the impact on the student and music educator. Understanding the challenges confronting city students is just as important as understanding how those challenges affect the educators in those environments. She states, “Good urban teachers understand that empowerment comes from learning how to negotiate barriers in life.”⁴³ Music education allows students to explore their creativity and express themselves through an art form. Although an urban school setting might look different, students with nurtured programs can still feel the impact.

⁴¹ DeLorenzo, *Teaching Music the Urban Experience*, 2.

⁴² *Ibid.*, 5.

⁴³ *Ibid.*, 8.

Each chapter in the text by DeLorenzo describes different aspects of what it is like teaching music in an urban school setting. Like many school environments, urban schools have their share of challenges. However, DeLorenzo lists the importance of nurturing the true nature of music learning and how it can be pivotal for students. This text provides insight into the different types of music education in today's society that is not commonly discussed. By researching environmental challenges and characteristics, future educators can better understand how to prepare their students based on what kind of environment they live in with the same opportunities as those in other places.

Music Technology and its Branches

Music, Technology, and Education: Critical Perspectives by A. King & E. Himonides

Authors King and Himonides explore the role of technology in the music education environment. The book addresses the critical perspectives of technology in music education in three parts: music production; game technology; musical creation, experience, and understanding.⁴⁴ The authors then split these categories into fourteen chapters with perspectives by musicians and producers, the future of education, and how technology is seen through a pedagogical lens. Specifically, within the music creation section, there is a chapter that discusses the concept of music technology within the context of special educational needs. This chapter introduces changed perspectives of music technology within education. The authors state, "the music-educational avenues that technology opens up are wider than ever before, and the distinction between formal and informal learning is becoming increasingly blurred, with the two existing on a fuzzy– if rich– continuum of educational

⁴⁴ A. King & E. Himonides (Eds.), *Music, Technology, and Education: Critical Perspectives (1st ed.)*. Routledge. (2016).

opportunities.”⁴⁵ The chapter continues to offer a background on music education and therapy, as it brings supporting evidence to the idea that music technology can aid in helping students within the educational environment.

In the concluding chapter, King and Himonides discuss education's future within the previously stated contexts. To understand how education can change, the authors bring up the concept of “big data,” which refers to datasets of any kind that are typically expanding rapidly and are impossible to store, manage, and process using mainstream computers and software.⁴⁶ When looking at big data with a music focus, the authors state, “The current face of education and music education and the numerous challenges that music and the arts in general are facing are now more than ever presenting the need for systematic research and mapping of how musical development fosters the development of other skills, expertise, and abilities.”⁴⁷ They explain that big data can be used to provide accounts of musical development. For example, its role can be expanded into preserving culture and tradition. In music education, students must learn about music in other cultures to understand new perspectives worldwide, and what kind of role music plays in other traditions. Among many other ideas, the authors highlight the importance of technology to grow with music education. This book offers insight into how aspects of technology can be found in a musical setting, such as game technology, production, and creation.

Engaging Students with Music Education DJ Decks, Urban Music, and Child-Centered Learning
by Pete Dale

Pete Dale explores the idea of “remixing” the way music education is taught by introducing DJ skills in current music culture to engage students. The author maps out the text by

⁴⁵ King & Himonides, *Music, Technology, and Education*, 173.

⁴⁶ *Ibid.*, 245.

⁴⁷ *Ibid.*, 252.

discussing categories such as curriculum tensions, understanding students themselves, and using new technologies in the classroom. The focus on music technology techniques is presented in the book's second half, as the subtopics include changing the curriculum to fit digital age requirements. He states, "Once some discussion of the decks as musical equipment had been undertaken, I would explain that two turntables and mixer had normally been used, up until the late 1970s, to simply play one record and then, at the end of the disc, to segue to another."⁴⁸ Dale continues to explain his personal experiences as an educator experimenting with this type of technology in his classroom.

In the concluding chapter, Dale explores the details of using new technologies in music education. He provides his own perspective on the ongoing argument about technology taking place of traditional instruction. He states,

"In my own practice, and in my observations of others' teaching practice, it seems clear that new technologies can really help to engage and stimulate young people, especially those who are enthusiastic about EDM. This does not mean that all existing traditions in music education should now be abandoned; but it does mean that new technologies should be embraced as a music tool which can make more learners feel that music is 'do-able' than traditional methods and modes of music education have been able to."⁴⁹

Implementing these types of technologies into classrooms brings its own challenges and obstacles. However, the excitement and motivation of students exposed to these ideals could increase music education's popularity, resulting in more participation and funding. This book offers hands-on experiences from a music educator that could inspire other educators and programs to follow the same path, creating a new future for music education.

⁴⁸ Pete Dale, *Engaging Students with Music Education DJ Decks, Urban Music and Child-Centered Learning* London: Routledge, 2017, 101.

⁴⁹ *Ibid.*, 142.

Entrepreneurial Music Education: Professional Learning in Schools and the Industry by
Kristina Kelman

This book, written by Kristina Kelman, discusses the project that introduces students' viewpoints in a school setting, mapping out learning tactics in the music industry. The author questions why music industry learning is not learned in a music education setting and how it should be done. Kelman then connects music education with the music industry, which is becoming more helpful to students due to the digital age. "Education needs to respond not only to societal changes—in particular, to the emergent conditions of creative and knowledge economies—but also to the changing needs of today's learners... These facilities enable them to more effectively negotiate entrepreneurial careers within the creative industries."⁵⁰ As students rely on technology in their daily lives, the expectation for a learning environment to have these aspects is increasing. Therefore, the expectations for educators to be able to keep up with the rise of technology in their classrooms are increasing. The author provides perspectives from numerous music educators and their experiences teaching in urban music classrooms to offer new ideas that are not seen in every situation. Music educators can use Kelman's book to gain knowledge from those in a technologically advanced setting to teach their students efficiently.

Technological Advancements in Music Education

Positive Instruction In Music Studios: Introducing a New Model for Teaching Studio Music in Schools Based Upon Positive Psychology by Tim Paston and Lea Waters

This article by Tim Paston and Lea Water discusses the history of traditional music instruction in schools and hypothesizes studio instruction and engagement can be boosted in a school setting to gain a greater appreciation for the instruments. Using a positive psychology

⁵⁰ Kristina Kelman, *Entrepreneurial Music Education: Professional Learning in Schools and the Industry*. Queensland University of Technology, 2020, 23.

method, the four steps in the *Positive Instruction for Music Studios* (PIMS) model explore improving students' engagement in learning in the music studio. Then, the authors conclude the research by summarizing their suggestions for executing the PIMS model to be executed, which may increase student engagement. Currently, private music instruction is required outside of school, as students must choose to participate in that extracurricular activity. In recent years, music studios have been the pinnacle of music composition and production in the music industry. Paston and Waters identify that "this model is students' viewpointscience of PP and seeks to support the teacher in using differentiated teaching and learning approaches, making the learning visible, forming positive teacher-student relationships, and promoting student well-being."⁵¹

Alternative Approaches to Music Education by Ann C. Clements, ed.

The book written by Ann C. Clements provides her argument for an alternative approach to music education, written explicitly for music educators to learn a new tactic. Presented in the book are the 25 models that provide an alternative approach to music education in the form of case studies. Beginning with PreKindergarten-12 case studies, the author discusses topics in music education in our society of all levels. These topics include virtual field instruction, exploring new models in music education, and alternatives to music education. Each chapter is written by a different music educator, scholar, or researcher to offer perspectives on their alternative ideas to music education. These case studies further support Clements' point that music education curricula must adapt to current societal environments.

As previously mentioned, music education has traditionally been taught in specific formats with highlighted fundamentals. However, in multiple case studies, alternative

⁵¹ Tim Paston and Lea Waters, "Positive Instruction in Music Studios: Introducing a New Model for Teaching Studio Music in Schools Based upon Positive Psychology." *Psychology of Well-being* 5, no. 1 (10, 2015): 2.

approaches are offered to see how students of all levels react to different forms of learning music in the classroom. A specific example from these studies is Sarah J. Bartolome's chapter, "Toward a New Concept of World Music Education: The Virtual Field Experience." The study focuses on different teaching methods that analyze the relationship between teachers and students.

Bartolome states, "This model is based upon the new science of PP and seeks to support the teacher in using differentiated teaching and learning approaches, making the learning visible, forming positive teacher-student relationships, and promoting student well-being."⁵² She describes her personal experience with the virtual field experience (VFE) model, further described in chapter four of this project.

Music Education in the Developing Digital Age

Listening in Action: Teaching Music in the Digital Age by Rebecca M. Rinsema

The book by Rebecca M. Rinsema discusses her philosophies about music listening, her experience teaching music in the digital age, and how to keep students engaged in music learning. The text is divided into three parts: philosophy, observation, and practice. Each part contains chapters discussing subtopics such as music listening, navigating real and virtual spaces, multimedia, hermeneutics, and the music classroom.⁵³ All subtopics support teaching music education in the digital age, and why the concept needs to be further explored in society. Rinsema continues by outlining the rest of the text by stating, "Following from the first two chapters, the three theses are: 1) everyday music listening can be meaningful, 2) music listening

⁵² Ann C. Clements, ed, *Alternative Approaches in Music Education: Case Studies from the Field*. Lanham: R&L Education, 2010. ProQuest Ebook Central, 28.

⁵³ Rebecca M. Rinsema, *Listening in Action: Teaching Music in the Digital Age* (London: Taylor & Francis Group, 2016).

can lead to musical understanding, 3) everyday music listening can be creative.”⁵⁴ With these three theses in mind, the author describes the concept of listening and musical understanding.

In Part I of the text, philosophy, the second chapter focuses on musical understanding. The author discusses the praxial philosophy of music education by David Elliot and three possible developments for how the author can broaden the philosophy. Rinsema refers to the categories of musical thinking and knowing, defined in Elliot’s text as musical thinking and knowing (MTK’s).⁵⁵ These categories were separated by musicianship and listenership, including the MTK examples such as procedural and action. Rinsema states, “The resources come from expanding notions of the eight MTKs; expanding notions of musicing; and reducing the number of MTKs necessary for music listening so that just listening can, in some cases, lead to musical understanding.”⁵⁶ This chapter provides a small insight into what Rinsema’s text explores within the theme of music education philosophies and how it can be updated in the future. By understanding what other educators discovered in past music education curricula, future researchers can look back and use that information to create new perspectives and arguments to keep it relevant for current students.

The Elephant in the Room by David A. Williams

The article by David A. Williams discusses the growing concern of K-12 music education within the context of large ensemble practices. Williams explores the argument that the curriculum regarding ensemble requirements is becoming outdated for students in public schools. The question he asks is why fewer students are enrolling in music classes. In this article, the

⁵⁴ Rinsema, *Listening in Action*, 125.

⁵⁵ *Ibid.*, 35.

⁵⁶ *Ibid.*, 44.

author suggests increasing the number of students enrolled in music classes. The categories he lists are the outdated model, other alternatives, things to consider, and a new direction. In the first section, Williams notes that “the large ensemble structure was established for the model for music education in the 1900s and has remained relatively unchanged for a century.”⁵⁷ When introducing new technology and multicultural music in music education, it is found that students learn these topics better in separate classes rather than being integrated into large ensembles. The large-ensemble model has been successful in many ways and held essential roles in the secondary school process. Because this widespread model has such a fast-changing pace, many music educators find it challenging to keep up with incorporating these changes into the large ensemble model.

