

**AN EVALUATION OF THE USE OF TECHNOLOGY IN MUSIC
EDUCATION IN PRIMARY TEACHERS' TRAINING
COLLEGES IN KENYA: A CASE OF KISII COUNTY**

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DECLARATION

I, the undersigned, declare that this thesis is my original work. Information obtained from other sources has been appropriately accredited.

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DEDICATION

This work is dedicated to my family and all primary school music tutors in Kenya.

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ABSTRACT

The use of technology is not a new venture in the teaching and learning of music; it has assisted music educators for centuries. Harpsichord and piano are examples of old technological gadgets that were of great importance to those who first used them, just as recently invented devices such as computers, electronic keyboards, and compact discs (CDs) are to those who use them today. This study evaluated the use of technology in Primary Teachers' Training Colleges in Kenya, the case of Kisii County. The following are the study objectives: to examine what technology is used in teaching music in Primary Teachers Training Colleges (PTTCs); to establish the extent to which available technology is used in PTTCs; to identify challenges to technological integration, and to establish possible solutions to the challenges faced in the use of technology in PTTCs. The study employed a mixed-method approach to data collection and analysis. The target population consisted of 1500 student teachers, 4 principals, and 8 music tutors from the four teachers' training colleges in Kisii County. The study used purposive and systematic sampling techniques to select all the 4 principals of the primary teachers' training colleges in Kisii County, the 8 music tutors, and the 150 student teachers. The study sampled a total of 162 respondents. Questionnaires, an in-depth interview guide, and documented data were used as research instruments. The data processing was done by Statistical Package for Social Sciences (SPSS) program. Analysis was done using descriptive statistics, that is, in the form of frequencies and percentages. The Quantitative data was presented in the form of tables and charts. The qualitative data was analyzed, categorized into themes, and presented in narrative form. The study established that providing access to the required technological and non-technological resources such as chalkboards, flip charts, keyboards, pianos, television/videos, audio CDs, and radio resources for all students; lack of electricity, provision of adequate administrative support, and technical issues were significant challenges to the use of technology in PPTCs. It was concluded that chalkboards, local resources, flip charts, audio CDs, recorders, and pianos/ keyboards were sufficiently available for teaching and learning music. The study recommends that the Ministry of Education provide adequate funds to PTTCs to purchase the required technology. In addition, the ministry of education should organize training seminars for music tutors on technology to facilitate their use in the teaching and learning of music. Further, administrators of PPTCs should adequately plan music halls to facilitate electricity access points for use with the available technology.

TABLE OF CONTENTS

DECLARATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENTS	iv
ABSTRACT.....	v
TABLE OF CONTENTS	vi
LIST OF TABLES	xi
LIST OF FIGURES.....	xii
LIST OF ABBREVIATIONS AND ACRONYMS	xiii
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Background of the Study.....	1
1.2 Statement of the Problem	7
1.3 Research Questions	9
1.4 Research Objectives	9
1.5 Rationale.....	9
1.6 Assumptions of the Study	10
1.7 Scope and Limitations of the Study	10
1.8 Justification of the Study.....	10
1.9 Operational Definition of Terms.....	11

CHAPTER TWO	13
LITERATURE REVIEW	13
2.1 Introduction	13
2.2 Technology in Music Education	13
2.3 Technology in Teacher Education.....	22
2.4 Technology Resources in Music Education	24
2.5 Challenges and Solutions Related to Technological use in Music Education ...	28
2.7 Theoretical Framework	33
2.8 Conceptual Framework	35
CHAPTER THREE	37
RESEARCH DESIGN AND METHODOLOGY	37
3.1 Introduction	37
3.2 Research Design.....	37
3.3 Target Population	38
3.4 Sample Size and Sampling Procedures	38
3.4.1 Sample Size Determination.....	38
3.4.2 Sampling Techniques.....	39
3.4 Data Collection Instruments.....	41
3.4.1 Pilot Study.....	41

3.4.2 Validity of the Research Instruments.....	42
3.4.3 Reliability of the Study Instruments	43
3.5 Data Collection Procedures.....	44
3.6 Data Analysis Procedure	45
3.7 Ethical Considerations.....	46
CHAPTER FOUR.....	48
DATA PRESENTATION AND INTERPRETATION.....	48
4.1 Introduction	48
4.2 Response Return Rate	48
4.3 Demographic Characteristics of Respondents.....	49
4.3.1 Gender Representation of the Respondents	50
4.3.2 Age of the Respondents	50
4.3.3 Teaching Practices	51
4.3.4 Level of Education of the Tutors and Principals	52
4.3.5 Years of Teaching Experience	53
4.4 Technology Used in Primary Teachers' Training Colleges.....	54
4.5 Extent of Usage of the Technology in PTTCs	57
4.6 Challenges Facing the Use of Technology in Music Education in PTTCs.....	59
4.7 Possible Solutions to the Challenges Faced on the Use of Technology.....	62

CHAPTER FIVE	65
DISCUSSION OF FINDINGS	65
5.1 Introduction	65
5.2 Demographic Characteristics of Respondents.....	65
5.3 Available Technology for Use in Music Education in PTTCs.....	67
5.4 Extent of Usage of the Available Technology in PTTCs.....	80
5.5 Challenges in Using Technology in Music Education in PTTCs	84
CHAPTER SIX	90
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	90
6.1 Introduction	90
6.2 Summary of the Study	90
6.2.1 Summary of findings of the Available Technology for Use in PTTCs	90
6.2.2 Summary of findings of the Level of Usage of Technology in PTTCs	91
6.2.3 Summary of findings of Challenges in Using Technology in Music Education in PTTCs	91
6.2.4 Possible Solutions to Challenges Faced on the Use of Technology in PTTCs	92
6.3 Conclusions	92
6.4 Recommendations	93
6.5 Suggestions for Further Studies	94
REFERENCES.....	95

APPENDICES	107
Appendix 1: Letter of Introduction	107
Appendix 2: Questionnaire for Student-Teachers	108
Appendix 3: Questionnaire for Tutors	112
Appendix 4: In-depth Interview Guide for Music Tutors and Principals	116
Appendix 5: University Recommendation for Research.....	117
Appendix 6: Letter from National Commission for Science, Technology and Innovation.....	118
Appendix 7: Research Clearance Permit.....	119

LIST OF TABLES

Table 3. 1: Respondents Sample Distribution Frame	39
Table 4.1: Questionnaires Return Rate.....	47
Table 4.2: Available Technology.....	55
Table 4. 3: Challenges Facing the Use of Technology in PTTCs.....	59

LIST OF FIGURES

Figure 2.1: Conceptual Framework	35
Figure 4.1: Gender distribution among the Music tutors.....	49
Figure 4.2: Age distribution for the tutors and student teachers.....	50
Figure 4.3: Number of Teaching Practices	51
Figure 4.4: Level of Education	52
Figure 4.5: Teaching Experience.....	53

LIST OF ABBREVIATIONS AND ACRONYMS

BECF	Basic Education Curriculum Framework
BECTA	British Educational Communications and Technology Agency
BOM	Board of Management
CD	Compact Disc
DVD	Digital Versatile Disc
ICT	Information Communication Technology
KESSP	Kenya Education Sector Support Programme
KICD	Kenya Institute of Curriculum Development
MoEST	Ministry of Education Science and Technology
MT	Music Technology
NCATE	National Council for Accreditation of Teacher Education
PTE	Primary Teacher Education
PTTCs	Primary Teachers Training College
TV	Television Set

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The use of technology in music education is not a new phenomenon; it has been a service tool in the music industry both for performers and educators of the same for centuries. In music education today, there has been a consistent yet rapid change and continuous advancement regarding technology as a tool for teaching and learning. Today technology is increasingly acknowledged as an important educational tool for teaching and learning music. It is present in music education from elementary to university (Ruismäki, 2009). Electric and non-electronic devices, hardware and software, the use of the internet for musical collaboration, and storage systems, among others, are pertinent items in most music classrooms.

The fast growth of technology use in music in contemporary society, particularly new music software, recording devices, and electronic instruments, as mentioned earlier, has propelled research on the use of technology in the teaching and learning of music to the fore of this discourse. The importance of technology in music education cannot be overstated; it enhances students' learning environments, supplements teachers' classroom instruction, provides administrative tools, expands access to music teaching and learning tools, and serves as a communication platform. Developing countries must embrace and use technology in order to remain competitive and relevant in the globalization trend, according to Jhurree (2005). Therefore, the nature of the above change and development in the use of technology in music education has led to varied

research being carried out over the years. Some that are pertinent to this discourse are highlighted.

Historically, technology has evolved from ancient to modern digital devices and has significantly influenced music for hundreds of years; specifically, it has been instrumental in music education. Kramer (1988) notes that after the inventions of sound recordings (Phonograph invented by Thomas Edison 1877), and the printing press (lithograph and high-speed printing machines), there was a widespread, rapid change and the continuous use of technology in music education. Due to these technological developments, the way in which music is taught and learned has tremendously changed. Reo (2020) affirmed this, who observed that since the inception of recorded sound, many new technologies have been developed that have enhanced how we learn, teach, and engage with music in classroom settings.

Further, technology infuses classrooms with tools to support both teaching and learning; it has made it possible for teachers to teach basic music skills like rhythm and note recognition through practice and drills. Technology has also made it easier to make handouts and presentations that can help teach any musical genre. In short, it is a very important tool for teaching musical concepts to students. While technology easily aids in teaching, it has also aided in learning; students can employ modern technology to create their original musical works, record those works, and learn basic or complex concepts in music theory. Generally, technology has opened up a world of possibilities in music education with numerous tools teachers and students can use in and out of the

classroom to enhance teaching and learning. (Using Technology for Teaching Music, n.d.-b).

Currently, many technological gadgets are used in teaching and learning music. Nart (2016) highlighted some of the soft and hardware as following; Tutorial music software which assists in the preparation of online tutorial programs while also providing visual and auditory content about music types and styles, music history, famous composers, country music, music instruments, etc. While these programs can be used with CD-DVD players, they can also be run on the Internet or be used upon installing them on a computer. Others include; drill and practice software for musical listening, reading, writing, and musical form or harmonic analysis; Notation Software which allows all the musical elements to be written, edited, arranged and recorded, and reproduced according to the rules in the computer; and lastly the Sequencing and recording software such as the musical instruments digital interface technology (MIDI).

The importance of technology in music education has also been demonstrated through various studies conducted globally by other scholars. "The use of technology in music education is not for the purpose of eliminating the communication between the teacher and the student or breaking down the classical education system, but for using the advantages offered by them as a supporting resource. Traditional music education has become more effective and multidimensional with the use of technology, and new technologies have transformed the music learning environment into a technological learning center," as reported by (Tecimer, 2006). The use of technology, therefore, offers a wide variety of opportunities and applications to teachers and students, making learning more efficient and long-lasting by providing support for teaching and learning.

Kadzera (2006), in his study on "the use of instructional technologies in teacher training colleges in Malawi," notes that the use of technologies enhances teaching and learning. Technology is an essential component of the educational environment to achieve instructional goals and ensure productive and cost-effective operations. The study focused mainly on understanding factors pertaining to academic background, availability of technologies, ability to use identified technologies, frequency of using the technologies, and reasons for not using them.

Achola (2007) carried out research on the use of computer technology in teaching and learning of music among secondary schools in Nairobi County. Using a descriptive design with a sample constituting both music teachers and learners selected randomly among secondary schools in Nairobi, the study sought to find out the application of technology in the teaching of music education. The major findings of the study revealed that technologies were present and accessible to Kenyan schools but their use in the teaching of music is not adequate among most of the schools. Considering these findings, recommendations for the application of technology in the field of music education for improvement, and further course of action by appropriate authorities were made. Students learn best when they are engaged through the use of technology; they become active participants instead of passive ones where they simply receive instructions or information.

Mustafa & Bakir (2010) observed that technology used to enhance teaching and learning was becoming one of the most desired missions of educational institutions. Most institutions have been spending a great deal of money, time, and effort on getting

the latest technological tools. However, no matter how much technology is brought into classrooms, it does not assure effective use. Kamau (2014), in his study, established that several challenges were facing the use of technology in the teaching and learning process. The findings revealed that teachers in secondary schools in Kenya had limited training skills in technology and/or lacked effective technology skills. In this study, the focus was on secondary schools, and the subject of teaching was mathematics.

Ogange (2011), in his research, found out that integration of technology into the education system has contributed towards student-centered form of learning. Specifically, technologies used in music education, from traditional audio and audio-visual to the newest digital technologies, provide powerful tools for creative teachers and support diverse learners. Additionally, with the use of technology, teachers can establish credibility in what they teach. With increasing changes in the global economy, the music education sector has had to enhance its music instruction technology in order to participate effectively in the global technological age (Achola, 2013). According to Gode (2013), learning institutions in Kenya are under increasing pressure to use technology in the teaching/learning process, given the knowledge and skills needed in the 21st century. He noted that the major challenge affecting the education system in Kenya is how to integrate technology in the teaching/learning process to provide teacher trainees with the skills to function effectively in this dynamic era.

The use of technology at the classroom level plays a significant role in creating effective teaching and learning environments. Its use empowers teachers and learners, allowing them to radically transform their teaching and learning processes (Kandiri, 2014). For

example, many different computer programmes and software currently used make music-making, composition, accompaniment, practice, and improvisation easier and more meaningful (Brown, 2014). Nart (2016) states that in contemporary society, it has become an inevitable requirement for a teacher who guides his student to master and use the technology in the classroom and integrate it into the lessons. Training is, therefore, necessary for teachers to feel comfortable using the technology for effective teaching and learning. It is imperative that teachers adjust to the technological revolution not only to prepare themselves but also to prepare their students for the real technological world.

Given that scores of scholars have, through research, found out that the use of technology in music education is of paramount importance, this study focused on evaluating its use in primary teachers' training colleges in Kisii county, Kenya. PTTCs spread across Kenya's 47 counties, and this study area was arrived at through a simple random sampling method to avoid biases. In this study, primary teachers' training colleges in Kenya are key since they bear the responsibility of preparing teachers for primary school teaching. This is the basic level for which the government of Kenya recently opened up greater access to technology use through school-wide tablet initiatives, the national ICT policy on education (2019), and the Competency Based Curriculum (CBC) requirements.

The introduction of the Competency-Based curriculum, with one of the key areas being the need to use technology to enhance learning, has pressured the PTTCs to do the same to meet the required standard of teaching and learning in primary schools. Besides,

there is a great global push for technology integration in all education content areas, including music education in the 21st Century. Maluei (2019) contends that the curriculum reforms aimed at providing every learner in the country with core competencies and world-class digital literacy skills needed to be competitive in the 21st Century. The use of technology in music education in PPTCs is therefore paramount.

During the process of pre-service teacher training the PTTCs take out their student teachers for their teaching practices in primary schools. During this period, the teacher trainees prepare and use technology in teaching and learning of music. This, therefore, requires that they familiarize themselves with and use technologies in their various colleges beforehand. The Kenya Institute of Education (2004) observed that unless trainers use modern technology or the most current available technology, it will be hard for them to cope with the advancements in technology in preparing future students to fit in the 21st Century where the use of technology is a key factor in education system.

Therefore, a technologically updated teacher performs better in the classroom, for they help expose the learners to various educational technologies and adapt to this rapidly changing situation. Since the use of modern technology know-how will have an influence on the teaching of music in both primary teachers' training colleges and, by extension, primary school learning, it is, therefore, critical to evaluate its use in PTTCs.

1.2 Statement of the Problem

The use of technology in music education has gained and rapidly continues to gain ground in various institutions of learning around the globe. It has become an indispensable tool for music educators. In music classrooms, teachers leverage

technology to increase student engagement, improve student performances, and differentiate students' educational experiences. The use of technology continues to have an impact in terms of how teachers are trained and how they, in turn, instruct their learners.

There is evidence from studies, as discussed in the background of this study (1.1), that technology is essential in the teaching and learning process. In Kenya, learning institutions are under pressure to incorporate technology into the teaching and learning processes. This arises from other quarters' social dynamics, the vision 2030 document, national ICT policy on education, and the current CBC requirements. Furthermore, there is some effort to advocate its use in the education sector. Therefore, this study is a specific evaluation of the use of technology in music education in PTTCs to keep them current with these Kenya's national educational requirements and cope with the rapid pace of technological advancement. Additionally, one major and core goal of education in Kenya is to equip learners with the most important technological necessities and industrial development knowledge that can build the nation positively; this is in line with global trends (KICD, 2017).

As a result of the fore mentioned demands and as technological innovations rapidly progress, music educators are required to incorporate new as well as retain old relevant technologies for a music education that meets the national and global standards. Therefore, in line with these current developments in the Kenyan education sector; which involves some change and continuity in the use of technology, this study evaluates its use in PTTCs in order to bring to the fore the available and level of use of

technology in music education in these colleges and possibly recommend those that need to be incorporated for effective music education in the 21st century.

1.3 Research Questions

The research questions used during the study were as follows:

1. What technology is used in music education in PTTCs?
2. To what extent is technology used in music education in PTTCs?
3. What are the challenges and possible solutions to the use of technology in music education in PTTCs?

1.4 Research Objectives

The following research objectives guided this study:

1. To examine the technology used in music education in PTTCs.
2. To establish the extent to which technology is used music education in PTTCs.
3. To analyse the challenges and solutions related to the use of technology in PTTCs.

1.5 Rationale

The acquisition of knowledge and skills on the use of technology in music education by primary school music teachers may have an influence on the teaching and learning of music in Kenyan primary schools. Music, as a subject, entails the application of various technologies in aural production and enrichment. Status of how technology is being used to teach in primary teachers training colleges is underexplored in Kenya, hence the need for conducting this research.

By engaging with music teachers and students, and through the research recommendations, one gains more insights on how to use or improve on the use of

technology in primary schools' music teacher education. By extension, it may benefit all the primary schools in Kenya where these teachers will be assigned.

1.6 Assumptions of the Study

The assumptions made for this research were:

1. Technology is important in music education in PTTCs in Kenya.
2. Technology is used in music education in PTTCs in Kenya.
3. The respondents would be honest in their responses, when filling the questionnaires and during the interviews.
4. This study's findings on the use of technology in music education mirrored those of other colleges in Kenya.

1.7 Scope and Limitations of the Study

This study was confined to evaluating the use of technology in music education in PTTCs in Kisii County, Kenya. The study sample was restricted to all first-year and second-year music students, music tutors, and principals. The study results were based on the respondents' perceptions of their understanding of the study topic. The study was also limited to using two research tools; the questionnaires and the in-depth interview guides. Finally, the literature used focused mainly on technology in music education.

1.8 Justification of the Study

Since the primary school curriculum in Kenya is undergoing reforms, evaluating the use of technology in teaching music to student teachers informs the curriculum designers on the technological tools required to teach and learn music in primary schools. In turn, the Board of Management (BOMs) may make informed choices in

procuring the required modern technological resources for teaching and learning towards the implementation of the new curriculum in primary schools.

The findings are a basis for the Kenya Institute of Curriculum Development to formulate pragmatic policies especially related to the use of technology in primary school teacher education.

The study may increase teachers' awareness of the changes in the use of technology for music teaching and learning in order to modify their teaching approaches to meet the challenges of the new technologies. The findings will contribute to the advancement of knowledge and a treasured database for researchers conducting future studies on technology for music teaching and learning.

The use of technological resources by PTTCs tutors in teaching music to learners boosts the acquisition of music skills, while on the part of learners, there are expected to bring about a high rate of interaction, collaboration, and motivation during the teaching-learning process.

1.9 Operational Definition of Terms

Evaluation: A systematic and objective process of reviewing the use of technology to teach/learn music to estimate their usage according to changing trends.

Student Teacher: Learners under training in primary school teachers' colleges in readiness for actual teaching in primary schools in Kenya

Technology:	Electronic and non-electronic devices used within the framework of music education and from a classroom perspective to enhance teaching and learning. It includes music instruments, audio, audio-visual, hardware, and software.
Principal	The head of a teachers' training college
Teaching and learning	Music education
Local resources	Various types of technologies used in music education from the local community

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews various sources of literature that are connected to the use of technology in music education. It is divided into four major themes: technology in music education, technology resources for music education, technology in music teacher education, and challenges to technological integration in music education. The theoretical framework, which guides this study, is elaborated at the end of the chapter.

2.2 Technology in Music Education

In the formal education system across the world, there is a continuous phenomenon reflecting changes in the wider world. The introduction of new technology, for example, has led to the invention of designs and perspectives related to teaching and learning. Currently, education at all levels of learning is struggling to fit in with the changes. These new developments will assist students in becoming more prepared for life in the twenty-first century (Driscoll, 2019). The new perspective in education entails the introduction of innovation into the training process of different subjects of the curriculum in which music is included. The emergence of a wide range of technologies available in the market has brought about a fundamental change in music education, and many scholars have acknowledged the recognition of its importance as pertains to music education.

Technology in music education shares many attributes with regular education in its global context. However, music education entails music-specific learning technologies that create interactive environments to enhance individual and ensemble performance

needs. Technology relevant for music education has the ability to teach student musicians unique skill sets that include intonation improvement, practice guidance/incentives, music theory, composition, music history, playing tests, recording and editing rehearsals or performances, and individual instrumental or vocal pedagogy (Ubovich, 2015).

According to Ghavifekr et al., (2014), the introduction of ICT as an innovative tool in all areas of curricular has helped to enhance the teaching of technical subjects. Its use in teaching and learning goes further than the provision of computers and Internet connections in classrooms. Currently, there are several different types of ICT available to institutions of learning that would be used to enhance students' overall educational experience in a variety of ways. A study carried out by Carnoy (2004) notes that the implementation of these techniques in basic education aimed at addressing the following objectives; Promote connection possibilities, offer distance learning, and supplement formal schooling. When properly incorporated into education, ICTs provide a variety of benefits to both students and educators. This study focused on the function of ICT in basic education but did not discuss its use in the delivery of technical disciplines such as music. This study will not only look at the use of technology, but it does so in primary teachers' training colleges in Kisii County.

Mawusi & Kwadwo (2020) asserts that new technologies provide an alternative instructional delivery mechanism that can change the teaching and learning process. Though it can be used as an extension of traditional methods to present information, technology can be used more effectively to motivate students and impact student

learning. The study affirms Pearson's (2000) study that posited that technology use and cognitive outcomes in the first year of college could fundamentally alter teaching and learning. The focus, however, was only on the first year but the current study focuses on both the first and second years together with their tutors.

Primary content delivery without instructional material is common in most learning institutes. Though relatively cheap, this method does not impart adequate understanding to the learners. It leaves most learners having to imagine the actuality of the content delivered. As a result, teaching aids are recommended since effective integration of technology into the classroom activities changes both the teacher and the learners; students become more attentive when instructional technology is used in the classroom and understanding is stimulated. It also rouses students' interest and enhances their participation in class activities. Consequently, it improves the teaching process since it promotes performance in classroom situations. As a result, it enhances the instructional strategies by encouraging students to do well in the classroom (Ifegbo & Ukegbu, 2015). The technologies studied were chalkboards, flip charts, overhead projectors, videos, computers, and local resources from the environment.

Alssen (2012) investigated university students' perceptions of learning English for Specific Purposes (ESP). The study conducted on 53 students gives a report about four design courses taught at the Language Centres. Instead of teacher-centered methods, the courses used a student-centered approach whereby small groups of students designed ICT-enhanced instructional materials for learning English for specific purposes (ESP). The results were published on the internet, where they were available

for all students. The students reported improved skills, especially in speaking, reading, writing, and domain-specific vocabulary. This report supposes that student teachers exposed to preparation and utilization of instructional media would post improved performance. Hence, tutors are called upon to use instructional media to reinforce learning. This study emphasized on the English language against the present research that evaluated technology in music education.

According to Bukoye (2019), instructional materials, which are essential tools for learning, are required for every subject in the school curriculum. These resources are critical for effective instruction. Teacher educators can use them to design more interactive, interesting, and engaging learning activities. These teaching and learning materials also improve student-teacher engagement in classroom activities, trainee teacher examination performance, and teaching process.

Various forms of instructional materials have been used for PTTCs in Kenya. They include the use of charts, placards, and models amongst others. However, these materials have slowly been outdated due to several drawbacks. For example, charts and placards are permanent and a teacher would require several of them to effectively deliver. On contrary, electronic instructional materials can easily deliver several contents to students by simply swapping. It is for such reasons that technology is replacing traditional instructional materials. According to Reese (2001), technology has the potential to substantially alter music education and learning. It has the ability to produce engaged, autonomous music makers, listeners, and performers by expanding music programs into more complete, innovative experiences.

According to Costley (2014), technology has a positive impact on student learning. Students are more engaged as a result of technology, and they often retain more information. Technology is relevant to students due to the rapid arrival of new technologies around the world. It facilitates meaningful learning experiences and provides hands-on learning opportunities that can be integrated into all school curricular areas.

A study carried out by Trytten (2017) revealed that the use of technology was prevalent among pre-service teachers who use it to find out lesson plans and classroom organization ideas. The study, however, focused only on Twitter, Pinterest, and Facebook and how teachers applied them to classroom education. Trytten (2017) study affirmed Culp's (2003) study which indicated that technology has an influence on how instructors plan and deliver their educational lessons; incorporating technology into a learning setting frequently results in a shift away from lecture-based lessons and toward geotechnical inquiry-based classrooms, hence playing an important role in music-making. Furthermore, Zhao & Michigan (2003) revealed that teachers may also apply technology for their own professional use, to develop materials that will improve their efficiency or keep students' progress records.

Technology, therefore, as the application of tools is used continuously since most people's lives revolve around it on a daily basis. Nevertheless, incorporation within the educational system necessitates the use of tools that have been carefully chosen and executed to have a direct effect on the accomplishment of certain learning objectives. Technology may be used to address and overcome specific difficulties experienced by

students; it can also be used to assist instructors in designing, developing, and implementing learning experiences that connect students more deeply and produce more sophisticated, realistic learning opportunities. Active involvement with the learning material is facilitated by technology. It makes learning more interactive, and students learn by participating (Abhipriya, 2019).

According to Rudolph (2014), the employment of music education technology resulted in the following: Students' views regarding classroom music are not only improved but their rates of motivation and engagement are maintained throughout time; When opposed to conventional classroom music techniques, short- and long music achievement is considerably boosted, as shown by standardized exams; Music instructors' benefit from digital music education because it promotes the occupational development of individuals' growth; Innovation boosted student focus, increased time on task, and promoted teamwork, among other things, and developed more outstanding intellectual capabilities, and non-music classroom instructors, as well as supervisors, observed that all these characteristics transferred over.

In music learning, technological change has an impact on musical creativity and expression. A study carried out by Wanyama (2006) on music education indicated that the music instructors' use of modern technology in giving lessons where necessary make learning enjoyable and interesting and encourages creativity. Williams (2012) contends that technology offers new tools for learning. For example, software creativity tools empower individual expression for music. King (2017) affirms this, by emphasizing that learning institutions should incorporate 21st Century competencies

and expertise throughout the learning experience to remain competitive globally and nurture engaged citizens.

King (2017), gives five ways that technology can help improve and enhance teaching and learning: Technology can aid in the organization of learning around real-world challenges and project-based learning by allowing students to demonstrate mastery using a variety of digital learning devices and resources; Technology can provide more interesting and relevant individualized learning or experiences; Technology may assist learning outside the classroom, allowing students to take advantage of learning opportunities in libraries and other non-traditional settings; Technology can assist students in pursuing their interests and hobbies; and Equitable access to technology can help bridge the digital divide and provide all students with transformative learning opportunities. The findings determined that technology should be employed in contemporary society. These findings focus on the role of technology generally in education, while the current study focuses specifically on the use of technology in music education in PTTCs.

According to Nichol (2010), embracing music technology liberates compositional possibilities challenging the composer's imagination and creative thinking as to how this might be used effectively to make music. Technology has a critical function in assisting, expanding, and improving music education. It supports existing pedagogical approaches to music education while fostering greater cooperation and interaction with other students (National Music Participation Director Report, October 2010).

Technology encourages student-centered learning and student autonomy, and it is used as a tool for learning, enhancing composition, performing, and listening processes. It can also be seen as a means to an end in musical performance and composition (Sutherland, 2017). Technology may be utilized in nearly every aspect of music education and learning.

Scher (2014) contends that involvement of technology directly impacts the level of student engagement and consequently student productivity and creativity. Apart from all the advantages mentioned earlier about the use of technology in learning, this study seeks to consider the use of technology in enhancing the learner's attention in learning music. Scher (2014) stresses that it is important to use technology in a classroom situation to increase interaction, encourage collaboration and simulate activities since students develop more interest in lessons that incorporate technology over traditional lecture methods.

Kelly (2014) affirms that technology as a tool for instructions adds variety and excitement to lessons. With its use, learning cannot be monotonous because of its higher levels of student engagement, interactivity, and collaboration amongst students. It also aids teachers in achieving curriculum goals and provides a visual aid for students to understand concepts being explored in the classroom. However, studies on its application in teaching a specific subject such as music to students is still limited. The review has indicated that technology has been widely applied in understanding teaching and learning effectiveness in general.

According to Ghavifekr & Rosdy (2015), technology can be applied in various ways to assist teachers and students in learning about their subject areas. Educational videos, stimulation, data storage, database use, mind-mapping, guided discovery, and music are just a few of the exciting ways that technology-based teaching and learning can make the learning process more enjoyable and meaningful. Brown (2017), further established that incorporating technology into music education programs has been shown to help students improve. Students' understanding of digital techniques and computer systems has improved as a result of the integration. Additionally, the incorporation of technology improves learners by refocusing concentration on the skills and procedures required for efficient computer music creation. The integration of computers has benefited learners' academics beyond music education in the sense that it has increasingly recognized the development of new literacy among them. Integration of technology in the teaching of music has brought about renewed music education programs.

There has been a growth in interest in the link between technology and music education, as seen by the rising number of research on the topic. Therefore, it is evident from the discussion that there has been an increase in the number of studies from 2000 onwards on the interaction between technology and music education, indicating that this phenomenon is of interest. Nevertheless, there is little research evaluating technology usage in PTTCs. The importance of research like this is evident by its rapid use in educational practice and contribution to musical knowledge expansion. Today, using technology to teach and learn music in colleges is a fascinating and appealing topic.

2.3 Technology in Teacher Education

Teachers play a fundamental role in the education process, and the need for educating and training them is essential, especially in technology, which is continuously developing and changing. Technological advancements affect teaching and learning methods in a classroom; therefore, teachers need to have wide-ranging instruction on its use through training. Given the abundance of instructional technology accessible, it is critical that teachers feel confident in their abilities to use it successfully. It is vital to increase teachers' understanding and confidence in the process by providing training and support from educational authorities. Future teachers must be prepared to teach in classrooms that will involve technology, and in order to do so, they must be prepared to use technology themselves. Teachers are better prepared to employ technology in their classrooms by training relevant technological devices and procedures for effective integration (Johnson et al., 2016).

Bakir (2016) asserts that the use of technology is central to teacher education programs since it aids in preparing future teachers to be technology-integrated professionals in the classroom. Training of teachers is essential for the introduction and effective use of technology in music teacher education since training provides teachers with the experience needed to be more confident while using technological tools.