Williams introduces other alternatives to the large ensemble model in the second section of the article. He notes that other countries such as England have done studies to integrate various types of music and instrumentation into the current music curricula, showing positive results for both. He states, “It is the only model in which most college music education majors participated during their secondary school years, as well as throughout their undergraduate experience.”⁵⁸ Unfortunately, many students choose not to participate in large ensemble classes in their early education due to a lack of interest. To combat this, Williams offers opportunities to consider, such as changing class size, introducing student-centered learning, looking at musical/creative decisions, traditional notation, etc.⁵⁹ Each of these categories describes various ways to change the traditional thinking of music education regarding large ensemble contexts.

⁵⁷ David A. Williams, “The Elephant in the Room.” *Music Educators Journal* 98, no. 1 (2011): 52.

⁵⁸ *Ibid.*, 53.

⁵⁹ *Ibid.*, 54.

These ideas can be taken by both music educators and administrators when looking at updating music curricula for the students learning in current classroom environments.

This article could be considered vital for educators to reference when teaching large ensembles in this upcoming digital age. The way classical music is taught is constantly evolving with the technological advancements available to elementary and secondary school students. Williams argues that if changes are not put into practice within United States music education, there would be an even more significant lack of interest from students, resulting in the removal of large ensembles altogether. The article describes new perspectives and approaches to teaching music education in the digital age, offering new ideas for educators to use in their classrooms. This article is helpful for this project, as it focuses on the main idea surrounding this research project. The researcher aims to discover if these claims in the article are reflected in the thirteen studies from educators and students in the field of music education currently.

Chapter Summary

The sources analyzed in this study include previous research on teaching digital music in current music education. To understand music education in the future, past successful methods of music education must be analyzed first. These sources include the history and philosophy of music education. Next, music technology as a subject has its history regarding how it might fit into current music education. The context of music education taught in the digital age has been studied and explored by many different scholars. With the ever-changing technological society, music should not fall behind in the journey. There are alternative approaches to teaching music education in the digital age with constantly challenging issues.

CHAPTER THREE: METHODOLOGY

Introduction

A secondary analysis of recent research on the topic will be conducted to understand the need for change in music education that promotes learning in the digital age. The secondary analysis was commenced based on thirteen data studies. These thirteen studies consist of educators, students, and professional musicians as participants involved. The studies are separated into the following categories: music student perspectives, music educator perspectives, and technical methods and approaches. In the first two categories, the researchers include a variety of methods to obtain data from music students and educators about their current environments and opinions. In the third category, researchers chose one type of specific technology to discover new aspects of instrumentation. In this methodology, a brief overview of each study will be illustrated, followed by the collection of responses to see them side by side, an analysis of both parallels and differences of the data collected, and the researcher's conclusion.

Design

To successfully discover alternative methods for teaching technical knowledge within music education curricula, the researcher must gather data from thirteen studies that already explore this problem. The researcher will conduct the secondary analysis of qualitative research in surveys, case studies, phenomenological research, and narrative research. Researcher and professor John Creswell states, "The concept of mixing different methods originated in 1959 when Campbell and Fisk used multimethods to study the validity of psychological traits. They encouraged others to employ their multimethod matrix to examine multiple approaches to data collection."⁶⁰ The techniques and results will be compared in each of the thirteen studies. This

⁶⁰ John W. Creswell, and J. David Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 5th ed. (Los Angeles: SAGE Publications, 2018), 30.

comparison might discover the success of each method when observing the participant group and setting. With this secondary research, the researcher will be able to identify direct correlations between each study and will decide if the methods were effective with each group.

Questions and Hypotheses

The researcher discovered previous studies pertinent to the subject had been conducted. Through secondary analysis of this data, it is hoped that new approaches and methodologies for teaching music and its digital components can be suggested. The following proposed research questions and hypotheses include:

Question One: To understand the present need for digital proficiency, what research methods are required to study primary music education?

Question Two: If music education varied in multiple American states, is making digital proficiency not necessary in some places?

Question Three: How is music education being taught due to the current technological advances?

Question Four: To become digitally proficient in music education, what are some new approaches to teaching while keeping students both current and engaged?

Question Five: Amidst the previous inquiries, one still asks, what technical methods need to be implemented for students to learn in the music education field successfully?

Hypothesis: Due to the previous literature review, the assumption is that this problem has attempted to be addressed through scholarly articles and books. Despite this, there may be more challenges in formulating education in the operation of digital music equipment.

Procedures

The procedures that will be used to analyze the secondary research will involve finding sources of relevant information, collecting data that includes similarities among the sources,

along with different methods of technology used in music education settings, and analyzing the data collected from the sources of information. This secondary data will consist of all thirteen studies collected to conduct a successful analysis. Each study will be analyzed based on the participants involved, methods and approaches used, the literature reviewed, and the results of all data collected from the researchers.

Secondary Analysis

This study will re-analyze existing data to answer the research questions. The researcher will be researching and completing a secondary analysis based on collected data from thirteen studies centering around alternative methods of using technology in a music education setting. The analysis will consist of a chart to see which methods were used against which sample groups in each study and diagrams of the similarities and emerging themes found throughout all studies. After organizing analysis from secondary data, conclusions will implement in response to the research inquiries.

Chapter Summary

By conducting a secondary analysis of thirteen previous studies, the researcher will endeavor to answer their research question and possibly support the hypothesis. The findings of selected studies will be organized into these categories: perspectives of music students, the perspectives of music educators, and technical methods and approaches. After gathering all data from those studies, the researcher will conduct a secondary analysis to find common themes. Then, the researcher will analyze all data in the forms of surveys, case studies, phenomenological research, and narrative research. The five research questions will guide the researcher throughout each study to discover if implementing technology in the curriculum is a

necessity for current music education. Furthermore, they will explore the required knowledge and technical equipment to create effective learning environments for music students.

CHAPTER FOUR: RESEARCH FINDINGS

This chapter discusses the findings of various research studies conducted within the context of incorporating technology in music education curricula. To discover the possibilities for enhancing music education, the researcher found thirteen studies to conduct a secondary analysis of the data. These studies are separated into the following categories: perspectives of music students, perspectives of music educators, and technical methods and approaches. The data found in each section reveals various aspects of music education, some of which successfully incorporate technical knowledge into the curriculum. Due to the fast-changing pace of the music industry, students are becoming more technically intelligent with different types of equipment, software, and skills. The chapter emphasizes the importance of introducing technology into music education to enhance students' learning and increase their motivation within the classroom. The topics discussed include various surveys from music students and educators about their experiences with music technology, methods and approaches designed to incorporate technology into music curricula, and specific technical knowledge exhibiting enhancements to musicians.

Perspectives of Music Students

“Secondary Students’ Preferences for Various Learning Conditions and Music Courses: A Comparison of School Music, Out-of-School Music, and Nonmusic Participants” by Seth Pendergast and Nicole R. Robinson

Seth Pendergast and Nicole R. Robinson studied middle and high school students’ preferences for music learning conditions and secondary music course offerings.⁶¹ The authors identify the remaining gap in music education involvement: most secondary school students do

⁶¹ Seth Pendergast, and Nicole R. Robinson, “Secondary Students’ Preferences for Various Learning Conditions and Music Courses: A Comparison of School Music, Out-of-School Music, and Nonmusic Participants.” *Journal of Research in Music Education* 68, no. 3 (2020): 264-85.

not enroll in music classes. The purpose of this study was to explore why there may be a lack of engagement in music classes among secondary school music students and the differences involved in their students' preferences. The research questions for this study include the following:

1. What are secondary students' preferred learning conditions for music class regarding teacher role, group size, and repertoire?
2. Which music course options do secondary students express the most interest in?
3. How do students' preferences for learning conditions and music courses differ based on socioeconomic status and ethnicity and among students who participate in school music or out-of-school music and students who are not involved in musical activities?
4. Why do some secondary students choose not to enroll in music courses, and what music activities do they participate in outside school?⁶²

In two separate large school districts, the researchers conducted several field tests to discover the reliability of the surveys. The researcher organized the survey into demographic information, learning condition preferences, and music course interests. The music courses were divided into six categories for the students to show their preference for piano/guitar, music composition with technology, popular music group, large ensemble, history/theory, and world music group. The sample of this study included a total of 827 students who were and were not participating in school music classes. Out of the total number, 369 participants were enrolled in secondary school music, 254 students participated in music outside of school, and 204 students did not participate in music.

For the first research question, the authors found that 43.5% of students preferred instructional methods where teachers occasionally lead instruction, while 33.5% preferred learning independently.⁶³ In the second research question, the Likert scale was employed. The

⁶² Pendergast and Robinson, "Secondary Students' Preferences," 268.

⁶³ *Ibid.*, 274.

researchers found that participants were most interested in the piano/guitar class, followed by the music composition with technology. The third research question revealed that in-school music participants had a stronger preference for a mixture of large and small group teachings, differing from the out-of-school and nonparticipants. The findings also showed that out-of-school and nonparticipants preferred students to choose the music learned in class.

To discover findings in the fourth research question, participants answered three questions to determine why students chose not to enroll in secondary music classes and types of music activities outside of school. The findings revealed that 80.1% of nonparticipants reported no interest in enrolling in music classes, and 19.6% indicated they did not have time to take them. Of the out-of-school music participants, 35.4% reported no interest in enrolling in music classes, and 37% did not have time for extracurricular. The second and third questions within the survey discussed student involvement in music outside of school and instrument choice. Participants responded with the most common musical activities outside of school being playing or singing alone, taking music lessons, playing with friends, and writing their music. The instrumentation of choice consisted of voice, piano/keyboard, guitar/ukulele, string/wind instruments, and drums or technology.

After analyzing the data, the researchers found that students preferred a mixture between teacher and student-guided instruction. Small-group learning was more preferred by out-of-school and nonparticipants rather than in-school participants. Out-of-school and nonparticipants preferred choosing all repertoire, while in-school participants preferred a collaborative choice with the instructor. When looking at the student interest in different music class types, the nonparticipant group expressed less interest in every music class type than the other two groups. The authors conclude that the music curriculum should be reformed and reshaped for students of

the 21st century to understand all students' motivations for participating in music classes and activities.⁶⁴

How Children Listen: Multimodality and its Implications for K-12 Music Education and Music Teacher Education by Judy Lewis

In an article written in 2019, Judy Lewis discusses three different research study sessions to discover how music education students listen, specifically through aspects of multimodality. The article states, "the author argues that current music education does not sufficiently build on the digital literacies and affinities of students and suggests ways that music teacher education programs may address this gap."⁶⁵ The article discusses the background and context of multimodal music listening and how it ties in with the following study. Multimodality appears in both music consumption and production. This concept has evolved in music technology, especially how people listen to music. The researcher further explored this idea by bringing in the question of how children listen, specifically music students.

The methods used throughout this study include introducing the multimodality aspects of popular videos and designing pedagogical frameworks for 'multimodal music learning.'⁶⁶ By looking into the methodology, the sampling of 26 participants were graduate music students at an American university. Each student was enrolled in an intro to music education course or philosophy of music education course. Throughout two 3-hour meetings, they were involved in a conversation based on the following research questions:

1. How do music education students use multimodal music pedagogy to explore the affordances of multimodal popular music listening and envision learning experiences for K 12 students?