The teacher's educational background is a significant factor in shaping the use of technology in the classroom. Teachers with previous experience using technology, both personally and professionally, are more likely to utilize technology in their classrooms. Teacher education programs are developed to prepare future teachers for the increasing diversity of learners and the sophistication of technology so that they will be

technologically and conceptually equipped to help all students learn. Teachers' initial values, attitudes, and practices may significantly shape their responses to and experiences of educational programs that involve technology (Power, 2014).

Consequently, Vannatta-Hall (2010) researched the consequences of music practices courses on early childhood teachers' confidence and competence to teach music. The research meant to access if there was a major impact in respondents' recognized self-efficacy to instruct music after the end of a 15 – week music practice course. The research brought to light interpersonal and ecological impacts on confidence and credibility to instruct music by testing the self-efficacy (i.e., vicarious experience, mastery experience, physiological persuasion, and verbal and affective states) following the context of a university music practice programme for 41 early the researcher was also the course instructor for childhood pre-service teachers. According to each course of self-efficacy, changes in self-efficacy perception were discovered. Students' self-efficacy levels increased significantly over time, according to the data. Vannatta-Hall (2010) focused on teachers' self-efficacy rather than the technology utilized in the teaching and learning of music as a topic. The current study looks into the usage of technology in teaching music among student teachers in primary teacher training Institutions.

According to Jacka (2015), the use of technology in the study room can come in a variety of applications. Access, and even training, on computers and different software, is not enough for teachers to begin implementation into the classroom. Training on relevant applications and methods for implementation are needed to prepare teachers to

begin using the technology available to them. It has become a necessary requirement that a teacher today should be well informed of the technological developments in his/her field, master them, and use them in the classroom lessons (Nart, 2016).

According to Nicholl (2016), teachers' technology adoption is influenced by the quantity and quality of pre-service technology experience and instruction. As a result, therefore, teacher education programs should emphasize how technology may be used to enhance teaching and learning. This necessitates a greater emphasis on the use of technology and various technical tools by teachers to improve the teaching process.

2.4 Technology Resources in Music Education

Teaching resources are an essential part of every class. These aids help teachers to communicate information and knowledge to students. They usually engage and appeal to the students directly. Many technologies exist in schools to enhance instruction and support student learning, regardless of which learning theory a teacher subscribes to. Teachers employ these technologies in various ways, but they all choose the material that they believe will help them achieve their educational objectives (Mehlinger & Powers 2019).

Technology is a powerful resource for educators. Education generally has progressively utilized technology to facilitate learning throughout history. Music education as an area concerned with the teaching and learning of music focuses on knowledge acquisition, skills development, and appreciation. Technology is the most important tool for knowledge dissemination. Its use in music education brings up a wide range of options,

supporting existing approaches and allowing for more focused composition, transformation, and classification activities. Technology allows learners to have easy access to knowledge, learn faster, and practice what they've learned engagingly. It allows students to delve deeper into challenging concepts and learn about new subjects. Students can learn 21st-century technical skills needed for future careers through technology both inside and outside the classroom (School of Education, 2020).

Wishart (2009) argues that combining technology and conventional techniques to equip students with skills and understanding fully offers a new and interesting component to a music-learning atmosphere. Students may achieve both music and technology requirements. The employment of technology in the classroom, for example, may supplement established teaching methods while also facilitating whole new ways of learning. Although technology has become extremely sophisticated in the digital era, its creative potential has been known for generations. Music educators and researchers have explored several approaches to incorporating technological advancements into music instruction. In the classroom, lessons are planned around the available resources to improve learning.

Mayer (2010) observed that schools had changed their teaching techniques and approaches throughout time to improve student learning. There are numerous technical resources available for musical activities, and new ones are developed continuously. Chalk and slate were once the most cutting-edge technologies. After a while, technical advancements shifted from cinema, radio, and television toward desktop computers and interactive smartboards. Earlier, Kadzera (2006) highlighted five mainly used

instructional technology in teacher education; chalkboards, flip charts, PowerPoint slides, video, and computers. Simpler technologies that required less adjustment to current practices were more commonly utilized in teaching and learning, according to Zhao (2007). Telephones, e-mails, overhead projectors, and computers were the most often utilized technology at educational institutions. However, because teaching using technology is crucial for students' growth in the twenty-first century, new instructors entering the field are going beyond the basics and incorporating more technology into their units and courses.

According to Kitson (2007), technology is employed on a daily basis in the twenty-first century. Information systems have developed as essential instruments for education and learning as a result of the rise of the internet and other digital materials.

(Hofer, 2012) identified sixty-nine music learning activity types designed to help educators connect musical content, pedagogy, and various technologies in authentic ways that enable students to create, perform, and respond to music. Such activities and tools include the MIDI, digital audio recorders, music notation software, electronic instruments, and mobile apps are but a few of the technological tools that teachers can use to support music learning. Sastre, & Cerdà, (2013) indicated that for hundreds of years, technology has had a significant impact on music. The printing press was likely the most crucial factor in the wider adoption of music education, and technological innovations are now being utilized to teach music, for example, in rhythm, note recognition, and assessment from the beginning.

Further, on resource development Sutton (2013) observed that technology had changed society throughout history. Cellular devices, iPads, iPods, computers, and most importantly, the internet have completely overhauled the way people interact in society and the way educators work in schools. The most popular form of technology used in the classroom to enhance learning is PowerPoint presentations. According to Hicks & Turner (2013), teachers use social media platforms such as Facebook, Yammer, and Twitter, some teachers also utilize the capabilities and various components of the computer to engage students in active learning. In addition, Purdue (2021) indicated that educational capabilities are evolving and developing on a daily basis, due to technological advancements. The Internet is a massive electronic library of information where you may undertake research and learn with a single mouse click. The Internet has grown faster than any other technical invention in humanity's civilization, resulting in a greater ability to produce a critical threshold for implementing a teaching approach utilizing a specific technology.

Scher (2014) contends that technologies have become more prevalent in homes for personal use and in schools as an instructional tool, software such as GarageBand, websites such as YouTube, and hardware such as iPads, are some of the new technologies that most teachers and students are comfortable in using to enhance their learning process.

(Nart 2016) affirmed that technology has also benefited music education by creating resources that can give students and musicians a place to network and share their skills. Platforms such as Youtube allow students to explore and learn more about musical performance on their own and can promote interest in specific areas of music. This can

certainly benefit an individual student and help them discover more about specific musical interests and skills they hope to achieve as a result of their music education (Daubney, 2017) notes that many essential technologies are already in use in the classroom, such as interactive whiteboards, internet sources, cameras, audio and video recording devices, and even video-based professional development tools to capture our teaching and allow teachers to evaluate and analyze teaching. This study seeks to look at the use of technology in music education in PTTCs.

2.5 Challenges and Solutions Related to Technological use in Music Education

Today's educational landscape is shaped by technology, which is possibly the most powerful component. Johnson (2016) observes that many learning institutions are demonstrating their support for higher levels of technology in the classroom by providing tools such as tablets and PCs, improving internet connectivity, and creating computer literacy programs for both teachers and students. Although most teachers recognize the value of using technologies in teaching and learning, they frequently find the smooth and successful incorporation challenging. For the teacher, it is a dual challenge since adapting to technology may require flexibility in teaching and the learning process (Rogers & Wallace, 2011).

While the importance of technology in music education cannot be overstated, its adoption is not without challenges. In a study conducted by Sorah (2012) on the effects of music teacher beliefs, experience, and resources on technology use, it was discovered that most music education programs lack the needed technology for effective music education. Specifically, Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur

(2012) identified some of these barriers which hinder the effective use of technology. They included, among others, the monetary implications of using technology, inadequate training, the time needed to invest in learning the skill and implementing the technology within lessons, and how to address the changes that have to be made in designing the learning experience.

Ertmer et al. (2012) further emphasized that the most significant hurdle to integrating classroom technologies, particularly new ones, is time. A teacher's time is extremely valuable, and it should come as no surprise that time is one of the most commonly cited barriers to integrating technologies in the classroom. Making and revising lesson plans takes time and a lot of work, but updating lesson plans to incorporate technology takes even more time

Teachers encounter a challenge known as "double innovation" when implementing recently innovated technologies in a classroom setting. Double innovation essentially adds a layer of preparation teachers must work through. The teacher must first learn the technology well enough to utilize it in a classroom setting before integrating it with classroom objectives and curriculum. Further, while technologies used for music education are becoming more user-friendly, the twofold innovation problem still necessitates more preparatory time (Cleaver, 2014). Training which is important may require time to using the rapidly increasing and changing trend in technology today.

Educational policies impose restrictions on the use of technology in music classrooms. Crawford (2013), in his article "Evolving Technologies Require Educational Policy Change: Music Education for the Twenty-First Century," it is noted that the policies of

the past are credited with limiting how technology can be utilized in the classroom. Education policy constraints need to change to provide access to interactive information exchange technology platforms and numerous apps and resources that are currently unavailable to institutions of learning. Additionally, the obstacles created by these policies are a reality that many educators face when planning to implement technology into the music classroom. As both the role and uses of technology rapidly change, so should educational policies.

Kairo 2013) observed that the most significant challenge that hindered effective technology integration in teaching and learning was the lack of enough facilities. The study indicates a lack of internet connectivity in most schools, lack of technological infrastructures, and lack of preparedness among the teachers in terms of training. The other noted challenge in integrating ICT in teaching and learning has been the lack of technical support (Gode, 2013). The availability of technical support in learning institutions means using ICT in teaching without losing time, especially in having to fix software and hardware problems. Computer breakdowns lead to learning interruptions. Without computer technicians who can give technical assistance, the regular repairs of the computer will likely not be carried out, which discourages teachers from integrating computers. Other than equipment breakdown, sometimes teachers' fear of equipment failure restricts their integration. Thus, without technical support for teachers, they become frustrated, resulting in their unwillingness to integrate ICT to teach (Gode, 2013; Muyaka, 2012).

There are still many challenges in introducing and integrating technology into classrooms. There are quite a number of learners who don't have access to the internet, and the digital divide remains in classrooms today. Immersion in technology is made even more difficult by the financial constraints that the learning institution face. Institutions learning around the country differ in terms of expense, infrastructure, and technology development. Most technology in a learning institution is available in computer laboratories, where students can schedule a time to utilize them. It will take several years for a suitable technology to be available in all classrooms at various educational institutions (Harris et al., 2016)

Omariba (2020), in the article 'Recent Research on Teachers' Preparedness in Integrating Information Communication Technologies in Public Primary Teacher Training Colleges in Kenya,' showed some of the challenges faced by student-teacher trainees while integrating technology. The findings of the study revealed a myriad of challenges among which included: inadequate facilities, lack of competence, knowledge, and skills in technology integrations, limited time for accessing the computer in the college, Power blackout, lack of support from the college administration, and government, college systems do not embrace integration in all subjects, inadequate training, low levels of technology literacy among tutors especially on the use of modern technology, lack of appropriate and relevant content from publishers and the ministry, apathy on the usage of technology in teaching-learning process, some tutorial ignore using the technology available and initial preparation time is too long.

Generally, from the preceding discussion, the challenges facing the use of technology are not exhaustive. Furthermore, the studies did not consider the challenges of using technologies in primary teacher training colleges and specifically in music education resulting in gaps in knowledge which this study sort to fill.

The availability of instructional media encourages its usage. According to Al-Khayat, (2012), for technology to be exploited in an environment, it must first exist. This means that if college tutors use instructional media in their teaching, then the resources should be made available in the college environment. The qualitative study conducted on 143 student teachers' use of instructional media found that more than half of the respondents indicated the unavailability of instructional media in classrooms. This was echoed by Kadzera (2006) in a survey on the use of instructional technologies in five teacher training colleges in Malawi" where classroom facilities like power sockets were vandalized or were not there at all for use with instructional media.

Kadzera (2006) further reports that lack of instructional media resources is one of the reasons contributing to minimal use of instructional technology in teachers training in Malawi. This was also corroborated by Abdo, & Semela's (2010) observation in an earlier study in Ethiopia, which stated that one of the reasons for instructors' restricted usage of instructional media is a lack of required instructional media resources. A study conducted in Pakistan to assess the effect of Instructional technology in enhancing the instructional process (Suleman et al. 2011a) noted that students' educational attainment is dependent on the effectiveness of the instructional technologies applicable in the teaching and learning process.

When instructional media is available and the management is committed to implementation, change effects can be seen. This would exhibit the administration's commitment and facilitate the change process, making the subordinates easily acceptable (Kadzera, 2006). Thus, it is necessary to avail technology and essential technical support to ensure technology adoption in teaching music in Teacher Training Colleges. Even when the resources are available or the management shows commitment, and the implementers (Music School College tutors) do not see the need for these instructional media, no use can occur. Thus, it is equally necessary to involve, train and include the tutors in implementing various technologies in the teaching/learning of music for student-teachers.

2.7 Theoretical Framework

There are varied theoretical bases for instructional learning. This study applied the social constructivism theory, which emerged as a theory of learning from the works of Piaget (1896-1980). The theory perceives the mind as inherently structured to develop concepts and acquire language. From a constructivist perspective, learning is determined by the complex interplay among students' existing knowledge, the social context, and the problem to be solved. Individual learners actively explore their environment by building on their existing cognitive structures. The primary responsibility of the instructional expert is to create and maintain a rich, stimulating, and generally supportive learning environment.

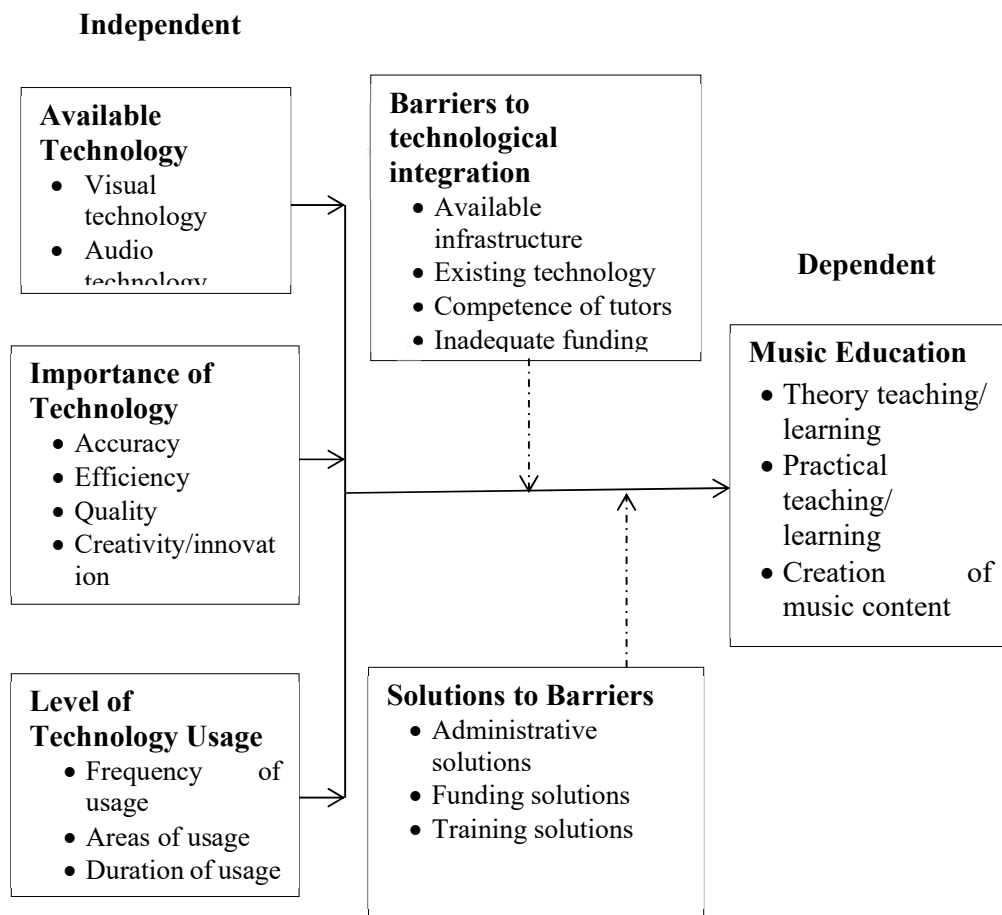
The role played by this theory in technology is to accentuate key constructive elements such as social interaction and create meaning from what is encountered in the

environment. The use of technologies like computers and other conventions mediate learning in social environments. Knowledge is formed as part of the learner's active interaction with the world, and learners confront their understanding in light of what they encounter in the new learning situation. Ouyang and Nile (2014) note that from a social constructivist view, one's direct participation in social communication activities is the main way to construct new knowledge structures. The core of this theory is discovery learning. Students learn by doing. John Dewey (1859-1952), a well-known educational psychologist, believed that practicing is a foundation of learning, and without learning practice, students would get lost. Technology, in this context, is a tool for learning in a constructivist environment. Technology has created an environment where a higher level of learning and problem-solving is expected from the learner (Newby, 2004).

From a constructivist perspective, music education evaluates where a new approach may produce success since social factors influence the pace and direction of technological development. This theory is pertinent to this study because it shows how technology adoption and usage significantly affect music education. The availability of a variety of music technologies not only stimulates experimentation and versatility but also creates an accessible setting for learners who may struggle to develop a musical identity; Technology provides learners with access to a musical environment. Consequently, the study acknowledges the challenges and barriers in the adoption of technology while at the same time invoking the constructivism theory to explain the value of technology in learning. Thus, the theory is significant in answering the main questions in this research.

2.8 Conceptual Framework

The researcher developed the conceptual framework to show the relationship between the independent variables: availability of the technology, importance of the technology, and the level of technology used by the teachers, while the dependent variable is teaching and learning music. The relationship that exists between the variables is presented in Figure 2.1.



Source: Researcher Developed (2020)

Figure 2.1: Conceptual Framework: The Relationship Between Variables

The researcher's conceptual framework is based on the relationship between the dependent and the independent variables, as shown in figure 1 above. The independent

variables are various aspects of technology used in teaching and learning music in Primary Teacher Training Colleges (PTTCs). The available technologies have been perceived as important in the teaching/learning of music in PTTCs, which ultimately determines how each technology is used. Thus, available technology, the importance, and the level of usage/adaptation influence the teaching/learning of music in PTTCs.

The level of usage of the technology in the teaching of music is conceptualized in terms of frequency of usage, areas, and duration of usage of the technology. This is seen to have a direct relationship with the teaching of music to the trainees in primary teacher colleges. However, this relationship is influenced by various barriers in the adoption of technology in teaching/learning music, including infrastructure within the institution, existing technologies in the market, training, and competence of tutors, as well as behavior/attitude towards adoption of technology. For effective teaching/learning of music, these barriers are overcome through various solutions, including administrative, financial, and training.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter presents the research design, target population, sample size and sampling procedures, description of data collection instruments, validity and reliability of the research instruments, data collection procedures, data analysis procedure, and ethical considerations.

3.2 Research Design

This study employed a mixed-method research design: a procedure for collecting, analyzing, and mixing both quantitative and qualitative techniques in a single study as defined in (Orodho, 2008). According to Creswell and Clark (2011), the mixed-methods approach encourages multiple worldviews by combining inductive and deductive thinking, which helps to answer questions and provide more comprehensive evidence in numbers and words for studying research problems than either quantitative or qualitative. This research method was appropriate for this study as it allowed the researcher to collect qualitative and quantitative data, which helped validate the findings; using both methods added to the credibility and integrity of the research. Moreover, using both methods simultaneously in this research helped achieve answers from two perspectives, which aided the researcher in obtaining more authentic answers to the research questions comprehensively.

Specifically, the study adopted the embedded mixed methods research design where both forms of data were collected and analyzed simultaneously. This design was

particularly useful because the researcher needed to embed qualitative component within quantitative design; the qualitative data was collected and analyzed within quantitative research. In this case, quantitative was the primary data supported by the qualitative data. Mixed methods research provides strengths that offset the weaknesses of both qualitative and quantitative research.

3.3 Target Population

The target population, according to Wakahiu (2016), are individuals or institutions in which researchers are interested in describing and making statistical inferences. It is a set of objects or people that have distinguishing or common characteristic that is of interest to the researcher and to which the researcher would generalize their findings (Kamau, 2019). Since this study sought to evaluate the use of technology in teaching and learning music in PTTCs in Kisii County, Kenya, the target population entailed the principal, music tutors and student teachers who study music in the colleges. From all the four colleges in Kisii County, the study established that there are 2 music tutors for each college, making it 8 tutors. The study also targeted the 1500 student teachers from both the first and second years, as well as the principals of the PTTCs in the county as respondents (Kisii County Director of Education, 2017).

3.4 Sample Size and Sampling Procedures

3.4.1 Sample Size Determination

A sample selection determined the sample size to form the representation of the entire population. Various scholars like Orodho (2009), Mugenda (2012), and Kothari (2014) have all suggested that the appropriate sample size for a large population should range

between 10%-30 % of the population. This study used all the principals and music tutors in collecting the data, while for the student teachers, the study used 10% (150) of the target population (1500). The students' teachers were selected proportionally from each year of study. The respondent's sample distribution is as shown in table 1.

Table 3. 1: Respondents Sample Distribution Frame

Respondents' categories	Number	Sampling Technique	Sample Size	Research Instrument
Principals	4	Purposive	4	In-depth interview guide
Music tutors	8	Purposive	8	Questionnaires/ interview guide
Student-teachers	Aprox. 1500	Systematic sampling	150	Questionnaires
Total	1512		162	

As shown in table 1, this study's sample size consisted of 162 respondents from all the PTTCs in Kisii County, Kenya.

3.4.2 Sampling Techniques

Sampling is a process of obtaining information about an entire population by examining only a part of it (Kothari, 2009). It is a scientific process of selecting entities from a population of interest. By studying the sample, a researcher may fairly generalize the findings to the population from which the sample was selected. On the other hand, the sampling technique is the selection of sample components that will give a representative

view of the target population; It is the process by which the sample entities are selected. It is from this sample that a researcher collects data (Wakahiu,2016). This study made used of both purposive and systematic sampling techniques to choose a sample.

Purposive sampling is used in selecting a sample that meets specific requirements and characteristics for the study (Kombo and Tromp, 2006). This was affirmed by Best and Kahn (2006) who noted the purposive sampling helps a researcher select a sample with the required characteristics. It is a deliberate choice of the specific members of the population to form sample respondents due to their qualities (Etikan, 2016). Purposive sampling was used to select the music tutors and the principals because they were deemed to have vital information about technology in the teaching and learning process.

Music tutors were in charge of music education in colleges; hence they were quite appropriate to provide the required data regarding the study objectives. The principals as college managers were automatically included in the study since they were deemed to have valuable information regarding the available and use of technology in their various colleges. The study also assumed that both the principals and music tutors had more information regarding the use of technologies; since they are responsible for planning and recommending for purchase the required technology. Generally, purposive sampling allowed the researcher to gather qualitative responses from both the music tutors and the principals, which led to better insights and more precise research results.

Systematic sampling in this study was used to select the 150 student teachers from the four different colleges in Kisii County to obtain the required data. Kothari (2004) argues that systematic sampling increases a sample's statistical efficiency and provides adequate data for analyzing various populations. This method is cost-effective, fast-track data collection, and access to the study's unit of analysis and elements. Further, Kothari, observed that a sample drawn systematically is unbiased in that no member of the population has any chance of being selected more than the other.

3.4 Data Collection Instruments

The questionnaires and in-depth interview guide were used as data collection tools for this study; they were first critically examined to determine their appropriateness in providing the required research information. The validity and reliability of this study depended largely on the appropriateness of these instruments. The researcher, therefore, ensured that the data collection instruments were valid and reliable, as described under the following sub-themes:

3.4.1 Pilot Study

Before going to the field, a pilot study was undertaken in one of the primary teachers' training colleges in Bomet County, a neighbouring county to Kisii County. Bomet County has only one primary teacher's college, which was considered. This was considered because all the four primary teachers' colleges in Kisii County were to be used in the study. Also, all the tutors and the principals were considered; hence Bomet teachers' college was considered appropriate. A pilot study was conducted to assess the appropriateness of the instruments in collecting the required data. Hence preventing

errors and inconsistencies. According to Mugenda and Mugenda (2012), a sample of 10% of the study sample is appropriate for carrying out a pilot. For this study, therefore, a sample of 16 (10% of 162) was considered. The results from the pilot study were used to determine the validity and reliability of the study instruments. The reason for a pilot study was to assess the validity of the instruments, the correctness of some concepts, the adequacy of the method and instrument of measurement (Pietkiewicz, & Smith, 2014).

3.4.2 Validity of the Research Instruments

The content validity of the research instruments in this study was improved by first giving the two appointed University supervisors the tools to scrutinize and give suggestions to be incorporated. The instruments were also checked for content coverage by assessing what concept the instrument was supposed to measure. The experts also determined whether the set items accurately represented the concept of this study. The results from the pilot study also aided in correcting ambiguity and unclear items.

Validity was also enhanced by instrument triangulation which was achieved by comparing the response obtained from the three sets of instruments: questionnaires, in-depth interview guides, and document analysis. The data obtained from the different sources were compared for consistency and similarity about the themes on the use of technology in music education.

The respondents were requested to judge each item in the questionnaire either as Relevant (R) or Irrelevant (IR). The Content Validity Index (CVI) was computed using the formula by Amin (2015) as shown below:

$$(TR1+TR2) / 2$$

$$CVI = \frac{\text{Total Items}}{\text{Total Items}}$$

Where:

CVI = Content Validity Index

TR1 = Total items marked as relevant by 1st Expert

TR2 = Total items marked as relevant by 2nd Expert

$$(23+27) / 2 = 50 / 2 = 25$$

$$CVI = \frac{25}{32} = 0.78$$

Amin (2015) notes that any validity index above 0.6 suggests that the instruments are fit and good for data collection. From the above computation, the instruments were valid since they had a validity index of 0.78 which was greater than 0.6.

3.4.3 Reliability of the Study Instruments

According to Kothari (2009), a measuring instrument is reliable if it provides consistent results. Reliability of an instrument is the degree to which a test consistently measures the desired construct. The research tools can yield consistent results or data after repeated administration. Reliability, therefore, is the accuracy of the results obtained by

the use of a research instrument and not about the instrument itself. The purpose of reliability is to determine how much error is present in the test score.

The reliability coefficient can be computed using various methods such as the split-half, test re-test, and the Cronbach alpha reliability method. For this study, because of the challenges of time and resources, the Cronbach alpha reliability method was used where the questionnaire is tested only once and coded for analysis with the aid of a computer system software, Statistical Packages for Social Sciences (SPSS, version 23). The study used results obtained from the 16 respondents to check for reliability. The researcher also verified their content for accuracy, consistency, and assurance that ambiguous information is eliminated.

The reliability coefficient was worked out where the questionnaires were coded, input in the SPSS software, and built the formula for computing the reliability coefficient. A reliability coefficient of 0.86 was obtained for the study instrument. According to Kothari (2004), reliability values above 0.7 are acceptable for any social research meaning that the questionnaire was reliable and was considered to generate the required data for the study.

3.5 Data Collection Procedures

Upon receiving a research authorization from the National Commission for Science, Technology, and Innovation (NACOSTI), as indicated in Appendix VI, the researcher visited all the PTTCs in Kisii County to seek permission to carry out the research from respective principals. When the sort permission was granted, the researcher delivered

the tested and approved research instruments with the assistance of the music tutors. The sampled respondents, student teachers, and music tutors were each issued a questionnaire to seek their views and concerns concerning the use of technology for music teaching and learning in their institutions. The selected respondents answered the questions individually; after that, the researcher received back the questionnaires after they had been duly completed. The questionnaires had both open-ended and closed-ended questions. The open-ended questions gave the participants room to provide further explanations regarding the items. Questions related to technology for teaching and learning music and the general biodata of the respondents were included in the questionnaires (see Appendix II&III).

The in-depth- interview guides were of paramount importance in this study. According to Mugenda & Mugenda (2012), an interview guide aids the researcher in measuring what a person knows and thinks about a particular issue. This study used structured-direct and unstructured direct interviews conducted with the music tutors and principals of the selected primary teacher training colleges in Kisii County. The principals acquire and monitor music education technology used in their institutions. On the other hand, the music tutors are deemed to be experts in the music subject area. The interviews were generally used to obtain detailed information on the availability and use of technology in music education. (See Appendix IV).

3.6 Data Analysis Procedure

Kothari (2009) explained data processing as meaning editing, coding, classification, and tabulation of collected data so that it can successfully be analysed. Data analysis involved processing the data to answer the research questions. This research used both

quantitative and qualitative data analysis procedures. After data collection, the researcher organized, edited, and systematically coded the data to facilitate analysis.

The quantitative data obtained from the closed and opened-ended questions were coded by categorization, qualification, and processed. The data was then entered into Statistic Package for Social Sciences (SPSS) software, where a database was developed to facilitate analysis, description, and inferences to this study's research questions. The descriptive data were analyzed using the frequency and the percentages, which helped show how the respondents responded to the various questions. The data summaries were presented using frequency tables and pie charts, respectively.

The qualitative data was derived from in-depth interviews and the open-ended items on the questionnaires. The interim data analysis of the qualitative data began in the field as the researcher identified emerging issues during the interviews. The researcher categorized data into themes according to the research questions and then used thematic analysis to discuss the findings and present them in the form of narratives and direct quotes. This process enabled the researcher to draw the research conclusions and make recommendations.

3.7 Ethical Considerations

Ethical considerations are essential components of given research since it involves collecting data from people about the people. In this study, the researcher observed an ethical code of conduct by first asking for an authorization letter from the Technical University of Kenya (see Appendix V) to conduct the study. The researcher also sought

consent from all the PTTCs principals in Kisii County before conducting the research in their institutions.

The researcher disclosed to the participants the purpose of the research in advance, and voluntary consent was sought before in-depth interviews were carried out. The same was done for other respondents before they filled in the questionnaires. The anonymity of the respondents was assured and maintained during the whole process of the study. Confidentiality was maintained, and all the respondents were assured that the information given was used solely for purposes of the study. The researcher accredited all the materials from other sources and authors using the American Psychology Association (APA) method in the study.

CHAPTER FOUR

DATA PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the findings and interpretations of the study based on the data collected through the questionnaires from the student teachers and tutors and in-depth interviews with the music tutors and the college principals. The findings of the study are based on the research objectives as provided in chapter one (1.4). In order to enable the researcher to respond to the four research questions, the data collected after analysis was presented using frequencies and percentages.

The section is organized into five sections: demographic information of respondents, available technology for use in PTTCs; extent of usage of the technology in PTTCs; Challenges to using technology in PTTCs, and possible solutions to the challenges faced by the use of technology in PTTCs.

4.2 Response Return Rate

The study targeted 150 student-teachers and 8 music tutors to answer the questionnaires.

The response return rate data are presented in table 4.1 following distribution.

Table 4.1 The Questionnaire Return Rate

Respondent Category	No Dispatched	No Returned	Percentage Response
Student teachers	150	150	100%
Music tutors	08	08	100%
Totals	158	158	100%

The response return rate for the student teachers and music tutors was each 100%, as shown in Table 4.1. All four PTTCs principals were interviewed. Hence the study achieved a 100% response return rate which was good enough to analyze the study comprehensively. High response rates are deemed an essential attribute of a quality research study for generating valid, reliable, and generalizable results for a study. A response rate of 70-85% or higher is considered to be satisfactorily a good output, according to Mangione (1995) in Bryman (2012). This ensures that a researcher has less non-response bias. The response rate was therefore deemed acceptable for this study.