⁶⁴ Pendergast and Robinson, "Secondary Students' Preferences," 281.

⁶⁵ Judy Lewis, *How children listen: multimodality and its implications for K-12 music education and music teacher education*, *Music Education Research*, 22:4. (2020): 373-387.

⁶⁶ *Ibid.*, 373.

2. How, if at all, does multimodal music pedagogy impact their understanding of the role of the teacher and student in the music classroom?
3. How, if at all, does multimodal pedagogy impact their understanding of music teaching and learning?⁶⁷

The discussions in the two meetings involved multimodality and contemporary listening experiences. Another important topic covered in this literature includes the researcher's *Network Learning Design* (NLD) about a particular song. The students were asked to work in groups to discuss the topics, choose popular songs for the group, and bring their researched songs back to the second meeting. Three questions were then posted on a communal blog for the students to answer and discuss their thoughts about why they chose certain NLDs, as well as comparing the multimodal framework to their previous notions of music teaching. After the data collection, the researcher discovered that introducing the aspects of multimodality significantly different focus training for music education students.

Technology Use and Attitudes in Music Learning by George Waddell and Aaron Williamon

In a study conducted in 2018, George Waddell and Aaron Williamon sought to research the gap in music education by “examining the use of and attitudes toward technology and the one-to-one learning and teaching of music performance.”⁶⁸ The researchers created a *Technology Use and Attitudes in Music Learning* survey to achieve this. This survey was developed to gather data from a 338 musicians ranging from amateurs and students to professionals. This sampling also varied in age and musical experience. The purpose of this study was to prove their claim that there is still a lack of research done on the use of digital technologies by students in individual settings.⁶⁹ The researchers chose to focus on the Technology Acceptance Model (TAM) when

⁶⁷ Lewis, *How children listen*, 378.

⁶⁸ George Waddell and Aaron Williamon, *Technology Use and Attitudes in Music Learning*. Front, 2019, 2.

⁶⁹ Waddell and Williamon, *Technology Use*, 1.

looking at the results presented. This model illustrates that technology use in music learning predicts an increase in efficiency for music education.

The respondents of this survey were 338 musicians, with their primary genres reporting as primarily classical, with hints of jazz, folk, and pop. Of the respondents, 94% had taken formal lessons on their primary instrument. The Technology Use and Attitudes in Music Learning survey developed for this study were divided into four sections. The first section asked about standard demographics, and the second sought information on day-to-day technology use. The questions in the third section involved technical knowledge, access, and attitudes about learning one's primary instrument. This also included inquiring about access to a practice room and lesson space to these standard technologies, especially metronomes, tuners, and audio/video recording devices. The last section looked at attitudes toward future technologies, which involved responding to hypothetical questions about new technology use, specifically audio, video, and motion capture technologies. This survey was available online via Survey Monkey to record responses.

After analyzing the data collected from their survey, the researchers discovered that technology use is actively being pursued and demanded by musicians with a high degree of technological aptitude, specifically those that prefer mobile devices to achieve the same results as audio/video recording equipment and metronomes.⁷⁰ Although technology enhances musical learning, the gap in technology use remains. This study proves that technology has the potential to grow musical skills in the education setting while establishing positive attitudes toward these new systems. Therefore, this new structure could enhance communication, efficiency, and healthy practice in music learning.

⁷⁰ Waddell and Williamon, *Technology Use*, 11.

Engaging Students with Music Education: DJ Decks, Urban Music, and Child-Centered Learning by Pete Dale

As seen in previous studies, instructors who have introduced modern methods of teaching music education have been successful among students of this digital age. Due to young students' frequent use of technology, music education should not fall behind. In Pete Dale's book, he introduced disk jockey (DJ) decks as well as other technological music instrumentation to peak students' interests in types of music that are not just instrumental classical.⁷¹ This book focuses explicitly on engaging students of the younger levels in the music world to jumpstart their interests for future endeavors, things to avoid in the classroom, and helpful experiences from Dale's own classrooms. Through electronic dance music (EDM), Dale learned the details and key components of teaching electronic music in a classroom setting.

In the book's fifth chapter, Dale recalled his first classroom experience where he introduced DJ decks. A significant point he made within this chapter was about managing space within the classroom. It was necessary to consider how the space would be set up when using this equipment. After toying with various layout designs, Dale settled upon one that allowed the students to sit at desks facing him with the keyboards in front of them. He states, "I made sure there was enough 'circulation' around the room to allow headphones, splitters, and exercise books to be handed out quickly and efficiently without significant downtime between my explanation of some practical task and the commencement of practical activities by the learners."⁷² The DJ decks were across the room toward the door, visible but never distracting. After using this design for a few years, he learned how to add tables on wheels to move around speakers and vinyl decks. This would allow for efficiently moving the equipment to the front of

⁷¹ Dale, *Engaging Students*, 93.

⁷² *Ibid.*, 93.

the room and back without hassle. Throughout his career as an educator, he focused on specific software in the classroom to entice students to learn.

After studying and interviewing multiple successful educators and musicians, Dale began implementing methods to answer these questions with his own student experiences within his classroom. He began observing other teachers with musical software in their classrooms to see what was successful. Taking that knowledge, he began to incorporate musical software into his classrooms, such as GarageBand and Audacity. The computer software Audacity was something Dale found very beneficial within his classroom. With each of his students, he had them record basic rhythms or claps to certain songs he chose. To achieve this, they would record these rhythms through Audacity on their school-given laptops. Dale then could have the students explore the different editing functions of Audacity to change the rhythm or edit it to their liking. He noted that he preferred Audacity over GarageBand because of the opportunity for students to expand their creativity. He states, “One advantage of this work, as compared with the GarageBand-based lessons, is that individuals with skills in singing, or with special facility for rhythmic work, or with the ability to play a traditional instrument could demonstrate advanced skills.”⁷³ Not only did these Audacity lessons guide students to explore their talents, but they also increased motivation and confidence within them.

Through his experiences, Dale discovered that music changes as students grow and learn to ask different questions about their experiences. He found various things for students to explore in the classroom to encourage the enthusiasts of EDM to develop their musical skills on their terms.⁷⁴ Throughout each chapter, Dale listed a new discovery he encountered when studying

⁷³ Dale, *Engaging Students*, 149.

⁷⁴ *Ibid.*, 157.

EDM in the classroom. These themes would incorporate advanced DJ techniques, new technologies, their valuable aspects, their role as a supplement rather than an alternative, and how to set up a music classroom for these uses successfully. His experiences added to the research on incorporating specific technologies into a musical classroom.

“Toward a New Conception of World Music Education: The Virtual Field Experience” by Sarah J. Bartolome

In a book written by Ann C. Clements, she describes various case studies of music education teachers implementing alternative approaches to teaching music. Each chapter presents a case study from a different music educator and their experiences with the project being presented. Their personal experiences explain different aspects of music education by taking various new approaches to increase student motivation for music classes. The two case studies the research highlights involve the virtual field experience (VFE) within a world music context and exploring new models of music education through music in cyberspace.

In the book’s third chapter, Sarah J. Bartolome presents a case study about the virtual field experience (VFE), an immersive, multidimensional experience for students to learn world music through multisensory interactions.⁷⁵ This approach would create opportunities for students to explore visual media and cultural artifacts integrated into the VFE. The authors state, “Students are engaged in listening, playing, singing, and moving activities in addition to learning about and discussion geography, history, and culture.”⁷⁶ The author discusses some approaches to teaching world music in the context of world music education. These approaches involve the inclusion of multicultural repertoire, singing songs, playing musical games, and using music

⁷⁵ Sarah J. Bartolome, “Toward a New Conception of World Music Education: The Virtual Field Experience” in *Alternative Approaches in Music Education: Case Studies from the Field* (Lanham: R&L Education, 2010), 28.

⁷⁶ *Ibid.*, 28.

drawn from various cultures to highlight the concepts being taught. The author discusses the third approach to world music education which allows students to look at a specific culture for an entire musical instructional unit. This approach includes a more immersive curriculum based on the virtual field experience.

The author defines this experience: “A virtual field experience (VFE) is a multisensory, multidimensional instructional unit focusing on a single musical culture over the course of an extended period of time.”⁷⁷ The VFE allows students to interact with musical examples from specific cultures chosen by the instructor by singing, playing, listening to, and discussing the music learned. Simultaneously, students can visualize cultural elements while learning about the music, such as food, landscapes, or people, by looking at videos of performances. Through the VFE process, an instructor can expose students to the culture and encourage interaction with it and its music. The author implemented VFE after her summer study in Ghana.⁷⁸

Upon her return, the author developed a six-week VFE using her knowledge she gathered from her trip to Ghana. She began by giving her students a slide show on Ghanaian people and culture and focused on a drum-and-dance selection. She taught them aspects of Ghanaian music culture by introducing hand-clapping games, drum and shaker making, as well as traditional Ewe drumming by watching videos and listening to audio recordings.⁷⁹ The author recalls the experience, “Our VFE in Ghana culminated in a public performance for students and families, showcasing the musical skills and cultural knowledge gained over the course of the six-week

⁷⁷ Bartolome, “Toward a New Conception,” 31.

⁷⁸ *Ibid.*, 31.

⁷⁹ *Ibid.*, 31.

intensive instructional unit.”⁸⁰ After the unit on Ghana was completed, she asked her students to give feedback and comments about what they had learned from studying the culture. The various responses illustrated their skills in geographical knowledge, general knowledge, and musical awareness.

From this case study, the author discovered that the virtual field experience was an approach that focused on authenticity and accessibility for students to experience different cultures in the classroom. The author states, “Through the integration of multisensory, multidimensional musical and cultural activities, virtual field experiences serve to broaden students’ musical horizons, raise awareness of diverse lifestyles and cultures, and foster a more global perspective on music making as a human phenomenon.”⁸¹ By using the VFE approach, music educators would be able to provide meaningful opportunities for students to learn more about music in other cultures.

“Music In Cyberspace: Exploring New Models in Education” by Sheri E. Jaffurs and Betty Anne Younker

Another case study in the ninth chapter of Clement’s book explores music in cyberspace, specifically new models of music education. Authors Sheri E. Jaffurs and Betty Anne Younker explore three software programs integrated into a music education course. The three software programs included in this case study were Moodle, Blackboard, and Second Life. The authors state, “Using these three programs, students were encouraged to exchange ideas, download assignment information and lessons, blog, create wikis, and otherwise generally participate in

⁸⁰ Bartolome, “Toward a New Conception,” 31.

⁸¹ *Ibid.*, 35.

what is increasingly becoming a traditional online learning experience.”⁸² During these projects, students were encouraged to explore further music development with aspects of songwriting and film-score composing.

The authors discuss a course proposal presented in the United States Midwest in the 2007-2008 school year. This course targeted nontraditional music students focusing on virtual-education settings. During class, participation would be through the software program Moodle, which is an online course-content management system.⁸³ The authors state, “The Moodle software was chosen because it was created from a social constructivist’s perspective that cohered with the instructor’s beliefs about learning and pedagogy.”⁸⁴ The online class would have students engaging in discussions while blogging for assignment information exchange.