The maximum response return rate was achieved due to administering typed questionnaires, providing ample time to fill in the questionnaires, and making regular follow-ups to ensure the completeness of the questionnaires. Moreover, the researcher conducted face-to-face interviews with music tutors and the principals with whom the researcher had made prior arrangements to secure their availability. This was after an initial orientation to establish rapport and explain the purpose of the study to the respondents.

4.3 Demographic Characteristics of Respondents

The Respondents' background and demographic information were captured to ascertain their suitability to provide information necessary to the study. Among the demographic factors are gender and age distribution of the respondents, the number of teaching practices carried out for the student teachers, level of education, and the years of teaching experience for the music tutors and principals. These were analyzed and presented in the subsequent subsections.

4.3.1 Gender Representation of the Respondents

The study sought to find out the gender representation of the response in order to evaluate the attainment of gender parity. The results are presented in figure 2:

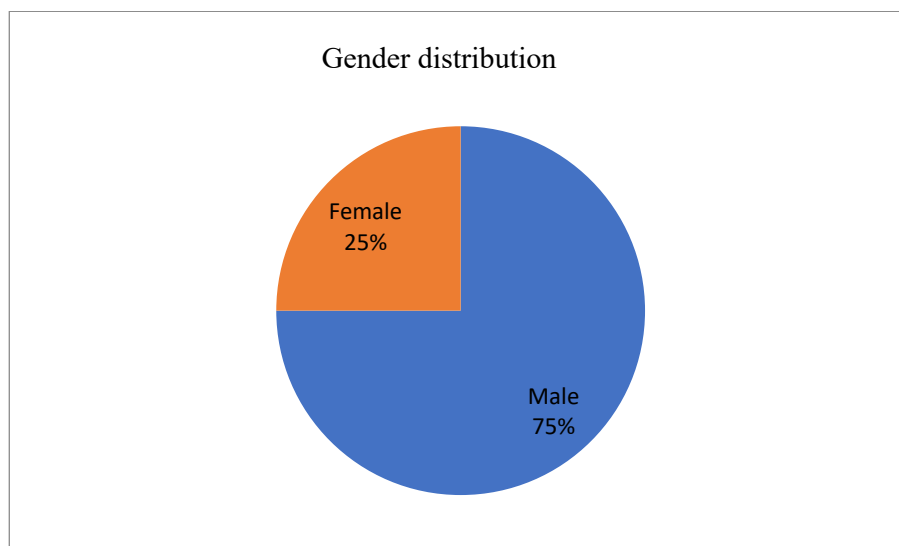


Figure 4.1: Gender distribution of music tutors and principals

The results for the music tutors and the principals show that the majority (75%) were male, with (25%) female.

4.3.2 Age of the Respondents

The study also sought to determine the distribution regarding the age of the student teachers and their tutors. In the wake of the rapidly increasing changes brought about by technological inventions, the age factor of the respondents may have some influence on the usage of technology, particularly among those who are older and those who are younger. The results of the finding of the study are presented in figure 3.

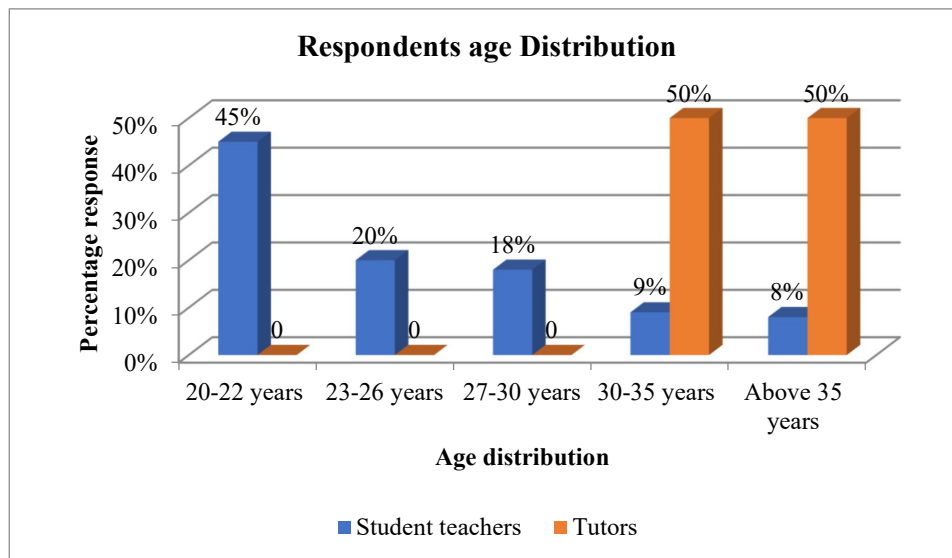


Figure 4.2: Age distribution for the tutors and student teachers

From the analysis of the study findings, it was established that most of the music tutors were aged above 30 years, with 50% being in the age bracket of 30-35 years and another 50% in the age bracket above 35 years. Among the student teachers, the study noted that 45% were in the age bracket of 20-22 years, followed by 20% in the bracket between 23- 26 years, 18% were in the age bracket 27-30 years while only 9% were in the age bracket of 30-35 years. This distribution is expected as the majority of the student teachers are below 30 years and are expected to be biased towards the application of technology in their lessons. This would enable them to effectively pass on the skill to their primary school students during their teaching career.

4.3.3 Teaching Practices

The study also sought to find out the number of teaching practices that the student tutors had undertaken where they have been involved in teaching music as a subject. The results are presented in figure 4.

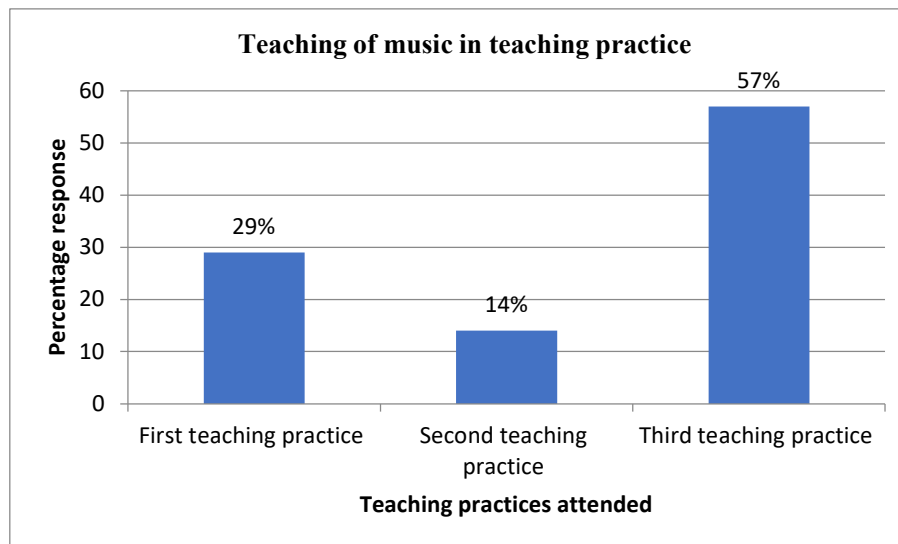


Figure 4.3: Number of Teaching Practices

From the background information gathered by the researcher, it is noted that 29% of the respondents had taught music in their first teaching practice, 14% had taught music in their second teaching practice, while 57% had taught music in their third teaching practice. This implies that at least the majority of the student teachers who had participated in the study had taught music as a subject to the learners for quite some time. They were, therefore, able to provide information on the available technology and the level of used in music education in the various PTTCs in Kisii County.

4.3.4 Level of Education of the Tutors and Principals

The study sought to determine tutors' and principals' highest education levels. This was important since the highest level of academics is attributed to having the prerequisite knowledge and ability to handle any change and development in the teaching and learning of music using various technologies. The student teachers were omitted since the ministry of education's requirement for one to be admitted to any Kenyan primary teachers training college is a bachelor's degree. This implied that all the student teachers

had a minimum of a bachelor's degree or equivalent. The distribution of the results is presented in figure 5

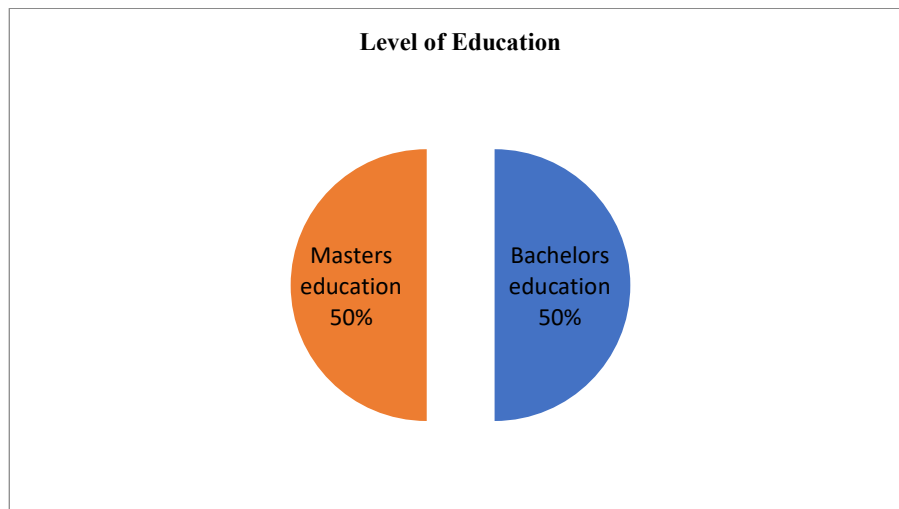


Figure 4. 4: Level of Education

The results show that for the tutors, 50% had bachelors' qualification with the other 50% having master's qualification. Further analysis indicated that all the four tutors had taken music during their undergraduate education and hence had the required qualifications, skills and knowledge of teaching music. It was also further noted that the majority of the tutors had undergone training in using technology in teaching and learning music.

4.3.5 Years of Teaching Experience

The study sought to find out the years of teaching experience of the tutors. Years of teaching experience may be correlated with pre-service training experiences, which may also impact how tutors use technology in teaching music. A teacher's experience is therefore significantly associated with the actual use of technology. The results are presented in figure 6.

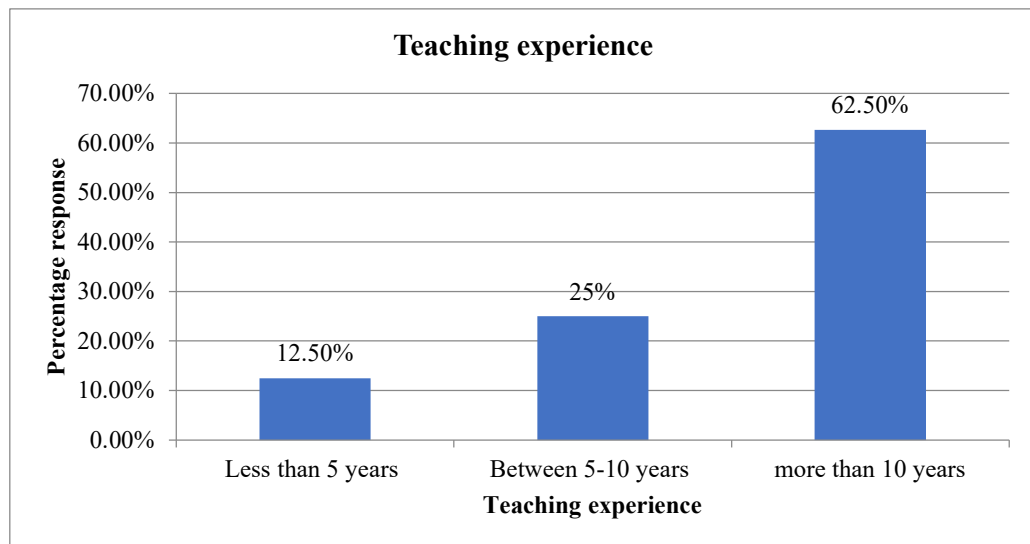


Figure 4.5: Teaching Experience

The results show that the majority of the tutors, 62.5%, had taught for a period of more than ten years, 25% had taught for between 5-8 years, and the rest 12.5% had taught for less than five years in various primary teachers training colleges in the country. This shows that most of the respondents had teaching experience. Hence, they were in a good position to respond to provide relevant information for addressing the objectives of the study.

4.4 Technology Used in Primary Teachers' Training Colleges

This research sought to establish the technologies currently available and used in music teaching and learning in PTTCs. The main reason was to evaluate and ascertain whether to retain or recommend adding other newly invented technologies to meet the current demands of enhancing the overall primary teacher preparation process in these present technological advancements. The findings of the study were summarized into frequency and percentages and presented in Table 2.

Table 4.2: Available Technology

Available Technology	Student-Teachers				Tutors			
	YES		NO		YES		NO	
	Freq	%	Freq	%	Freq	%	Freq	%
Chalkboard	150	100.0%	0	0.0%	8	100.0%	0	0.0%
Overhead projectors	50	33.3%	100	66.7%	4	50.0%	0	0.0%
Computers/Laptops	50	33.3%	100	66.7%	8	100.0%	0	0.0%
Flip charts	135	90.0%	60	40.0%	8	100.0%	0	0.0%
TVs/Videos	0	0.0%	150	100.0%	8	100.0%	0	0.0%
Audio CD/DVD	60	40.0%	90	60.0%	6	75.0%	2	25.0%
Radios	0	0.0%	150	100.0%	0	0.0%	8	100.0%
Pianos/electronic Keyboards	60	40.0%	90	60.0%	8	100.0%	0	0.0%
Recorder	70	46.7%	80	53.3%	8	100.0%	0	0.0%
Local resources	150	100.0%	0	0.0%	8	100.0%	0	0.0%
Smartphone/mobile phones	130	28.9%	20	71.1%	8	100.0%	0	0.0%

Source: Researcher (2017)

Technology availability is a prerequisite for music teaching and learning. From table 2, the results show that the available technologies that are used in primary teacher training colleges in Kisii County to enhance the music education according to student-teachers, were mainly the chalkboards (100%) Flip charts 90%, and local resources (100%) as non-electronic resources, while others were audio CDs/DVDs (40%), music recorders (46.7%) and piano/ electronic keyboards (40.0%). This view was supported by all the tutors who unanimously (100%) agreed that audio CDs/DVDs, music recorders, pianos,

and electronic keyboards were available for use in the teaching of music subjects. Radios were found to be unavailable for music teaching and learning by both student teachers, and their tutors, with 100% saying that they were unavailable. The interview with the principals established that the common technologies used in enhancing the music education in PTTCs were as mentioned by both the student teacher and their tutors; flip charts, chalkboards, audio/ video, music recorders, computers, smartphones/mobile phones, and TVs among other instruments.

The study also found that overhead projectors (33.3%) and computers/laptops with software (33.3%), according to student-teachers, were slightly available for use in learning music. Similarly, only half of the tutors agreed that overhead projectors were available for use in teaching music lessons. As for videos, all the student teachers (100%) considered them unavailable for their use while all the tutors (100%) considered them available. This, therefore, implies that TV/Videos are available but only accessible to the tutors, and thus, are not used in the teaching/learning of music. Thus overall, the study found that chalkboards, local resources, flip charts, audio CDs/DVDs, music recorders, and keyboards were sufficiently available for use in the teaching and learning of music. The results indicate that most of the technologies available are used significantly by the teachers with little application from the student's side.

The results from the interview schedule administered to the principals revealed that though the primary teachers' training colleges had adopted to some extent technology in the teaching and learning of music, the devices were not adequate. One of the

principals, when asked to give his view on the availability and use of various technologies in the teaching of music in their various colleges indicated that.