After exploring Moodle, the chapter explores the software program of Second Life. Second Life is a virtual multiuser platform for students to access course content and interact with each other. It allows students to experience meetings through virtual worlds, has their avatars share musical interaction, and encourages student collaboration. One of the biggest strengths of this online format is the interaction between students and teachers. The authors describe the results of this learning experience being democratic principles of voice, ownership, and responsibility.⁸⁵ Students learn how to voice their own views on music writing and experiences and collaborate with their peers to discover new ideas. This district’s equipment loaned for students included midi keyboard controllers, headsets, and digital audio programs. For this idea

⁸² Sheri E. Jaffurs and Betty Anne Younker, “Music In Cyberspace: Exploring New Models in Education” in *Alternative Approaches in Music Education: Case Studies from the Field* (Lanham: R&L Education, 2010), 92.

⁸³ Ibid., 94.

⁸⁴ Ibid., 94.

⁸⁵ Ibid., 95.

to be successful, equipment needed to be for personal computers (PC) and Apple computers, as each student would own something different. Through Moodle, students would have projects that allowed them to understand the skills necessary to become a musician in the multimedia industry. When the class incorporated Second Life, students could stream live and recorded music to their peers.

The participants of this course, when it launched in 2008, were five male high school students between the ages of thirteen and seventeen. One of the biggest challenges the researchers faced was recruiting students for the course, especially in the online environment. Universities have more online environments available than high school settings. There was also a fear of decreasing participation in large ensembles due to the online music course offered. The researchers hoped the program would introduce students to composition and other aspects of music learning, aiming to motivate them to pursue further studies such as performance or orchestration. The researchers conclude the case study with the benefits of online music-technology courses. With the online platforms, students would have the opportunity to make other kinds of nontraditional music to explore student-directed collaboration. These students could discover their talents through music making.

Music Educators

“Music Education and Educators in Missouri, Iowa, and Illinois” by Jocelyn Stevens Prendergast

Jocelyn Stevens Prendergast conducted a survey study in 2021 to provide a demographic profile of PK-12 public school music teachers and music teaching positions in Missouri, Iowa, and Illinois.⁸⁶ A questionnaire invitation was sent out to all PK-12 public school music educators within the three states, containing questions about classroom details and demographics. The

⁸⁶ Jocelyn Stevens Prendergast, “Music Education and Educators in Missouri, Iowa, and Illinois.” *Journal of Research in Music Education* 69, no. 2 (2021): 228.

researcher claims that the findings between the three states were inconsistent regarding experience level and school location. The author found that very few studies research specific details about the field of music education in public school courses. The information about the demographic profile of current music teachers was also incomplete. The research questions of this study included:

1. What are the demographic characteristics of teachers in Missouri, Iowa, and Illinois? Are significant differences observed among the demographic characteristics of the teachers in these three states?
2. What are the teaching responsibilities of PK-12 public school music educators in Missouri, Iowa, and Illinois?⁸⁷

This study aimed to analyze the similarities and differences in music education offered in Missouri, Iowa, and Illinois by gathering demographic profiles of PK-12 public school educators in those three states. The study procedures include a questionnaire designed to provide a demographic profile of music educators in these states and include details of their teaching duties. The questionnaire was divided into four sections. The first part included items to gather information on demographic data. The second part collected years of experience and degrees and certifications earned. The third part collected information about daily experience, specifically whether participants traveled to their school location. The fourth and final part of the questionnaire included open-response items where the participants were asked to list the classes they taught during school hours while including as much detail as necessary.

The author sent emails to all music educators in every PK-12 public school district from the identified states to encourage participation in the study. The results of the 2,023 music educators contacted via email in Missouri showed that 527 participants completed the questionnaire in its entirety. The author contacted 1,248 music educators via email in Iowa with

⁸⁷ Prendergast, "Music Education," 230.

438 completed questionnaires. Of the 2,942 music educators contacted in Illinois, 932 completed the questionnaire. The data shows that 26.1% of music educators responded in Missouri, 35.1% in Iowa, and 31.7% in Illinois.

The results of the survey study were presented in various chart formatting. There were notable findings in each of the states regarding various topics. It revealed that rural Missouri teachers were likelier to teach a subject without certification, such as Spanish. In Iowa, women were less likely to teach band and more likely to teach vocal music. Illinois teachers had a significant relationship with those who had a master's degree among the various teaching levels of elementary, middle, and high school. This point was interesting because a master's degree was not required to hold a valid teaching certificate in the three states. The author states, "A significant association was observed between state and secondary general music, with teachers in Missouri more likely to teach secondary general music and teachers in Iowa less likely to teach general music at the secondary level."⁸⁸ Each state varied in demographics, teaching backgrounds, and the current classes they taught. It was found that more women worked in music education public schools after this research was done. Specifically, it was discovered that women tended to work with younger students and vocal music, while men typically worked with older students and band music. Among the other results of this study, it was concluded that music teachers indicated a need for further preparation in all states.

"Secondary School Teachers' Approaches to Teaching Composition using Digital Technology" by Stuart Wise

In a study conducted by Stuart Wise, he explored the concept of how secondary school teachers can teach music composition using digital technology. This research aimed to study the

⁸⁸ Prendergast, "Music Education," 239.

impact of digital technology on music composition pedagogy processes for secondary school teachers.⁸⁹ The researcher collected data from various interviews with music teachers. The sample of this research included teachers from four different schools that participated in a larger project. Information and communication technologies (ICT) integrated into music education transform curricula in elementary and secondary schools. Implementing this technology into music education has started in various countries, such as the United States, United Kingdom, New Zealand, and Hong Kong.⁹⁰ Teachers must familiarize themselves with the new technological advancements to keep up with the pervasive nature of music in students' lives.

Media and digital devices' increasing impact has dramatically changed how students learn and retain information has changed dramatically. In a composition context, digital technology allows students to believe that composition is more accessible to them, rather than just trained professionals. This technology trains music educators to teach these compositional skills within the traditional pedagogical techniques. Referencing a book by Beckstead, the researcher discusses two uses of technology: amplicative and transformative. The amplicative use describes the technology in the classroom doing traditional tasks more efficiently. Conversely, the transformative use of technology shows a change in how people act, think, and react.⁹¹ The researcher offers examples of various studies implementing each use of technology within an educational setting.

⁸⁹ Stuart Wise, "Secondary School Teachers' Approaches to Teaching Composition using Digital Technology." *British Journal of Music Education* 33, no. 3 (2016): 283.

⁹⁰ *Ibid.*, 283.

⁹¹ *Ibid.*, 285.

The study's research methods for discovering the impact of technology on secondary school teachers' compositional techniques involved a questionnaire given to each teacher with questions including topics such as the compositional software such as GarageBand and Sibelius. The researcher gathered data from nine secondary school teachers from four schools that adopted an interpretist qualitative approach to composition.⁹² These schools consisted of an independent girls' school, an independent boys' school, a large co-educational state school, and a small co-educational state school. The interviewed participants included six male and three female music teachers. The researcher then collected data by analyzing the answers to the questionnaires.

The researcher reviewed the analysis and found that the data suggested digital technology could enhance students' creativity in composition if available.⁹³ Specifically, in the data, the compositional software Garageband required no knowledge of music theory or traditional music notation, allowing students to create pieces through their knowledge and desires. While analyzing the data, three of the four schools' teachers offered carefully structured exercises to learn how to use Sibelius properly. Through his findings, the researcher discovered that "although the majority of teachers involved in this research remain fundamentally conservative in their approaches to teaching composition, focusing on more procedural rather than creative activities, some music teachers do make radical changes to their pedagogy in contexts where this is important to their students' engagement and supported by their school."⁹⁴ In conclusion, this study found an educational value in integrating ICT into music compositional curricula to enhance pedagogy and increase motivation for beginner students.

⁹² Wise, "Secondary School," 287.

⁹³ Ibid., 291.

⁹⁴ Ibid., 291.

“Technology in Music Education: A National Survey” by William I. Bauer and Richard J. Dammers

In a study conducted in 2016, William I. Bauer and Richard J. Dammers surveyed collegiate music teachers to discover how prepared these instructors were in terms of environment and preservice education to teach music technology to their students properly. University requirements, national accreditation, and state mandates determine music education curricula. The authors state, “One area of consideration for music teacher educators is the role of technology in music teaching and learning and how preservice teachers can best be prepared to integrate technology into student learning experiences.”⁹⁵ The research questions include the following:

1. What courses and experiences are required of preservice music teachers to develop their understanding of technology integration in the K-12 music curriculum?
2. To what degree is preservice music teachers’ Technological Pedagogical Content Knowledge developed?
3. To what extent do music teacher educators believe their preservice teachers are prepared to integrate technology into the music curriculum upon graduation?
4. What challenges impact teaching preservice music teachers about technology?⁹⁶

The authors created a quantitative research design for this study. Using all National Association of Schools of Music (NASM) institutions with music teacher education programs, the authors created a list using a random sample of 250 NASM Directory of Institutional Members.⁹⁷ Each randomly selected participant was given an online survey to complete, and 36% of responses were recorded. Bauer’s online query examined each of the research questions.

⁹⁵ William I. Bauer, and Richard J. Dammers, “Technology in Music Education: A National Survey.” *Research Perspectives in Music Education* 18, no. 1 (2016): 1.

⁹⁶ *Ibid.*, 4.

⁹⁷ *Ibid.*, 5.

The first research question inquired about specific courses and experiences of preservice teachers to develop their understanding of technology integration. The results revealed that 47% of the programs employed a music technology course, and 33% required a music technology course for music education majors. Of the total students, results found that 13% take a standard technology class for nonmusic education majors. The second research question regarded the level of development of students' Technological Pedagogical and Content Knowledge (TPACK).⁹⁸ This section of the questionnaire used a 5-point Likert scale to determine to what extent their school's required music teacher curricula develop students' knowledge and skills. The data revealed that the highest percentage of knowledge fell under (1) pedagogical knowledge, (2) pedagogical content knowledge, (3) content knowledge, and (4) technological knowledge.

The third question contained content about which music educators believed how prepared their students were with the knowledge and skill necessary to integrate technology into the music curriculum. Participants responded with a 5-point Likert scale to determine the readiness of their students. Data in the third response revealed that participants felt their students were proficiently prepared. However, participants were not confident about teaching middle or high school music technology courses.⁹⁹ The fourth research question inquired about the challenges that impact preservice music teachers about technology. These responses were recorded with an open-ended item for the participants to respond freely. The data revealed that out of the 78% of participants that responded to this item, 25% indicated that the two most common issues were lack of instructional time and space in the curriculum and lack of funding/access to the technology.¹⁰⁰

⁹⁸ Bauer and Dammers, "Technology in Music Education," 6.

⁹⁹ Ibid., 7.

¹⁰⁰ Ibid., 8.

Other challenges included a lack of faculty knowledge, keeping up with the technology, and uncertainty about the availability of technology in field placements.¹⁰¹

After reviewing the collected data, the authors discovered that 77% of the participants indicated music education classes that integrated pedagogical information related to technical knowledge. The authors concluded that “music teacher educators need to engage in an ongoing, sustained effort to ensure that music teacher education curricula stay current and allow music teacher candidates to capitalize on the pedagogical opportunities possible with technology.”¹⁰² The pedagogical abilities that future teachers have access to would be endless to teach their students by integrating technology into the curriculum.