“I can say yes, we are trying our best to ensure that we have the required technology for assisting in the teaching and learning of music. However, he indicated that among the available resources in the primary teachers’ training colleges were the computers and laptops with music software such as Finale, Sebelius and noteworthy composers. We also have overhead projectors, TVs, electronic, keyboards, and music recorders. He noted that; most of the colleges are limited in terms of finances to purchase required technology (14th July 2018)”

The interviews from this respondent implied that technology applications are available but inadequate, which explains the low level of technology usage in primary teacher training colleges in Kisii County. The prime reason cited was insufficient funds for the colleges to acquire the necessary technology.

4.5 Extent of Usage of the Technology in PTTCs

The second research objective sought to examine the level of usage of the technology in PTTCs as reported in sub-section 4.4. The student teachers unanimously agreed (100%) that some available technologies, such as electronic keyboards and computers, were frequently used. None of the student teachers who participated in the study indicated that the available technologies were never used. This implies that the piano/ electric keyboard; widely employed in music for solo and ensemble performances, accompaniment, composing, songwriting, and rehearsals, helped the student teachers learn to recognize tones, intervals, and chords and develop a sense of pitch, which are some of the benefits of using this instrument. On the other hand, computers/laptops

provided students with easy-to-access information, accelerated learning, and opportunities to practice what they learn.

The music tutors also shared this view and unanimously agreed that the available technologies were frequently used in and out of the classroom to enhance student learning. The available technologies paved the basis for differentiated instruction, which can better cater to the specific requirements of student teachers as individual students within the classroom context. This implies that the piano/ electronic keyboards were available and accessible for use in music teaching. This underlines the significance of piano/ electronic keyboards in the teaching and learning of music.

The principals' responses corroborated these findings in an interview. Despite the tutors' familiarity with the technology used and its importance in the teaching and learning of music, all principals reported that they were employed to a lesser level. That was stated by one of the college principals.

“As an institution, we have tried our best to purchase some of the latest technology facilities needed to enhance the teaching and learning of music and also help to draw attention to the students to take the subject. Still, we are limited in many ways, especially financially to purchase all the required devices. This makes it difficult to improve on the extent of use of technology in music classes. But so far, I can say we are on the right track to achieving our expectations. (14th July 2018)”

From the findings, it can be deduced that principles influence the extent to which technology is used in PTTCs by not availing them due to financial constraints, as will

be discussed later. The results, therefore, clearly show that the degree of use of technology is still low.

4.6 Challenges Facing the Use of Technology in Music Education in PTTCs

In the fourth objective, the study sought to establish the challenges to using technology. The respondents were asked to indicate whether challenges were affecting their use of technology in learning music or not. Thus, the principals, music tutors, and student teachers gave their opinions which were analyzed and summarized as presented in Table 3.

Table 4. 3: Challenges Facing the Use of Technology in PTTCs

Challenge/ Barrier	Student-teachers				Tutors			
	YES		NO		YES		NO	
	F	%	F	%	F	%	F	%
Lack of Funding for hardware	90	60.0%	60	40.0%	8	100.0%	0	0.0%
Lack of access for all students	150	100.0%	0	0.0%	8	100.0%	0	0.0%
Lack of Technical support	80	53.3%	70	46.7%	8	100.0%	0	0.0%
Lack of enough time to prepare	140	93.3%	10	6.7%	0	0.0%	8	100.0%
Poor Training to use technology	140	93.3%	10	6.7%	4	50.0%	4	50.0%
Lack of Administrative support	130	86.7%	20	13.3%	8	100.0%	0	0.0%
Lack of Personal interest in instructional technology	30	20.0%	120	80.0%	4	50.0%	4	50.0%
Lack of workshop and seminars	140	93.3%	10	6.7%	8	100.0%	0	0.0%
Lack of interest in the use of new technologies	130	86.7%	20	13.3%	0	0.0%	8	100.0%

Unstable power supply	120	80.0%	30	20.0%	8	100.0%	0	0.0%
Fear of Students becoming too reliant on technology	50	33.3%	100	66.7%	0	0.0%	8	100.0%
Problems with access to hardware	90	60.0%	60	40.0%	8	100.0%	0	0.0%

Source: Researcher (2017)

The study found that all student teachers' lack of access to technology was a major setback to its use for teaching and learning, as indicated by all the respondents (100 % for both student teachers and tutors). Further, it emerged that lack of administrative support was also a significant challenge, as reported by the majority of the student teachers (86.7%) and all the tutors (100%). Similarly, lack of workshops and seminars (93.3% for student-teachers) and unstable power supply (electricity) (80% for student-teachers) were found to significantly affect the use of technology as supported by all the tutors (100%).

Based on the views of the music tutors, lack of funding for hardware (100%), lack of technical issues (100%), and problems with access to the hardware (100%) were significant challenges to the use of technology in music education as indicated by all the tutors. However, the student teachers did not see these as major problems, with 60% showing lack of funding for hardware, 53.3% lack of technical issues, and 60% problems with access to hardware as barriers to use of technology in the learning of music.

The study also found conflicting views from student teachers and music tutors regarding other challenges. Particularly, whereas student teachers indicated that lack of

enough time to prepare for the music sessions (93.3%) was a challenge in using technology in learning music, the tutors unanimously disagree (100%) that lack of enough time to prepare hinders them from using technology in the teaching of music. Similarly, student teachers indicated that lack of interest in technologies (86.7%) is a challenge in using technology in music education, unanimously disputed (100%) view by tutors. The fear that the student teachers will over-rely on technology was found not to be a challenge, as reported by both student teachers (66.7%) and music tutors (100%) who disagreed that students could become too reliant on technology.

The principals were also interviewed to find out the challenges they face in providing adequate technological tools for teaching and learning music in their respective colleges. Among the challenges cited included lack of funding (100%), rapid changes in technology are difficult to cope with (100%). One of the principals indicated.

“Music requires a lot of commitment and hence needs a lot of time from the students and the tutors to be able to explore the new technologies available. There are many challenges in terms of finances where the institutions lack the required finances to enhance the equipment in the music classes, employ more tutors to efficiently handle the subject, generally having this subject is a bit expensive (14th July 2018)”

This shows that besides finances, there are other limitations to technology use in the teaching and learning of music. Together with the learners, the principals need to put in place appropriate strategies to counter these changes. The results show that the major challenge hindering the use of these technologies is a lack of finances. With finances,

the institutions can effectively adopt the use and buy the required technologies and higher, more specialized tutors other than wait for TSC to send a tutor, sponsor the tutors, and develop their skills. Lack of staffing was seen as a key factor affecting the use of these technologies in teaching and learning music. The few tutors available cannot handle all the student teachers to be highly effective in using these technologies if the BOM does not agree to hire higher teachers to support the program. There is also laxity on the side of the management in most colleges; they seem not to have emphasized the teaching of music.

4.7 Possible Solutions to the Challenges Faced on the Use of Technology

In the fourth objective, the researcher sought to explore possible solutions to the challenges faced on the use of technology in primary teachers' training colleges as mentioned in subsection 4.6. The opinion was given word for word by the tutors, who noted that enough funds for purchase of the technological devices ought to be provided as well as administrative support to ensure availability of the technology for use. This emerged as indicated by one of the tutors who said that,

"The college administration should provide support and funds for the purchase of adequate and required technology to be used in a modern music classroom. This will ensure that students can efficiently and sufficiently access the equipment during their learning process. [Student-teacher 47: 12th July 2018]"

A similar opinion was also presented by the Music tutors who perceive funding and administrative support a challenge in their use of technology where one of them said that:

“Providing adequate funds will enable the colleges to acquire modern technology and equipment relevant for learning the subject. This is only possible through a committed administrative support which seeks information on the need, suitability, and availability of technology for use in learning Music. [Interview Tutor 2: 14th July 2018]”

Similarly, Mills and Murray (2000) underscore that buying, installing, and training of teachers is essential for the introduction and effective use of technology in music teacher education.

Further, the student teachers reported that there should be training to facilitate effective and efficient use of technologies and training on the use of available technologies. This, they indicated should be done through seminars and workshops on Music and technology.

One of the student teachers had this to say regarding training:

“There is need to offer tailored training to facilitators and tutors on the available technology and their use in the teaching of Music. Moreover, orientation and training should be given to music student teachers on the use of technology. This will boost the confidence among tutors and the student teachers to embrace technology in routine teaching and learning of the subject. Regular seminars and workshops on Music and technology will popularise the use of technology in primary teacher education. [Student-teacher 21: 12th July 2018].”

The study found out that electricity is a requirement for operation of some technological equipment in the learning of Music in primary teacher education colleges. However, availability of electricity in some areas limited the use of such technology. Thus, the student teachers indicated that there is need to provide electricity in some areas.

In an interview with the principals, it was noted that the government needs to support the teachers' colleges to equip their music labs so that more students can be encouraged to take up the music option and pursue it as a career in their teaching. Funds should be made available to take the teachers to workshops to learn more on how to use technology in teaching of music. They also suggested that more music teachers are required to effectively handle the growing number of student teachers who are interested in taking music as an option. This can be achieved by the BOM being requested to help higher new teachers instead of waiting for TSC to send the teachers. This can assist to decongest the classes and help the students to effectively master the concepts from a practical perspective other than having very few hours because there is no instructor to take them through the practicals.

The principals also noted that the though technology is changing so fast which may make it difficult for the institutions to cope and adopt each time, there is need to have software's and hard wares tailored for the teaching professionals to use to avoid replacing the entire systems when new technology is invented. The principals also indicated that hardware's should be made in such a way as to accommodate any new software and systems changes to reduce the cost of buying new equipment's.

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.1 Introduction

This chapter presents the discussions of the research findings. The study objectives provide a framework for the discussions of the findings. The chapter also gives the information on the demographic characteristics of respondents.

5.2 Demographic Characteristics of Respondents

The results from 4.3.2 indicated that the majority of the music tutors and principals were males. This shows that the teaching profession in PTTCs in Kisii County is male-dominated, implying that female participation among these educators in this study was low. Regarding the age factor, which directly affects technology use, the findings show that all the student teachers were below the age of 35years. This implies that these respondents are younger and have grown up with technology. They are more comfortable interacting with it since their lives revolve around technology, from the internet and social media to phones, apps, games, television, and other types of technology. Kastuhandani (2014) noted these learners are called 'digital natives, a term that has been coined to refer to someone who grows up using technology and who thus feels comfortable and confident with it. The use of technology is a way to bring the outside world into the classroom. KnowingTech (2015) affirmed that students in this age bracket would easily use technology to access various educational resources that inspire creativity, critical thinking, communication, and collaboration.

Since technology is ever-evolving and each digital generation adapts to these advancements very fast, the older generations, on the other hand, are deemed to be more hesitant about using some recently invented technologies. They may need more time than the younger generation to slowly learn and incorporate these technologies in music teaching. This concurs with Katitia (2015), who established that 21st-century teachers need to be familiar with the new technology to incorporate it into the teaching and learning process.

Although we speak about the "digital divide" to describe the differences in the level of technology use by younger and older people, Kastuhandani (2014) observed that while it is true that older adults use digital technology less than younger generations, many are eager to learn. Technological progress is constant, forcing people to adapt to "what is new". This undoubtedly brings challenges for a generation born outside of the digitalized world. This suggests that music tutors must be conversant with the technological trends in the 21st century, both the existing and newly innovated ones relevant for teaching and learning music.

Technology use is further influenced by various factors, such as the level of education and the teaching experience of the respondents. The study findings revealed that all the music tutors and principals had attained a bachelor's degree, which is the minimum academic qualification required to teach at any primary teachers training college level in line with the standards set by the Ministry of Education of Kenya. Some of the respondents who had attained a master's degree were an indication that they had advanced knowledge in their teaching profession. The respondents also attended some

seminars and workshops on the use of technology to improve their music teaching and learning skills and knowledge.

Teaching experience is an essential component of technology usage in music education. The use of prior knowledge and experiences with technology can be used to facilitate music learning. In an earlier study, Gorder (2008) reported that technology use significantly correlates with teachers teaching experience. From the findings of this research (4.3.5), most of the respondents had a teaching experience of over 5 years, except for the student teachers who had only carried out their teaching practice. Therefore, most respondents have interreacted with the various technologies required for music education in PTTCs. Tutors with more teaching experience may have been in their professional careers longer and will likely have used some technologies in music education. However, some may not have interacted with those technologies that may not have existed during their college training, especially the recently invented 'digital technologies. This, therefore, justifies the need for training (4.3.4) to keep current with emerging trends in technology for music education.

5.3 Available Technology for Use in Music Education in PTTCs

Availability of a technology is one of the prerequisites for its use in music teaching and learning processes. The primary goal of using the available technology in music education is to aid the teacher in presenting and transmitting the required musical content and realizing the objectives while also facilitating learners in the acquisition of skills, knowledge, and attitudes needed in the 21st century digital age.

In this study's findings, the available non-electronic technologies which were also adequately utilized for music education in PTTCs in Kisii County, as indicated in (Table 4.2) were; the chalkboards (100%), Flip charts 90%, and local resources (100%). From the findings, it can be deduced that the chalkboards are readily available and accessible for music education in PTTCs in Kisii County. The findings divulge that the availability and use of the chalkboard in PPTCs in this era make it one of the oldest technologies to be used in music education. Karpf (2012) affirms that the use of the chalkboard has remained one of the oldest, most available, and essential technology for music education since its invention by Scottish teacher James Pillans (1778–1864).

While many teachers have gone modern and replaced chalkboards with whiteboards, many still prefer chalkboards in the 21st century, as is evidenced in the current study. Therefore, the findings concur with those of Fowler (2018), who notes that chalkboards far outnumber whiteboards in many developing countries because they are easier to access. They are very popular in education segments because the running cost of chalkboards is much less expensive than markerboards or glass boards. Chalk is also less expensive than markers. According to an earlier study by Zhao (2003), simpler technologies that only required minimal adjustments to already defined processes were more frequently utilized in educational settings. The 100% support for the use of the chalkboard in PTTCs, as indicated in this research, could be attributed to its simplicity, affordability, and low maintenance. An earlier study by Krause (2000) designate that chalkboards are easy to operate. They are cheap, low-maintenance, and long-lasting. They are simple to use, flexible in application, and extremely reliable.

Additionally, the results also reflected Karpf (2012) who notes that chalkboards provide teachers with an effective and simple means of displaying music reading exercises before their students; aids music instruction, thereby becoming significant if an institution of learning cannot afford to provide books, music, or staff paper for each student. Secondly, allowing music instruction to move from strictly oral and rote strategies to include the integration of visual learning. Thirdly, students transformed from passive to active learners by working on music activities on the chalkboard. Fourthly, by using the chalkboard, students became more confident music learners. And finally, chalkboards inspire creativity and imagination in the classroom from teachers and students.

Flip charts, like chalkboards, were also available and mostly used (90%) in PTTCs in music education, as is evident from (Table 4.2). From the results, Flip charts are deemed common in music education in PTTCs because they allow a certain amount of spontaneity and give the music a visual representation, just like the chalkboard, making them feasible for music education. Flip charts also allow teachers to easily deliver their music presentations and aid students in comprehending and analyzing the material. They are also used to report back from groups, brainstorm, or record key points. Flipcharts are reliable and can be used for filling in the PowerPoint presentation after a power outage. Further, they don't require special skills to use them. Therefore, it is one of music education's basic and simplest resources. Aziz (2020) affirmed this, who explained that the Flipchart medium is simple, economical, easily obtained materials, can convey summaries and can overcome space and time limitations without requiring special equipment and easy placement. These factors may have contributed to the

majority (90%) indicating Flipcharts are available and used in music education in PTTCs.

Moreover, this study affirms Janel (2018), who indicated that a flipchart is frequently used in learning institutions due to its simplicity in introducing a new as well as a closing song in a music and dance lesson. It is also a great way to refresh a song one learned previously. Because of their simplicity and affordability, flipcharts are considered handy for student-teachers who are in for their teaching practice in PTTCs since they can be prepared earlier. Similarly, Laskowski (2012) illustrated four main reasons why flipcharts are prevalent: First, Flip charts do not need electricity; You don't need to worry if the bulb will burn out or you forgot the extension cord. Secondly, Flip charts are economical – They do not require you to use any special films or printers to produce them. Thirdly, colour can be added very easily; An inexpensive box of flip chart markers allows you all the creativity you want. Lastly, Flip charts allow spontaneity; Any last-minute changes can be easily made. Therefore, a flipchart still remains is one of the teaching/learning resources used in PTTCs in the twenty-first century to improve student learning outcomes. Students learn more effectively when they hear the lesson, read the message, and see an illustration simultaneously.

The availability and use of local resources, as indicated by all the respondents (100%), reveal its significance in music education in PTTCs in Kisii County. It is also an affirmation that despite modern technology, local resources are still incorporated for teaching and learning music. The presence and use of local resources in music education in PTTCs in Kisii County implicitly aid in developing knowledge and skills about some traditional/local musical instruments, for example; the chordophones

(stringed instruments), Bowed stringed instruments Plucked stringed instruments, Aerophones (Wind instruments), Membranophones (Skinned instruments), Ideophones (Instruments that strike their bodies) as classified by Kavyu, (1991). Hence promoting and enhancing the unique and varied cultures of the people of Kenya, which is in tandem with Kenya's national goals of education, number six; education should promote respect for and development of Kenya's rich and varied cultures (MoEST, 2015).

From the findings, Radios and TVs/Videos were not accessible to student teachers but only to tutors and, thus, were not used in music education, implying that PTTCs may have purchased these devices but were not intended for music teaching and learning. Using these devices in music education, specifically the TVs, could easily have filled the gap in building competence, especially in concepts involving processes and procedures that would not be delivered effectively using text or audio as they apply more to the visual (Njuguna& Gitabi, 2012). Further, Kenya's Education Broadcast Channel, launched in 2010, broadcasts education direct class teaching, including interactive radio instruction and televised lessons. This education channel targets learners and teachers, becoming complementary teaching and learning resources. Additionally, Njuguna& Gitabi (2012) note that television contributes to positive and enhanced educational content delivery methods, methodology, pedagogical skills, and expanding the teaching and learning knowledge base. It is evident, therefore, that PTTCs in Kisii County lack an essential technology which, according to KnowingTech (2015), has been used in education since the early 20th century.

The study also found that the technological resources available and used in music education in PTTCs included; audio CDs/DVDs, music recorders, and piano/keyboards (Table 4.2). These technologies store audio, music, video, and data. CDs and DVDs are integral and universally accepted data formats. Digital Versatile Disc or Digital Video Disc (DVD) is similar to a Compact Disc (CD) in that you can only read data from it. Though 60% of the respondents indicated that these technological devices were available and used in music education in PTTCs in Kisii Country, 40% indicated otherwise. They may have been using other technical gadgets available in this digital age. It is worth noting that CDs introduce learners to different styles of music, expanding their exposure through listening.

On the other hand, DVDs offer visual instruction, particularly for those learning an instrument, such as recorders and pianos/keyboards. They instruct beginners on the basics or new playing methods and techniques. Students' interests and specific needs can be attended to using these interactive tools, so long as the content is programmed & selected according to the primary teachers' training curriculum. Subsequently, technology may be used for a practical purpose and should be relevant and interactive to the coursework (Mcneely, 2019); Music is a visual and audio experience; therefore, recorded music can be appropriate for students' engagement in music and dance lesson. Audio/Video recordings of musicians, perhaps with dancers performing, can be stored on CDs and DVDs and used in music education. Music stored in these devices can be accessed through a computer, enabling student teachers to use them whenever they need them. Cognizant of the benefits of the CDs and DVDs, as shown in the forgoing discussion, may have prompted the use of these technologies, as indicated by most of the respondents in PTTCs in Kisii County.

Concerning the availability and use of records and pianos/electric keyboards, most of the respondents, as shown in Table 4.2, agreed that they were used in music education in PTTCs. The results were similar to Akuno's (2018) findings, which indicated that recorders and electronic keyboards are commonly used technology in schools for teaching and learning performers' skills and demonstrating different scales. The availability and use of pianos/ electric keyboards are aligned to the content of a specific music lesson. For example, Pianos/electric keyboards are important for pitching and accompaniment when learning and performing songs. Students can practice outside classroom lessons on how to sight play music in different keys and work on the correct interpretation of rhythm. Pianos/electric keyboards are also available to teachers for practice before music lessons.

The study's findings showed that the recorders were easily accessible and were utilized in music education in PTTCs. Recorders are probably the simplest, most accessible yet very effective melodic instruments appropriate for use in early music education. They aid in teaching essential music fundamentals, particularly sight reading, while acquiring rudimentary performance skills, including breathing, listening, pitch control, and rhythm Sianagowa, (n.d.). The current use of the recorder in PTTCs suggests that it is one of the ancient technologies utilized in music. Over the centuries, the recorder has enjoyed an explosion of popularity may be due to its simplicity and accessibility, as Scheibe (2016) notes; during the Middle Ages and beyond, the recorder remained extremely popular, and despite its reputation as an amateur instrument, it has been used by many notable composers, including Handel, Vivaldi, and Leonard Bernstein.

The availability and use of the recorder in PTTCs in the 21st Century is an indication that it is still suitable for music education, and its potential continues to be explored.

Some suggested reasons for continuous use of a recorder today in PTTCs are; it less expensive. While most PTTCs are likely not to purchase band or orchestra instruments for every student, they may budget for the tutors while each student-teacher purchases their recorders. For students who learn best with hands-on activities or are more motivated by instruments, having a recorder of their own can be so valuable. Playing the recorder helps build up their inner hearing, which will help them in other aspects of music class. Recorders also provide opportunities for live performances in and out of classroom lessons. It is a built-in way to incorporate live performances, moving music lessons from teacher to student-centered. This concept aligns well with the current education system curriculum, which is slowly being transformed from being teacher-centered to a student-centered curriculum with a Competency-Based Curriculum (Ndiritu, 2020). In summary, the availability and use of recorders are beneficial to both the student teachers and tutors in the teaching and learning music in PTTCs.

In learning institutions, cell phones have had a turbulent history. When students initially began bringing them to class, educators were almost unanimous in their opposition to the devices, claiming that they were a distraction and a tool for easy cheating. However, Smartphones/mobile phones are gradually becoming an engaging learning tool that can be used to improve teaching and learning of music in PTTCs, as is evident from the results of this study. This is deemed to follow the dramatic rise in smartphone/mobile penetration in sub-Saharan Africa; as Elliott (2019) reported, "African adults' mobile phones, with 51% of adults owning smartphones and the remaining 40% percent owning standard cell phones. Ghana has an 80% ownership rate, and Senegal follows closely behind with a 79% ownership rate, with 34% of adults owning a smartphone

and 46% of adults owning a standard smartphone. Nigeria and Kenya also had an 80% ownership rate." Additionally, Adjei (2019) observed that globally the development of smartphones/mobile phones and related devices has fundamentally transformed teaching and learning in developed and developing countries today.

Mobile devices offer access to music educational content as well as one of the primary ways that students-teachers interact with and learn from each other. Tutors and their students are deemed to make use of the device as learning and support technology frequently to access music class materials, quickly accessing information online to suit their information demands, to name a few. Subsequently, as Ehnle (2020) affirms, smartphones provide limitless opportunities for increasing student engagement, improving student knowledge, and extending learning beyond the classroom. It also offers an easy way for teachers to "facilitate and inspire student learning and creativity" while increasing motivation. The goal is to give students ways to use the technology to learn, collaborate, share, and create meaningful ways.

Concerning the computers/laptops, and overhead projectors, the results of the study showed that they were not adequately available for use in teaching/learning music. One of the music tutors, in an interview, observed that:

"In the institution, there is only one projector and a computer that we can use in the teaching of Music. This is limited since many classes and sessions require projectors and computers. Additionally, student teachers cannot adequately access these items due to the large number of the student teachers hence the need for more projectors and computers in the primary teacher training colleges [Interview Tutor 2: 15th July 2018]".

These findings can be construed to mean that the inadequacy of computers/laptops and overhead projectors for use in teaching and learning music is due to insufficient funding for the purchase of the same, which is a major challenge for most PTTCs in Kisii County. Student teachers learn how to integrate technology into their teaching during their training, which is the most critical step. Therefore, having the necessary technology available for use is considered an essential factor since the knowledge, skills, and attitudes acquired during this stage will enable them to apply the same when teaching their primary school learners.

On the other hand, only a few computers/laptops in PTTCs could be attributed to students having smartphones that are almost mini-computers that can be used to download and play videos that are carefully selected according to the music content outlined in PTTCs curriculum. They can also use this technology to type and document their class or project work, among other uses of the phone, for purposes of learning music. Nevertheless, while mobile devices have great potential to make learning easier due to easy access to required information, computers/laptops and overhead projectors in PTTCs, are still of great importance, primarily when they are used alongside these new technologies. Computers/laptops and overhead projectors empower music tutors to prepare and deliver content directly to the learners. Student teachers, on their part, are deemed to be lacking an essential resource for music learning. Music software such as noteworthy composer, finale, Sebelius is programmed and used from computers/laptops. It can benefit students in writing music notes, harmony studies, hearing works, writing, and listening to works that cannot be accessed in their recordings, symphonic workshops, and arranging studies.

Thus overall, the study found that chalkboards, local resources, flip charts, audio CDs, recorders, and keyboards were sufficiently available and used in teaching and learning music. However, teachers must strive to select the most appropriate learning technologies that will motivate students and enable the delivery of content in the best and simplest way possible to achieve the desired learning objectives. Still, some essential technologies like TVs/videos, overhead projects, and computers are not adequately available, affecting their use in the teaching and learning of music in colleges. These technologies have been gradually developed and used in music education over time, some which were commonly used years back, like a chalkboard, flipcharts have continued to be used, while others have been replaced with new ones, for example, radios, CDs/DVDs are being used alongside mobile devices.

The change and continuity in technological use for music education imply that change in teaching/learning methods/approaches is inevitable for effective music lessons in PTTCs. For example, the availability of recorders calls for a demonstration lesson on how to handle it and eventually how to play it. On the other hand, its absence changes lessons to discussion or lecture methods. Bakir (2016) observed that institutions of learning had modified their approach to teaching and the methods used to enhance student learning over time following rapid technological innovations.

Technology offers teachers and students a wide range of possibilities and applications in music educational settings, facilitating effective and continuous learning by supporting the attainment of the various goals and objectives of teaching. Nonetheless, what is most often important is choosing the kind of technology linked to the curriculum

in place. The findings of this study also support the argument of Kentaro (2015), who indicated that the use of technology in the teaching profession has had a great development for the students as well as teachers in their teaching profession. Though technology is a constantly evolving process, it has been noted to assist the teachers and students improve their instructional and learning.

A study by Downes and Bishop (2010) also established a similar view. They found that teachers and students strongly feel that technology is an essential learning component because it assists with engagement, makes music education relevant to students' lives, and serves as an inspiring force. Other similar earlier studies have established a relationship between digital integration and enhancing the teaching and learning process in a classroom play an integral role in students' education (Culp et al., 2003).

The availability of technology makes it possible for teachers to effectively form networks to share ideas and help each other improve their teaching and learning processes (Scottish Government, 2015). According to the report, the teachers can now form links with their learners and other learning institutions through the available digital technology. However, in this research, there is no clear indication of collaboration and sharing of knowledge, skills, and resources by technology. Still, there is no indication of online collaboration between teachers in college and other learning institutions even though the various technologies can be useful for sharing among music teachers to increase the effectiveness of technology use in teaching and learning.

Younie and Leask (2013) predict challenges in knowledge sharing, collaboration, and transferability of digital media skills between teachers from different schools and their learners. This implies that as much as technology aims to enhance the teaching profession, some barriers need to be addressed to make the entire process successful. Even with some challenges notwithstanding, technology in music education is inevitable in the 21st century. Due to the importance of technology in music education, as demonstrated in the literature reviewed (2.2), identifying the possible challenges to integrating these technologies in PTTCs would be an important step in improving the quality of music teaching and learning. It is evident from the study that challenges notwithstanding, PTTCs use some of the available technologies in teaching and learning music.

Though music teachers have continuously experienced accelerated and intensive changes in the teaching and learning process due to wide-ranging technologies, nearly every aspect of the music teaching/learning process has been subject to this change over time, which is sometimes gradual and sometimes abrupt. Therefore, the process that involves some aspect of change and continuity exists to encourage the development of musical creativity, sensitivity, and potentials through active involvement in performing, composing, and listening to music. These changes are there as a result of teacher training as well as the use of modern technologies. Some of the old become outdated and are replaced by new technologies. However, not every 'old' is outdated, and not every 'new' is ideal; for example, chalkboards, one of the oldest invented devices used for teaching and learning music as previously discussed, are still utilized alongside current technology in the twenty-first century.

The use of technologies is generally critical in enhancing music teaching and learning; while technology can help with instruction, it can also help with learning. Students are more efficiently and effectively motivated when they use learning technologies since their use often evokes curiosity, providing for the more successful transmission of music and music-related content (Ganimian, J., Vegas, E., & Hess, M. 2020). Since primary teachers' training colleges help the trainee acquire the basic technological skills and competencies of a good teacher. the use of technology therefore, in PTTCs in the twenty-first century helps teachers give their students a bright technological future.

5.4 Extent of Usage of the Available Technology in PTTCs

The findings on the extent of usage of the available technology in PTTCs indicated that the primary teacher training colleges were making use of the available technologies in the teaching and learning of music. However, this use was done occasionally due to unavailability of the technology attributed to financial constraints encountered in acquiring and maintaining the technology, as reported by both student teachers and music tutors. Consistent with these findings, Kafyulilo et al. (2015) found that the unavailability of technology was a critical factor in inhibiting teachers from using technology in their instructions. On a similar note, Hyndman (2019b) revealed that the two most difficult factors affecting technology use in teaching were lack of sufficient time to prepare technology-rich lessons and lack of adequate resources. This shows that despite some technologies being available in the PTTCs, their use is not maximized due to adaptability, electrical, and convenience challenges.

Ensuring the availability of funds to purchase relevant instruments, training student teachers on how to use technology, and building music workshops would facilitate increased use of technology in music learning in PTTCs. To highlight this finding, Riegel & Tong (2018) assert that using technology is central to teacher education programs since it aids in preparing future teachers to be technology-integrated professionals in the classroom. Additionally, if student teachers graduate and enter the field unprepared to use technology for instruction effectively, they will be left with a gap to fill in terms of being prepared to teach in technologically advanced classroom environments. This agrees with the findings of Buckenmeyer (2008), who sought to assess teachers' use of instructional media; most teachers teach the same way they were trained, therefore if they are prepared to integrate digital media at their respective training institutions, the probability is high to incorporate into their classrooms effectively.

The extensive studies and findings in Kadzera (2006) provided a great basis for the current study results. The findings of Kadzera have indicated that teachers must be assisted regarding training and support for the effective use of technology instruction in the classroom. According to the study, there is more to the effective use of technology in the classroom than the training. There are other more pertinent issues to enhancing the teaching and learning using technology other than the effective integration of the technology as a fundamental part of students' teaching and learning. The fundamental issues are connectivity, access, infrastructures, and appropriate collaboration and support from the community, like parents, school management, teachers, the business sector.