“Reconstructing Music Education through ICT” by Jonathan Savage

A study by Johnathan Savage was conducted in 2007 to discover the use of new technologies in formal music education and analyze the research. Referencing the ImpaCT2 (ICT) project, the author discusses the concept of music education alongside technology integration. The three stages of ICT include focusing on equipment, teaching ICT skills, and integrating ICT with curriculum subjects.¹⁰³ The author claims that few schools have made it to stage three to integrate technology into their curriculum fully.¹⁰⁴ The research questions for this study:

1. How do pupils learn about music in the classroom setting, using new technologies?
2. How does the introduction of new technologies change a teacher’s pedagogical approach?

¹⁰¹ Bauer and Dammers, “Technology in Music Education,” 8.

¹⁰² Ibid., 11.

¹⁰³ Jonathan Savage, “Reconstructing Music Education through ICT.” *Research in Education*. 78. (2007): 67.

¹⁰⁴ Ibid., 67.

3. What relationships are there between the uses of new technologies in formal music education compared with musical practices adopted by ‘digital natives’?¹⁰⁵

The author identified a sampling of 18 schools and three artists and asked them to participate in the project. All the schools were associated with universities that provided initial music teacher education. They were considered good in their practice with first-hand experience from their post-graduate students or tutors. The author chose the artists based on prior knowledge of their work and experience in previous projects. The research methodology was done through an online questionnaire for all participants and separate interviews with the artists. The interviews included questions for the artists related to their musical practice with new technologies. The author proceeds to list the critical issues revealed by the data.

Regarding hardware, 88% of departments had difficulty using networked computers for musical activities due to the policies on software content, networking of computers, and sharing of files.¹⁰⁶ The author found that keyboards were the most commonly used pieces of technology within the departments. The authors also found that 11% of the departments had a designated recording studio. In software, the author found that the teachers of these departments used a minuscule range of software, as 94% of teachers used Sibelius, 77% used Cubase, and 22% used Audacity.

Within the interview data, the teachers indicated many positive benefits of integrating technology into music education. The themes within this data included boys getting more involved in music, students showing an increase in pride and motivation about their work, and the music curriculum change making it more stimulating and relevant.¹⁰⁷ However, the interview

¹⁰⁵ Savage, “Reconstructing Music Education,” 67.

¹⁰⁶ *Ibid.*, 68.

¹⁰⁷ *Ibid.*, 69.

data also revealed themes of associated problems with the new technology. These themes included practical and technical difficulties of sourcing and maintaining music technology within a busy classroom. In some cases, there was a considerable loss of traditional music skills and decreasing confidence from students regarding musical performance.¹⁰⁸ Looking at the data in the context of pedagogy and ICT, the author found that 94% of teachers agreed that extensive uses of ICT in music teaching required new approaches to managing the classroom. Those who found managing the classroom easier with ICT use amounted to 33%, while 50% found it more difficult. Researchers found that 39% of the teachers mentioned that their students knew more than they did about the technology.¹⁰⁹ The author then analyzed all the data collected while considering the original three research questions.

When looking at the first research question, the author stated, “despite wide and significant cultural changes, music education in the classroom is still predominantly technologically conservative.”¹¹⁰ In the second research question, the data revealed that music teaching changes a teacher’s pedagogical approach positively and negatively by using ICT. One teacher’s response claimed that their teaching became more interactive by using a smaller room with computers, as ICT can support traditional approaches to music education.¹¹¹ However, when the technology became more complex, teachers’ roles began to shift within the two schools that had integrated recording studios within their facilities. In another teacher’s response, they claimed that classroom management had drastically changed, especially when considering safety

¹⁰⁸ Savage, “Reconstructing Music Education,” 70.

¹⁰⁹ *Ibid.*, 70.

¹¹⁰ *Ibid.*, 71.

¹¹¹ *Ibid.*, 72.

issues and positioning the equipment correctly.¹¹² Finally, when considering the third research question, the author discovered that the widespread changes in technology in the musical world were not reflected in the music classroom. As seen throughout past years, music curricula reflect the history of learning a musical instrument within Western classical traditions. The data also revealed that most teachers were anxious to maintain the dimension of music education that requires much change. The author concludes the study by stating, “If educators fail to grasp this major cultural shift, music as a curriculum subject will become increasingly alienated from young people’s lives and they will find their music education elsewhere.”¹¹³

Technical Methods and Approaches

Characterizing Movement Fluency in Musical Performance: Toward a Generic Measure for Technology Enhanced Learning by JL. Hatfield and RJ. Godøy

In a study conducted in 2018, the researchers aimed to determine movement fluency in musical performance. They state, “We propose to assess fluency in musical performance as the ability to smoothly and efficiently coordinate while accurately performing slow, transitional, and rapid movements.”¹¹⁴ Typical fluency in musical performance is expected to be highly skilled in movement, fast, and precise. Expert musicians display smooth, graceful movements regardless of the level of the piece they are performing. The goal is to seem effortless to audiences, accompanied by highly complex skills. If students are given the technology to assess their movement fluency within a practice setting, the motivation for the performers could

¹¹² Savage, “Reconstructing Music Education,” 73.

¹¹³ Ibid., 75.

¹¹⁴ JL. Hatfield and RJ. Godøy, *Characterizing Movement Fluency in Musical Performance: Toward a Generic Measure for Technology Enhanced Learning*. Front. Psychol, 2019, 1.

skyrocket. By monitoring typical features of movement fluency, music students could have more support and accurate feedback in their practice sessions.

The authors define the main movement categories that musicians can identify to analyze their data successfully. These categories include impulsive, sustained, and iterative movements. Impulsive movements are discontinuous, followed by short bursts of effort and relaxation. These are often referred to as “ballistic”¹¹⁵ movements and often appear in music practice and performance. They are abrupt, short movements that are commonly found in percussion instruments. Sustained movements involve continuous bowing, blowing, whistling, or singing. They are a transfer of energy from the body to the instrument. Finally, iterative movements are rapid back-and-forth movements such as tremolos or trills. These movements are typically wrist shaking or tilting while enabling a quick motion with minimum effort.¹¹⁶ The authors used each category to determine differences in measuring the players’ movements for the study.

The study involved participants with three cello players and three drummers of various skill levels. Each participant was recorded with an optical motion capture system and a wireless electromyography system (EMG) recording the muscle activity. The entire body was monitored; however, only the right hand was focused on transitional tasks from *accelerando* to *decelerando* bow and drum strokes. The group consisted of one advanced and two apprentice musicians of each instrument involving the cello and the drums. The advanced players had at least 15 years of professional experience, while the apprentice players were academy students. The participants’ movements were recorded with a twelve-camera optical motion capture system attached to the body and instrument. The focus of this study was the smoothness of the right-

¹¹⁵ Hatfield and Godøy, *Characterizing Movement Fluency*, 2.

¹¹⁶ *Ibid.*, 5.

hand bow and drumstick movements. Each musician was asked to play a selection of sixteen notes beginning with a comfortable tempo to increase and then decrease gradually.

The data analysis focused on smoothness from the velocity of the right effector of each musician. Kinematic and EMG analysis was conducted for each instrument. Both recorded the peak velocities which each instrument reached throughout the experiment. The purpose of the study was to indicate that this approach could help assess the movement performance of varying instrumentation and skill. Throughout the drumming task, participants showed an increased stroke smoothness at faster tempos. A similar smoothness analysis was found during the fast-tempo phases of the cello task. There was a parallel difficulty in smoothness at slower tempos and transitions among both instruments. After gathering and analyzing the data recorded, the results showed great potential for technologically advanced fluency objectives in musical performance, leading to improved practice sessions for musicians, instructors, and researchers.¹¹⁷

A Novel Interface for the Graphical Analysis of Music Practice Behaviors by J. Sokolovskis, D. Herremans, and E. Chew

Janis Sokolovskis, Dorien Herremans, and Elaine Chew conducted a study in 2018 to analyze music practice behaviors using a novel visualization system called the Music Practice Browser (MPB). The authors state, “The Music Practice Browser provides a graphical interface for reviewing recorded practice sessions, which allows musicians, teachers, and researchers to examine aspects and features of music practice behaviors.”¹¹⁸ The technological advances in music software have allowed students to improve their practicing techniques but only stay within that boundary. These types of software do not account for the expressivity that musicians require

¹¹⁷ Hatfield and Godøy, *Characterizing Movement Fluency*, 1.

¹¹⁸ J. Sokolovskis, D. Herremans, and E. Chew, *A Novel Interface for the Graphical Analysis of Music Practice Behaviors*. *Front. Psychol*, 2018, 1.

for practicing abilities. The Music Practice Browser was created to solve this problem. The authors claim that it allows users to monitor the development of expressivity in music practice.¹¹⁹

To test this software in real-time, the researchers conducted an empirical study to demonstrate how MPB identifies practice behaviors of piano students by providing views of recorded practice sessions to allow the students to inspect and analyze the sessions visually. The participants involved eight piano students that were asked to practice a new piano piece for one hour. These piano players were categorized into two concert pianists, four intermediate players who play for enjoyment, and two students who are beginning pianists. The piece chosen for these pianists was Frédéric Chopin's "Mazurka in A minor, Op. 17, No. 4." The reason for choosing this piece was because of its various challenges regardless of the pianists' experience level. The practice sessions were recorded using stereo microphones installed over the piano as a laptop recorded the Musical Instrument Digital Interface (MIDI) output. After the sessions were complete, the four techniques of the MPB were used to analyze practice behaviors and patterns.

The MPB integrates four novel visualization techniques to properly monitor and analyze practice behaviors. These techniques are Practice Session Work Maps, Practice Session Precision Maps, Practice Segment Arcs, and Tempo-Loudness Evolution Graphs.¹²⁰ Each of these techniques had a different method of measuring the various pieces of musical practice. The Practice Session Work Map increases existing work by implementing color-coding to identify various practice patterns and allows researchers to visualize how these practice patterns develop in tandem with formal structures of pieces. The Practice Session Precision Maps overview the player's accuracy progress through a practice session. The Practice Segment Arcs allow the user

¹¹⁹ Sokolovskis, Herremans, and Chew, *A Novel*, 1.

¹²⁰ *Ibid.*, 16.

to identify the practice flow and difficulty of the score itself. The diagrams associated with this technique let the player review challenging parts of the piece. The final technique, the Tempo-Loudness Evolution Graphs, tracks the progression of expressivity during a practice session. The authors claim that this piece of practice behavior is often ignored among other educational piano tools.¹²¹ With all four of these techniques, the MPB could potentially enhance online music education social networks by offering specific details and patterns of students' practice behaviors.

The study found extensive data for each practice technique through their sessions. The purpose of the study was to track practice behavior and patterns among piano students. The behaviors discovered through the technique analysis were drill-correct, drill-smooth, review and explore, and memorization strategies. Each of these behaviors was mapped out in various charts throughout the study. The successful nature of the MPB progress could allow for technological advancements in the practice session environment of music education.

Finger-String Interaction Analysis in Guitar Playing With Optical Motion Capture by A. Perez-Carrillo

The study conducted by Alfonso Perez-Carrillo aims to present the method for analysis of the finger-string interaction within guitar playing with optical motion capture, specifically looking at the fine action of the plucking motions. The researcher presents two models accompanied by audio analysis to determine a set of sound control features, including plucked string, plucking finger, and plucking gesture. The plucking gesture is broken down into characteristics regarding phases of contact, such as pressure and release, position, velocity, etc. The author states, "the interaction between a musician and a musical instrument determines the

¹²¹ Sokolovskis, Herremans, and Chew, *A Novel*, 16.

characteristics of the sound produced.”¹²² The two models presented in this research study are the rigid-body and flexible-body models. The rigid-body model tracks the motion of the guitar strings, while the flexible-body model tracks the motions of the hands.

The study involved two guitarists performing. Two computers recorded audio and video for each guitarist, synchronized by a world clock generator. Through a *Qualysis* system, the researcher recorded motion capture using high-speed cameras and infrared lights to detect 3D coordinates of reflective markers.¹²³ To understand the position of the strings, the researcher defined a guitar Rigid Body (RB) as “a rigid structure of six degrees-of-freedom (6DOF) defined by the position of a set of markers and associated with a local system of coordinates (SoC).”¹²⁴ This concept is paired with the marker placement protocol, as hand motions were detected by placing reflective markers on the hands and fingers, which are the joints used most when playing guitar. The hand was tracked in multiple parts of the finger and the various joints. Paired with diagrams to show each finger joint, the researcher followed this analysis with the finger model. This type of technology was pivotal for the researcher in discovering the specific movement patterns of the hand while playing guitar.

Parallels

As the researcher examined each of the thirteen studies in the previous chapter, they discovered parallels between some of the methods used. These parallels included themes such as participant groups and approaches to discovering the efficiency of music technology in an

¹²² A. Perez-Carrillo, *Finger-String Interaction Analysis in Guitar Playing With Optical Motion Capture*. *Front. Comput. Sci*, 2019, 1.

¹²³ *Ibid.*, 4.

¹²⁴ *Ibid.*, 4.

educational environment. When looking at the various participant groups, six of the studies included students from high school to collegiate levels as the samples. Out of the six studies, all students involved in the samples were asked various questions to determine themes such as their musical interests, music class involvement, pedagogy knowledge, and preferences. Both independent researchers and educators surveyed students to explore the answers to their research questions. The research questions among all seven studies involving students included themes such as enrollment status in music courses, kinds of music being exposed to students in and out of school environments, and implementing ideas to increase student motivation.

Three of the six studies involving student participation had participants with educators who included a specific type of technology brought into their classrooms. These types of technologies involved the following:

- 1) DJ Decks ¹²⁵
- 2) ImpaCT2 (ICT) project ¹²⁶
- 3) Virtual Field Experience ¹²⁷

The second category of research studies used educators as their sample group participants. In four of the thirteen total studies, researchers included educators to answer questions about the educational environment in which they are involved. Out of the four educator studies, three involved participants that were asked to describe their current musical education environments with questions involving access to technology, the efficiency of how current curricula were being taught, and their preferences for technology in a music classroom. Finally, in three studies, the researchers used musicians to explore the different kinds of technology that

¹²⁵ Dale, *Engaging Students*, 1.

¹²⁶ Savage, "Reconstructing Music Education," 2.

¹²⁷ Bartolome, "Toward a New Conception," 28.

could be experienced in a professional music environment. All musicians were asked to participate in an experiment regarding an instrument in tandem with a digital component. The studies explored the following instrument and technology pairs:

- 1) Guitar with Optical Motion Capture ¹²⁸
- 2) Piano with Music Practice Browser (MPB) ¹²⁹
- 3) Cello and Drums with Electromyography Analysis ¹³⁰

From these three musician studies, all researchers focused on a specific piece or skill of the instrument being played while using digital equipment for measurement. These studies were completed to explore the scientific meanings behind how a skilled musician plays an instrument. They found various patterns among the participating musicians, including practice techniques and physical ability.

The researcher found these parallels interesting, as none of the previous studies were simultaneously done in the same place. Therefore, the fact that they found similarities among sample groups and various used approaches showed that this was an ongoing obstacle in the progression of music education. The traditional methods found in the article by David A. Williams describe similar takes on what should be implemented within music education curricula.¹³¹ To combat this, educators, musicians, and researchers explored various ways to change music education. The data collected from these studies aid in finding the best methods and approaches to teaching music education by incorporating digital components. Along with the similarities, the researcher discovered differences from the studies.

¹²⁸ Perez-Carrillo, *Finger-String Interaction*, 5.

¹²⁹ Sokolovskis, Herremans, and Chew, *A Novel Interface*, 3.

¹³⁰ Hatfield and Godøy, *Characterizing Movement Fluency*, 1.

¹³¹ Williams, "The Elephant."

Emerging Themes

In contrast, the researcher found differences in the methods and approaches used in some studies. Three categories presented themselves as the researcher analyzed each study. The researcher discovered the following themes:

- 1) Types of technology exposed to students
- 2) Various method choices
- 3) Types of technology used for musicians

The first theme found throughout three studies discussed the types of technology chosen for the student involved in the sample groups. These technologies included DJ decks, Virtual Field Experience, Moodle, Blackboard, and Second Life software. In the study by Pete Dale, he allowed his students to interact with soundboard equipment in the classroom by learning EDM music to diversify their musical knowledge. Sarah J. Bartolome introduced the virtual field experience to her students, which gives students opportunities to interact with musical elements of other cultures without traveling to those specific places. Using the VFE method, the students could learn new models of music education in cyberspace. From her study, VFE focuses on authenticity and accessibility for students to experience different cultures.¹³² Finally, in the study by Sheri E. Jaffurs and Betty Anne Younker, students were allowed to use various software in the classroom to interact with each other, such as Moodle, Blackboard, and Second Life. Each platform allowed for a new sense of communication and collaboration among music students who participated.¹³³ Each of these studies focused on a type of digital music technology to introduce students to perspectives about a new music learning model, whether in different cultures, genres, or collaboration techniques.

¹³² Bartolome, "Toward a New Conception," 31.

¹³³ Jaffurs and Younker, "Music In Cyberspace," 10.

Another theme of the studies related to methodologies. These method choices involved surveys or questionnaires, field experience, types of technology chosen explicitly for research purposes, and discussions. After analyzing the total number of studies, the researcher found that six studies used a survey or questionnaire method for the individuals to participate. Among the four studies that surveyed educators, the commonalities for the questions used explored their current educational environment, how technology would impact their teaching and demographics.

Jocelyn Stevens Prendergast conducted the first study of this group, involving educators from Missouri, Illinois, and Iowa. Prendergast surveyed educators from each state with a four-part questionnaire designed to gather information on music education in those areas. The second study, created by Stuart Wise, gave out a questionnaire to secondary school teachers to inquire about compositional software and the impact of digital technology on music composition pedagogy processes.¹³⁴

Bauer and Dammers conducted the third study and surveyed collegiate music educators to discover how prepared instructors were in terms of environment and information on preservice education to teach music technology properly.¹³⁵ Johnathan Savage conducted the fourth study involving a survey method of music educators. The goal of this study was to explore the use of new technologies in formal music education by referencing the ICT project.¹³⁶ The educators were asked about music practice with new technologies, classroom management, and digital environments. With each questionnaire or survey, educators were asked specific questions about

¹³⁴ Wise, "Secondary School."

¹³⁵ Bauer and Dammers, "Technology in Music Education."

¹³⁶ Savage, "Reconstructing Music Education."

their classroom environments, demographic information, the preparedness of music educators in the field, and challenges they face with the impact of technology in education.

Out of the total number of studies, three chose to monitor professional musicians with digital equipment. The types of digital equipment chosen were optical motion capture, EMG recording, and Music Practice Behavior. In the study by JL Hatfield and RJ Godey, they conducted their study to determine movement fluency in musical performance by monitoring the features to give more accurate feedback to students. Professional cello and percussionists acted as participants to be monitored using optical motion capture and EMG recording to track specifically right-hand movements with the bow and drumstick. This equipment helped track smoothness levels in the musicians' right hand, an effective way to present feedback.

Similarly, as expressed in the previous study, A. Perez Carrillo conducted his study by also using optical motion capture. However, his study focused on the finger-string interaction of guitar playing by analyzing two different guitarists as they played specific melodies and rhythms.¹³⁷ The commonality between these two studies involves tracking a stringed instrument and focusing on a type of movement aspect.

Finally, J. Sokolovskis conducted a study to analyze the practice behaviors of piano players using the novel visualization system called the Music Practice Browser (MPB). The MPB provides a graphical interface for reviewing recorded practice sessions and features of music practice behavior to offer direct feedback to music students.¹³⁸ The authors claimed that the MPB allowed users to monitor the development of expressivity in music practice, and the results showed they were right. This technology could be used throughout various levels of

¹³⁷ Perez-Carrillo, *Finger-String Interaction*.

¹³⁸ Sokolovskis, Herremans, and Chew, *A Novel Interface*.

music education to provide immediate feedback for music students in their practice times away from their instructor.

As all the studies analyzed were in different parts of the world, the researcher knew there would be variances in the data collection. These themes included types of technology exposed to students, various method choices, and types of technology used for musicians. Due to the thriving music education industry, it is no surprise that many environments would not be open to change. As educators, it is vital to keep up with the current technology and research to ensure their students are learning at the most efficient level before entering the work industry. Music educators give students tools and tricks to learn the knowledge they can take with them in their future studies.

Questions and Hypotheses

The researcher previously posed questions to explore the topic of technology in music education environments, but for students and educators. The following questions are:

Question One: To understand the present need for digital proficiency, what research methods are required to study primary music education?

Question Two: If music education varied in multiple American states, is making digital proficiency not necessary in some places?

Question Three: How is music education being taught due to technological advances?

Question Four: To become digitally proficient in music education, what are some new approaches to teaching while keeping students both current and engaged?

Question Five: Amidst the previous inquiries, one still asks, what technical methods need to be implemented for students to learn in the music education field successfully?

After concluding the secondary research and analysis of all thirteen studies, the researcher discovered answers to guide their analysis further. With the literature previously explored, the analysis gave more information for the researcher to support her ideas. The following sections will list the topics covered in the original question and hypothesis, and the answers explored by the researcher to support their findings.

Question One

In assessing each of these questions, the researcher found various outcomes based on the hypothesis posed. For the first question, the different research methods required to study fundamental music education included music notation, pedagogical knowledge of rhythm and melody, and instrumentation. One of the originators of American music education was William Channing Woodbridge. In the early 1830s, Woodbridge studied alongside musicians in Europe about musical instruction.¹³⁹ He brought back his knowledge of the Pestalozzi principles and was convinced that music should be part of an American curriculum. Modified for the music curriculum, the principles were as follows:

- 1) To teach sounds before signs—to make the child sing before he learns written notes or their names
- 2) To lead the child to observe, by hearing and imitating sounds, their resemblances and differences, their agreeable and disagreeable effects, rather than explaining these things to him. By this principle the child was to be an active, rather than passive, learner.
- 3) To teach but one thing at a time—rhythm, melody, and expression are taught and practiced separately before the child is called to the difficult task of attending to all at once.
- 4) To make children practice each step of each of these divisions, until they master it, before passing to the next.
- 5) To give the principles and theory after practice, and as an induction from it.
- 6) To analyze and practice the elements of articulate sound in order to apply them to music.
- 7) To have the names of the notes correspond to those used in instrumental music.¹⁴⁰

¹³⁹ Mark, *A Concise History*, 33.

¹⁴⁰ *Ibid.*, 33.

By looking at each of these original principles, many if not all of them, are commonly referred to when looking at a recent American music curriculum. In the elementary school curriculum, students learn to listen and sing along with the music. As they age, the concepts build on each other as students are exposed to melodies and rhythms. Music notation is becoming more prominent at the high school music level to prepare them for collegiate-level music. By somewhat following this model, students can become successful with the foundation they need. However, because the contemporary music world is changing in the way it is heard and played, these ideas can be expanded to become relevant to students' lives today.

Following these original ideas, the traditional ways of teaching music education are becoming outdated, slowly decreasing engagement from students. The study previously analyzed by Bauer and Dammers offers the suggested TPACK model to integrate technology into the teaching and learning music framework.¹⁴¹ The three main categories of this model are technological knowledge, content knowledge, and pedagogical knowledge. The model is then broken into three subcategories: (1) technological content knowledge, (2) pedagogical content knowledge, and (3) technological pedagogical knowledge.¹⁴² Using this framework, the methods to teach fundamental music education can change and adapt to digital use in school environments.

Question Two

The second research question inquired about the necessity of digital proficiency within music education in various American states. After reviewing the study by Jocelyn Stevens Prendergast, music educator demographics and characteristics in Missouri, Iowa, and Illinois

¹⁴¹ Bauer and Dammers, "Technology in Music Education," 5.

¹⁴² Ibid., 5.

presented differences. This result supports the inquiry of variability in the second research question. As a result of this study, music educators indicated a need for further preparation.¹⁴³ Digital proficiency can prepare music educators further for students who prefer to learn genres outside of the traditional classical genres. The study also found that music educators must teach multiple classes within an educational setting. Therefore, their knowledge must span a wide range to fully prepare their students for further musical careers.

Question Three

When looking at the third question, the researcher inquired about the current state of music education and how it is taught now. By revisiting the article by David A. Williams, the researcher noted that the large-ensemble model has been mostly unchanged since it was introduced in the 1900s.¹⁴⁴ When discussing the model, Williams states, “The large-ensemble model has, in fact, become synonymous with music education in schools—so much so that it is difficult for preservice music teachers, to consider changes to the status quo.”¹⁴⁵ The biggest issue, Williams claims, is the lack of interest from music students in the current curriculum. If more technologies were implemented, students would be more inclined to enroll in music education courses.

After reviewing the study by Waddell and Williamon, the researcher concluded that most music education is being taught traditionally. The purpose of this study was to prove their claim that there is still a lack of research on the use of digital technologies by students in individual

¹⁴³ Prendergast, “Music Education.”

¹⁴⁴ Williams, “The Elephant,” 52.

¹⁴⁵ *Ibid.*, 53.

settings.¹⁴⁶ They surveyed 338 musicians to research information on the daily use of technology with their instruments. The participants were asked about attitudes and opinions toward technology in music learning. The results revealed that many musicians prefer to use some sort of technology within their daily musical lives, such as mobile devices for video/audio recording and metronomes.

Question Four

The fourth question asked about possible new educational approaches to keep students interested and engaged. Through studies from Stuart Wise and Pete Dale, the researcher discovered that these methods involved incorporating various equipment and technology access to music curricula. For example, in the study by Wise, he interviewed nine music educators in secondary schools about approaches to teaching digital music composition. By exposing students to composition software such as GarageBand and Sibelius, many students could create their own pieces of music for their own desires. After reviewing all the data collected, Wise suggested that digital technology had the potential to enhance students' composition creativity and motivation.¹⁴⁷ In Dale's study, he introduced DJ decks to students within the classroom to study EDM music through a technical lens.

Question Five

The fifth question involved topics regarding the technical aspects that need to be put in place for students to learn successfully in a music education environment. The researcher found that these technologies could involve computers in the classroom to access multiple types of software, MIDI keyboards to explore compositional techniques, and exposure to electronic music

¹⁴⁶ Waddell and Williamon, *Technology Use*, 1.

¹⁴⁷ Wise, "Secondary School," 291.

genres studying alongside traditional genres. In his text, Regelski discusses the concept of curriculum change in tandem with action learning. He states, “Action Learning is a curriculum model that brings examples of authentic exemplars of ‘real life’ into the classroom in preparing students for life outside and after graduation from school.”¹⁴⁸ In a music education context, action learning includes bringing different genres of music, such as jazz, rock, folk, etc., into the curriculum for students to pursue alongside the traditional. By following this model, music educators could introduce students to music that solely focuses on a technical aspect, such as subgenres of electronic music.

Students could explore music that strictly requires all instrumentation to be digital, allowing them to create new sounds that hadn’t been heard before, which could spark their engagement further. Musical software that has already begun to become implemented in music education includes Sibelius, GarageBand, Cubase, and Audacity. As seen in the study conducted by Savage, he discussed his data findings revealing specific groups of teachers using this software in their classrooms. For example, within his sample group, Savage found that 88% of departments had hardware designated for musical activities.¹⁴⁹ He also found that educators used a small range of musical software in tandem with this hardware.

However, Savage also discovered associated problems among the results of his interviews with music educators. The interview data revealed that teachers discussed recurring themes such as both practical and technical difficulties of sourcing and maintaining music technology within a busy classroom. The researcher discovered this was a repeating pattern among some studies. In the group of studies that involved surveys with educators, challenges

¹⁴⁸ Regelski, *A Brief Introduction*, 103.

¹⁴⁹ Savage, “Reconstructing Music Education,” 68.

such as lack of access and funding often presented themselves as another challenge to technology implementation. Therefore, the possible benefits of technological aspects becoming a part of music education should be considered alongside the potential challenges. As time passes and more curricula changes, music education will hopefully make technology regular and more accessible to those at any music learning level.

Hypothesis

The hypothesis the researcher posed before conducting the secondary analysis included the following: The assumption is that this problem has attempted to be addressed through scholarly articles and books. Despite this, there may be more challenges in formulating education in the operation of digital music equipment. By investigating all the literature and studies throughout this project, the researcher discovered this problem had been addressed through various scholarly articles and books. However, the researcher was correct in assuming there would be challenges in operating of digital music equipment in an educational setting. For example, in the DJ decks study by Pete Dale, he found these challenges present in his classroom. As previously mentioned, Dale presented digital music classes that implemented using MIDI keyboards and various technical equipment for the students to use when they came to class.¹⁵⁰ He discussed throughout his chapters the challenges he faced in his own classroom when testing this idea. He continues by stating that his school offered computers to each student; however, not all school environments are in that position. When discussing the positives and negatives of adding technical equipment into the classroom, Dale argues, “there is a limit on how much individuality certain technologies can offer to young learners: ‘composing’ by combining and remixing pre-programmed loops does [not] really allow the developing musician to ‘get their hands dirty’

¹⁵⁰ Dale, *Engaging Students*.

with, say, melody and rhythm relative to, for example, a xylophone.”¹⁵¹ Although new technologies are valuable for music education, some challenges present when physically incorporating them.

In the study by Bauer and Dammers, they posed their own research question inquiring about the challenges that impact teaching preservice music teachers about technology.¹⁵² The data revealed that the two most significant issues among educators’ responses were lack of funding and access to technology. In tandem with Dale’s study, these results support the researcher’s hypothesis that various challenges would be presented when incorporating technological equipment into the classroom. Therefore, before music educators introduce a technical aspect to their curriculum, they should recognize those challenges before proceeding to have the most significant chance of success.

Chapter Summary

The purpose of the secondary analysis was to discover previous research on updating music education with the incorporation of technological advancements. To succeed, the researcher studied thirteen different studies with numerous sample groups, methods, and questions posed to gather information efficiently. Various researchers across the world used approaches such as allowing students the opportunity to compose with exposure to musical software, such as Sibelius and GarageBand. These approaches aim to encourage motivation for all music genres by introducing virtual worlds to interact with their peers and share their music, as well as gathering opinions directly from music educators to discover the usability and efficiency of equipment in a music education setting. Participants in each sample study were

¹⁵¹ Dale, *Engaging Students*, 154.

¹⁵² Bauer and Dammers, “Technology,” 4.

music students, educators, and professional musicians. Each type of participant offered a new perspective on exploring the digital gap in music education.

The researcher discovered multiple themes throughout all thirteen studies that included types of technology exposed to students, various method choices, and types of technology used for musicians. Throughout the categories of the studies, different authors focused on different methods and technical techniques to discover the potential for expanding music education to keep up with the current advancements. The researcher deduced that there are benefits to incorporating technology into the world of music for students and educators. If more methods were put into the music education curriculum, music students would be more prepared for a technologically advanced music industry. This could lead to potential success in their own careers. Educators know first-hand how music education is run and can run effectively. If preservice teachers were completely prepared to teach music technology properly, students would immediately improve their knowledge.

In some of the studies, digital approaches incorporating technology such as DJ Decks, Optical Motion Capture, Music Practice Browser, and Virtual Field Experience were successful among music students and professional musicians as participants. The students involved with DJ Decks and VFE technologies were able to explore new avenues of learning music to increase their motivation and creativity. Professional musicians exposed to Optical Motion Capture and MPB allowed researchers to explore the technicalities that go into playing an instrument. Specifically, they highlighted skills in piano practice methods and how the fingers move with a stringed instrument. These types of technologies supported the researcher's hypothesis that the topic of updating music education was previously investigated. After revisiting the original research questions and hypotheses posed at the beginning of this project, the researcher

concluded that extensive research was already completed regarding the topic of technology incorporation within music education and industry interaction. In summary, the researcher analyzed thirteen studies with commonalities and variability among sample groups and music approaches taken to update and explore the potential for a positive change in the music education industry.

CHAPTER FIVE: CONCLUSIONS

This chapter discusses the findings and results of the secondary analysis of thirteen separate music studies regarding technology in music education. Music education in public schools focuses on ensuring students are prepared in ways that have always been successful. However, with a fast-growing digital world comes a necessity for change. Regelski states, "...the goal of all curriculum and pedagogy should be to get music education and students 'into action' in ways that reflect and advance music as an essential personal and sociocultural praxis."¹⁵³ He further discusses the need for music to change, as it is rapidly following the ever-changing nature of the contemporary world. The topics discussed in this chapter are a summary of the findings and prior research found, the significance of this project, limitations, and a conclusion.

Summary of Findings

Each of the thirteen studies involved various groups of participants, methods, and approaches in determining if technology was successful in a music education setting. By studying various literature pieces and other authors' studies, the researcher discovered potential findings for enhancements in the music education field for both educators and students alike. However, to create success among both groups, some challenges and perspectives should be considered, as it will be long before these ideas become common among all levels of music education. Nonetheless, implementing new types of technology in music learning can increase student enrollment in music courses, expand educators' knowledge and adaptability, and offer students opportunities for further creativity in their music lives.

¹⁵³ Regelski, *A Brief Introduction*, 111.

Perspectives of Music Students

After researching previous literature and studies on music education, the researcher thoroughly explored the perspectives of music students of various levels. Student engagement was one of the most critical aspects of previous studies and literature. If curricula do not keep up with the everyday culture of current students, they will lose interest in the subjects, such as music, that do not cater to those interests. Students interested in contemporary music genres should have the same opportunities as those with traditional enjoyment. Williams states, “Students attracted to nontraditional music classes can be just as earnest, sincere, and committed (if not more so) as students who play trumpet or sing in a choir, and they deserve teachers who are equally resolute.”¹⁵⁴ Looking back at the specific study by Pendergast and Robinson, most secondary school students do not enroll in music classes due to a lack of engagement. Their findings suggest that allowing students to choose their music repertoire among various genres could increase enrollment in music classes.¹⁵⁵ The three studies that exposed music students to specific technologies provided insight into how technology can spark a passion for music learning in a classroom setting. Students' lives are becoming more dependent on technology; therefore, their learning should be no different. Furthermore, the success of a student is also determined by the educator.

Perspectives of Music Educators

The foundation of music education begins with the educators. Understanding the current state of music education and its future relies on the perspectives of music educators at all levels. DeLorenzo states, “Under the leadership of a good teacher the music class can become a safe

¹⁵⁴ Williams, “The Elephant,” 57.

¹⁵⁵ Pendergast and Robinson, “Secondary Students’ Preferences,” 280.

space where students are nurtured for who they are rather than solely on what they can achieve.”¹⁵⁶ Music education looks different at the elementary and collegiate levels, as there are skills necessary before reaching higher levels as a music student. The educator is responsible for teaching the skills required to prepare their students for anything. After looking at current music education in the United States, the findings reveal that a change is needed. Much of the music curricula are taught traditionally, therefore creating a decrease in enrollment in music courses.

The researcher discovered that two of the most significant challenges educators face are a lack of interest and access to the technology needed to motivate students. If administrators are to update music and implement technology into their curriculum, the resources for educators and students should be available. Another note the researcher found after looking at the study by Bauer and Dammers was the need for training for preservice teachers to teach music technology properly. The authors state, “Classes and experiences where young educators are asked to combine and consider the relationships of the three primary components of the TPACK model (content, pedagogy, and technology), and the impact each can have on the others, is crucial to the development of a deep understanding and refined approach to using technology to facilitate the acquisition of music learning outcomes.”¹⁵⁷ Educators are known to take on many roles by teaching courses within and outside their primary subjects. To ensure that students receive the best possible preparation for music in the digital age, preservice teachers should be trained in proper technical concepts. Furthermore, there are many different methods and approaches to teaching technology in a music classroom.

¹⁵⁶ DeLorenzo, *Teaching Music*, 7.

¹⁵⁷ Bauer and Dammers, “Technology in Music Education,” 11.

Technical Methods and Approaches

Music education can be taught in various methods and ways. The past models have proved successful for music students of all levels. However, many researchers claim that some models have become outdated and need a change. Williams discusses the large ensemble model, “There is a growing concern about the future of American K-12 music education programs, and much of the anxiety involves enrollment in traditional large ensembles...Practically all teenagers find pleasure experiencing music, yet we know the greater majority are not involved in school music offerings.”¹⁵⁸ Due to previous success, the model established in the 1900s has remained unchanged.¹⁵⁹ After exploring different approaches to engaging students in music courses, the researcher found that many of these recent successes have come from a sort of technical aspect put into the curriculum. Three of the total studies involved a music educator introducing a new concept of music learning paired with a type of technology. Studies by Dale, Bartolome, and Jaffurs offered technologies to engage their students and give them a new perspective on music learning. These music technologies included learning EDM music through DJ decks, the virtual field experience, as well as software such as Moodle and Second Life. The results of each of these studies discovered higher involvement and motivation among students who participated.

The researcher explored three studies highlighting a type of technology to discover new details and developments of a musician playing an instrument. Studies conducted by Hatfield and Godøy, Sokolovskis et al., and Perez-Carrillo all focus on a particular aspect of how a musician plays their instrument, as well as collecting the data to improve their skills. The instruments involved in these studies were cello, drums, piano, and guitar. Two of these studies focused on

¹⁵⁸ Williams, “The Elephant,” 51.

¹⁵⁹ Ibid., 52.

capturing the hand movements of cello, drum, and guitar players by studying how the hand interacts with those instruments. The third study in the category focused on piano player practice success to determine and analyze practice behaviors.¹⁶⁰ The results of these three studies indicate that there are more possibilities for immediate feedback for musicians in practice and performance settings. Although not commonly offered in an educational setting, the potential benefits for music students can increase their skills for future success if this technology was available.

Significance

After conducting a secondary research analysis, the researcher discovered that there is potential success in incorporating technology into music education. However, with the implementation of technical aspects comes challenges that need to be considered by students and educators. There are learning curves on both sides of the educational field. In researching the study by Savage, he states, “Ultimately, music teachers and those undertaking initial teacher training in music have to develop a clear understanding of what constitutes effective music teaching with ICT. If educators fail to grasp this major cultural shift, music as a curriculum subject will become increasingly alienated from young people’s lives and they will find their music education elsewhere.”¹⁶¹ The number of students engaged in music courses is currently dropping. Therefore, the curriculum has to change somewhat with how the music industry is changing. With more research being done, the potential for implementing technological advancements in everyday public music education is growing.

¹⁶⁰ Sokolovskis, Herremans, and Chew, *A Novel Interface*, 1.

¹⁶¹ Savage, “Reconstructing Music Education,” 75.

Limitations

The limitations of this study could include short-handed conclusions based on the original research that was analyzed. Due to the nature of secondary data, the researcher was limited to the responses and data previously collected for different study topics. None of the data could be changed or manipulated. Therefore, there were strict boundaries the researcher had to consider. A conclusion could only be drawn from the researcher's knowledge and the data presented. Based on the answers from previous research, there will be an overall need for more technical knowledge for students, or there are already enough opportunities for students to learn about the vast opportunities of music education technology.

Conclusion

Technology has advanced not only in society but in music education as well. The equipment required to learn in our current society's situation is more evident than ever. The music industry has had multiple technological advancements in production and composition; therefore, instructors in music education should have their students more prepared for possible future careers. This qualitative study aims to look at the various studies regarding how incorporating technology in music education may stay relevant in the current digital age. Guided by previous multiple studies, this secondary research collectively provides enough data to conclude what may be missing on how technology in music education may be absent from current music curricula. The conclusion drawn by studying and analyzing these previous studies is that to keep music education alive, student engagement and motivation should be focused on just as much as the courses taught. The technology available for students in other aspects of their lives are constantly changing, and they should be offered the same opportunities in their music

studies. With proper training, music educators can master technologies implemented in music curricula to fully prepare their students for the current music industry.

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APPENDICES

Appendix A: Various Methods and Results of Thirteen Music Technology Studies

Table 1 Various Methods and Results of Thirteen Music Technology Studies

Study	Groups Involved	Methods Used	Outcomes Discovered
Seth Pendergast and Nicole R. Robinson. "Secondary Students' Preferences for Various Learning Conditions and Music Courses: A Comparison of School Music, Out-of-School Music, and Nonmusic Participants"	827 music students	Survey Questions	There was a mixture of preferences between teacher and student-guided instruction. When looking at the student interest in different music class types, the nonparticipant group expressed the lowest interest in every music class type than the other two groups.
Lewis, Judy. <i>How children listen: multimodality and its implications for K-12 music education and music teacher education</i>	26 graduate music education students	Multimodality discussions; small group work; discussions as a class	There is a significant difference within focus training for music education students.
Waddell, George, and Williamon, Aaron. <i>Technology Use and Attitudes in Music Learning.</i>	338 musicians (amateur, student, professional)	Survey Questions	The population actively demands technology use of musicians with a high degree of technological aptitude. Within that group, they prefer mobile devices to achieve the same results as audio/video recording equipment and metronomes.
Dale, Pete. <i>Engaging Students with Music Education: DJ Decks, Urban Music and Child-Centered Learning</i>	High school students	Field Experience; exposure to DJ decks, compositional software, music technology equipment	Music changes as students grow and learn to ask different questions about their experiences. Students can explore in the classroom to encourage the enthusiasts of EDM to develop musical skills on their terms.

Bartolome, Sarah J. "Toward a New Conception of World Music Education: The Virtual Field Experience"	High school students	Virtual Field Experience (VFE)	The virtual field experience was an approach that focused on authenticity and accessibility for students to experience different cultures in the classroom.
Jaffurs, Sheri E. and Betty Anne Younker "Music In Cyberspace: Exploring New Models in Education"	High school students	Software: Moodle, Blackboard, Second Life	With online platforms, students could make other kinds of nontraditional music to explore student-directed collaboration, leading to their own music-making.
Prendergast, Jocelyn Stevens. "Music Education and Educators in Missouri, Iowa, and Illinois."	Music Educators: 527 in Missouri 438 in Iowa 932 in Illinois	Questionnaire	Each state varied in demographics, teaching backgrounds, and the current classes they taught. Women worked in music education public schools after this research was done and were more inclined to work with younger students and vocal music, while men typically worked with older students and band music. It was concluded that music teachers indicated a need for further preparation in all states.
Wise, Stuart. "Secondary School Teachers' Approaches to Teaching Composition using Digital Technology."	9 music educators	Questionnaire and Interviews	Digital technology can enhance students' creativity in composition if available to them. There is an educational value to integrating ICT into music compositional curricula to enhance pedagogy

			and increase motivation for beginner students.
Bauer, William I., and Dammers, Richard J. "Technology in Music Education: A National Survey."	250 music educators and members of NASM	Survey Questions	The pedagogical abilities that future teachers have access to would be endless to teach their students by integrating technology into the curriculum.
Savage, Jonathan. "Reconstructing Music Education through ICT."	Music educators from 18 schools and 3 musicians	Survey Questions and Interviews	Teachers were anxious to maintain the dimension of music education that requires much change, as the music curricula reflect the history of learning a musical instrument within Western classical traditions.
Hatfield JL and Godøy RI. <i>Characterizing Movement Fluency in Musical Performance: Toward a Generic Measure for Technology Enhanced Learning.</i>	3 cello players and 3 drummers of various skill levels	Optical Motion Capture and EMG recording	The results of this study showed great potential for technologically advanced objectives of fluency in musical performance, leading to improved practice sessions for musicians, instructors, and researchers.
Sokolovskis J, Herremans D, and Chew E. <i>A Novel Interface for the Graphical Analysis of Music Practice Behaviors.</i>	Piano Players: 2 concert pianists 4 intermediate pianists who play for enjoyment 2 beginning piano students	Music Practice Browser (MPB)	The behaviors discovered through the technique analysis were drill-correct, drill-smooth, review and explore, and memorization strategies. MPB progress could allow for technological advancements in the practice session environment of music

			education.
Perez-Carrillo, A. <i>Finger-String Interaction Analysis in Guitar Playing With Optical Motion Capture.</i>	2 guitarists	Optical Motion Capture	The hand was tracked in multiple parts of the finger and the various joints. Paired with diagrams to show each finger joint, the researcher followed this analysis with the finger model. The researcher discovered the specific movement patterns of the hand while playing guitar.

Olivia Thompson
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Appendix B: Thesis Defense Approval

MA: MUSIC EDUCATION DEFENSE DECISION

The committee has rendered the following decision concerning the defense for

Olivia Thornton Thompson

on the Thesis,

Researching Technological Advancements Through Alternative Methods of Music Education to Engage Students in the Digital Age

as submitted on December 7, 2022:

a. Full approval to proceed with no revisions. The document should be prepared for submission to the Jerry Falwell Library.

b. Provisional approval pending cited revisions. The student must resubmit the project with cited revisions according to the established timeline.

c. Redirection of project. The student is being redirected to take ETHM/MUSC/WRSP 689 again, as minor revisions will not meet the expectations for the research project.

██████████

██████████

12/8/22

Print Name of Advisor/Mentor / Signature / Date

██████████

██████████

12/8/22

Print Name of Reader / Signature / Date