This study is in concurrence with other studies that have looked into technology and its use in music education. Tess (2013), for example, found that while continuous technological developments have created resources that are used in educational contexts, they have also prompted changes in the teacher profile and role and their teaching methods. Student teachers who use technology during their training are less likely to use traditional 'transmission-method' pedagogies; learners passively receive information from the teacher, who is considered the primary information source. The use of chalkboards (100%), for example, as indicated in 4.2 of this study, implies that the traditional method is highly relied upon in PTTCs.

Additionally, teachers who use different types of software and hardware technology to teach/ learn music tend to practice more "constructivist" pedagogies where students assume more responsibility for their learning and use available technology to collect pertinent knowledge. Hence, the teacher's role shifts to a "guide on the side" to create and maintain a supportive learning environment. Integrating technology usage into the classroom serves constructivist principles. According to the constructivist view described previously in chapter two (2.7), learners build on existing knowledge. They are dependent on the relevance of instructional activity in their own lives due to their interaction with the environment. The types of technology usage correlate with teacher pedagogical philosophies. Although not all technology is used in PTTCs music education it is evident in this study that locally available resources and flipcharts as indicated in table 4.2 are employed to a greater extent. However, some of the technologies such as mobile phones radios Tv/videos are not used for music education.

The study further established that with the development of technologies, the role of the teacher had become more of facilitation in learning process. Ajjan & Hartshorne (2008) noted that parallel with information technologies, communication technologies have improved, and their role in music education has increased. Social media serves as one type of communication technology, which in education is a relatively new undertaking. Along with these developments, the rapid increase in technology, especially new music software, recording devices, and electronic instruments, generally brings the integration of technology in music education to the forefront.

Similar studies conducted to evaluate the use of technology in education have indicated that technology has not reached the expected level of usage in teaching/learning on a global level (Howie & Blignaut, 2009). There is generally an exceptionally low uptake and use of technology in education in developing countries and more so in African countries (Stols 2015). This implies that though there is a remarkable improvement in the level of use of technology in music education in PTTCs, its use is still hampered by many challenges, especially in the African continent and more so in Kenya as revealed in 4.6 of this study.

Despite the extensive use of mobile phones and computers in developing countries, notably in South Africa and Sub-Saharan Africa, the situation in some African countries is much the same. Extant socio-economic and technological challenges have limited the application of technology in many learning institutions. Therefore, it is important to note that the rapid development of technology in the last 60 years has increased the diversity of electronic and acoustic music instruments, some of which offer new

opportunities in terms of educational materials for music educators (Savage, 2007). These technologies include keyboards, computers, musical instruments, electronic keyboards, and virtual studios. The use of some of these mentioned technologies are yet to be fully included in music education in PTTCs.

Generally, the findings of this study indicate that technology has been utilized in music education to a certain extent. Therefore, there is a need to enhance technology use in teaching/learning music to improve effectiveness in the music education system. Technology increases learner involvement by expanding learners' motivation and participation, easing the acquisition of varied music skills. It also aids teacher development and improves teacher training; hence, it is essential to incorporate technology in teaching/learning music in PTTCs.

5.5 Challenges in Using Technology in Music Education in PTTCs

The study found that providing access to technology for all students was a major challenge, as indicated by all the respondents. This study's findings are consistent with Johnson, A. M., Jacovina, M. E., Russell, D. E., & Soto, C. M. (2016), who researched on "The challenges and solutions when using technologies in the classroom." They specified that teaching and learning with technological access constraints were extremely challenging. If a teacher's college, for example, lacks suitable technology and a fast internet connection, its use is not feasible. It is, therefore, a fundamental requirement for learning institutions to avail the required hardware and software for teaching and learning music, especially in the 21st century, where the use of technology is of paramount importance.

This is not the case, as most tutors find difficulty in using the technology. The government should provide enough funds to purchase sufficient and effective music equipment, supply electricity to all PPTCs and provide seminars and training workshops for music tutors to curb available challenges since Ertmer et al. (2012) indicated that the most commonly cited reason for the lack of technology application in the classroom is inadequate professional development and training.

Literature has also indicated that there are many obstacles that still define the extent to which technology is used obstacles in applying technology in higher educational settings, such as lacking awareness of how ICT can benefit education, appropriate physical equipment/facilities, and teachers professionally trained in ICT, technology readiness, as well as budgetary constraints (Aksal & Gazi, 2015; Heyberi, 2013; Tenekeci, 2011). There are also restricted ICT infrastructure services and the high cost of developing infrastructure, teacher support and training procedures, and internet connectivity. This shows that there is goodwill in enhancing the use of technology in the teaching profession, not just in the teaching of music. Still, the systems are mired with many challenges that make it very difficult for the schools to adapt to the application of the systems in the teaching profession.

The findings of this study also corroborate with the findings of Akubuilu (2005) in his study conducted in Nigeria among secondary schools. In this study it was noted that among the major challenges facing the use of technology in teaching is the lack of availability, acceptability, and accessibility of these technologies by teachers, students, and administrators. It was also noted that lack of knowledge about the current best

practices, the motivation to make changes involved in their adoption, the lack of skills and the lack of time by the tutors to explore new skills in utilization of technologies are serious barriers to the use of technologies in teaching music.

Despite the many changes that have been highlighted in the use of technology in teaching and learning of music in PTTCs. The findings from various studies have been congruent in the sense that, they have all indicted that music allows a more efficient instruction of basic music fundamentals using practice and drill type scenarios that create a strong knowledge of rhythm and note recognition. Technology allows easier creation of handouts and presentations that can further aid in the instruction of any musical idiom.

Despite the improvement in technology and presence of electronic like mobile phones, the impact of this technology is not only effective but also helpful in education. Technology has made it easy for learners to acquire instructions and learn in a good environment. The same technology has made music instructors have some easy time in teaching the students. Technology has helped academicians carry more research on many sectors including the music one. This makes advancements in the music education. Again, with technology there is good quality and reliable work from students. Considering that they can learn from home and also complete assignments in time. Technological software like pitch and rhythm software help students in clearly understanding and finetuning music. With technology its possible to acquire less expensive music instruments depending on the budget. The small budgets for example can aquire keyboards and base amplified guitars which are comparable to expensive

pianos and which may contain double bases. It's because of technology small budgets can make it in music industry just the same way as the big budgets.

It is important to note that based on the Musicians' self-rated skills with smart phones, laptops, and desktop computers, studies have indicated that the use of technology is expected to expand beyond traditional audio and video recording devices, and most musicians reported using classic music technologies on smart phones and tablets rather than bespoke devices. However, this comfort with and access to new technology, availability reported within one-to-one lessons was half of that within practice sessions, while a large percentage of musicians actively recorded their playing, these recordings were not frequently reviewed. Our results highlight opportunities for technology to take a greater role in improving music learning through enhanced student-teacher interaction and by facilitating self-regulated learning.

The traditional models of learning music can give the impression of a rarefied culture resistant to change. The present study suggests that this is not the case. We found that technology use is being actively pursued and demanded by a population of musicians with a high degree of technological aptitude, one that particularly favors mobile devices over bespoke equipment to record audio and video or to set metronomic time. Technology, in addition to its role as a tool to network and communicate, is being used to enhance the development of technical and musical skills. However, gaps remain in technology use, particularly for aspects relating to kinematics such as posture and the avoidance of injury.

Music teachers are making use of technologies to communicate with and organize time with their students, though more research is required to reveal how technology is being employed within the teaching studio and what innovations may be possible therein. New technologies, through advanced and interactive systems of behavioral analysis and feedback, have the potential to enhance communication, efficiency, efficacy, and healthy practice in music learning. By understanding the challenges faced and attitudes held by musicians that may be impeding the take-up of such systems, researchers and designers will be able to develop genuinely useful technologies for the next generation of performers, teachers will be able to enhance the feedback they can give in their classrooms and studios, and musicians will be able to expand their toolkit to build the full range of skills required for their art and their careers.

Despite all these challenges, institutions can still enhance their adoption and utilization of certain strategies that can enhance their adoption of technology. There is a need to ensure that institutions' access to modern technology should be enhanced through institutions' policy to provide and have free access to these technologies by the tutors and the student teachers. The government should design and develop an inservice training programme for music educators to enhance the professional skills of music teachers and develop their abilities to design didactic plans according to the needs of the youths and the available technology.

Though the study has established that among the challenges facing the availability of technology in PTTCs, particularly in the teaching profession, is poverty, some developing countries like Malawi are making great strides in incorporating an effective

ICT policy in their education system. In a study by Shaffika (2007) conducted in Malawi, "despite being poor, the Malawi government launched a national ICT policy with the aim of promoting the use of Information Communications and Technologies in colleges, information services, and integrated library and networks." This implies that countries can make a difference despite their economic status; they can afford to enhance their education system by adapting to technology that can effectively help them improve learners' performance in learning institutions.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter presents a summary of the main findings. It also presents conclusions and recommendations on the use of technology in music education. The chapter also gives suggestions for further study.

6.2 Summary of the Study

Over years, technology has been utilized in educational institutions. The effectiveness of such technology is largely necessitated by the ability of teachers to operate and use them effectively in teaching environments. During their training, student-teachers, therefore, need to also learn how to use such technologies for the sake of effective delivery of content in future. As times change, so do technological innovations.

This study was premised on the assumption that not many teacher training colleges are developing as does technologies of the world. It was essential therefore to find out how technology is used in PTTCs. The study was conducted and established that most technologies were unavailable for use in the PTTCs and the available ones were less frequently used.

6.2.1 Summary of findings of the Available Technology for Use in PTTCs

Based on the first objective, the study found that various available technologies for use in the teaching and learning of music. Include audio CDs, recorders and pianos/ keyboards were significantly available. The study also found that overhead projectors and computers/laptops were slightly available for use in learning of music. As for

TV/Videos, they were found to be available in some of the PTTC and accessible to some of the tutors and thus, are not effectively used in the teaching of music.

6.2.2 Summary of findings of the Level of Usage of Technology in PTTCs

The study found that some of the available technologies were frequently used in the teaching of music in the PTTCs. The study also found that the most used technology in music education was Piano/Keyboard with technology such as chalkboard, pianos local resources are used frequently. The study established that the reason for using some of the available technologies only sometimes was that the technologies were not always available due to financial constraints encountered in acquiring and maintaining the technology.

6.2.3 Summary of findings of Challenges in Using Technology in Music Education in PTTCs

The study found that providing access of the available technology for all students was a major challenge while administrative support was also a significant challenge. The study also found that lack of workshops and seminars and, electricity not being available sometimes significantly affects the use of technology. The study also found that music tutors see funding for hardware, technical issues and problems with access to hardware as significant challenges to use of technology in teaching of music, although student teachers do not see these as major problems. On the contrary, the study found that student teachers believe that lack of enough time to prepare and keeping abreast of new technologies was a challenge in using technology although music tutors disagree. Overreliance on technology was found not to be a challengee in the use of technology in the teaching and learning of music due to limited availability of the technology.

6.2.4 Possible Solutions to Challenges Faced on the Use of Technology in PTTCs

On the fourth objective, the study sought to assess the possible challenges in the use of technology in teaching music education at PTTCs. The study found that funding for purchase of the equipment was lacking in most institutions, there was also lack of a supportive administration to ensure availability of the technology for use in teaching and learning music. Further, the study established that there should be training to facilitate effective and efficient use of technology in the teaching and learning of music. For efficient use of the available technology, the study established that there was lack of appropriate electricity coverage electricity in some key areas to enhance the teaching and learning of music.

6.3 Conclusions

Based on the findings, the study concluded that various technologies are used in music education in PTTCs, despite financial constraints hampering adequate acquisition and maintenance. According to all the respondents, some of the technologies that were available and commonly used to a larger extent in PTTCs in music education were chalkboards, flipcharts, recorders, and piano/electric keyboards. Others were local resources and Audio CDs/DVDs. Radios were not used in music education, while overhead projectors and computers were partly used in music education in PTTCs.

Researchers have highlighted the benefits of using technology in music education over time; this study concluded that there are still many newly invented technologies that were widely inaccessible and therefore not used in music education, hindering the higher achievement of such benefits in PTTCs. Consequently, there is a need to expose student-teachers to all types of technologies pertinent to music education throughout

their pre-service training in order to support their present and future use in a 21st-century education system in which the use of technology in music education is essential. Therefore, tutors need to reassess the use of technology for music education and continually engage with new innovations to remain current and maintain global technological standards in music education.

6.4 Recommendations

The following recommendations were made for policy and practice in using technology in music education.

- i) Since the study found inadequate funding for technology acquisition, primary teachers' training colleges should set aside adequate funds to purchase required equipment and provide sufficient administrative support to ensure the availability of the technology for use.
- ii) The study established inadequacy among teachers to use some technologies; thus, the ministry of education should organize training seminars for music tutors on the available technology and use of such technologies to facilitate the uptake of technology in music education.
- iii) The music teachers are to be trained on the effective utilization of technologies to motivate the student's interest in music education. The evidence of the technologies' potential is most visible when one considers how the new technologies have enhanced how people perform, compose, share and distribute their music.
- iv) There should be appropriate financing for the technology adoption among the colleges to ensure that both the tutors and the student teachers explore modern approaches to music education. This is expected to motivate the students to study music education.

6.5 Suggestions for Further Studies

The present study focused on the existing technology and its use in the teaching and learning of music in primary teacher training colleges. The study established the existing technologies and the extent they are used in teacher training colleges in Kisii County, Kenya. However, the study did not investigate the effect of technology on student performance in music as a subject.

Consequently, the study recommends that research be conducted to establish the effect of using various technologies in performance in music as a subject in primary school teacher training colleges.

Future research should expand on these findings by exploring deeper the reasons for and processes by which musicians choose the technology they use and the innovative ways they incorporate them into their pedagogy. This work could also examine the degree to which musicians continue to use technology once it has been adapted, as continued satisfaction with technology and the potential negative effects of overhyped and under-delivered features are powerful drivers of and barriers to continued technology engagement.

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APPENDICES

Appendix 1: Letter of Introduction

I am a postgraduate student at the Technical University of Kenya pursuing Masters of Music in Music Education in the School of Creative Arts and Technologies, Department of Music and Performing Arts. The purpose of this questionnaire is to enable me to evaluate the use of technology in primary school music teacher education in selected institutions in Kenya.

You are encouraged to answer all the questions with honest because your responses are very important to the study. Your answers will be treated with confidentiality and used only for the objectives of this study. However, the results of the study will be aggregated and published as a masters' thesis and may be shared with the public. Do not write your name or sign on the questionnaire.

Thank you very much for accepting to participate in this study.

Sambu Alice (Sr)

Appendix 2: Questionnaire for Student-Teachers

SECTION A: Demographic Information

INSTRUCTIONS

Please tick (✓) where appropriate and where an explanation is required use the spaces provided.

1. Gender: Male [] Female []
2. Age: 20-29 [] 30-39 [] above 40 []
3. No. of teaching practices carried out 1 [] 2 [] 3 []
4. Subject Area: Option A [] Option B []

SECTION B

1 a) Identify technologies available and use in PTTCs for teaching/learning music?

Please tick (✓) where appropriate

TECHNOLOGIES USED IN MUSIC LESSONS	YES	NO
Chalk board		
Overhead projectors		
Computers/Laptops		
Flip charts		
TVs		
Audio CD /DVDs		
Radios		
Pianos/Keyboards		
Recorder		
Local resources		
Smartphone/mobile phones		

Any other

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b. How often are these technologies utilized in music education lessons?

1. Frequently used [] 2. Sometimes [] 3. Not used []

c. If your answer in **b** above is **No 3** what could be some of the reasons for not using technology in music education lessons?

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d. Which technology is most used in music education lessons in your class?

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e. What technologies would you like to use in your class that aren't currently used?

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f. What do you think would improve your use of technology in your music education classes in primary schools in future?

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2. Identify factors that influence the use of technology in music education lessons

Please tick (✓) where appropriate

Factors	YES	NO
Availability of technology		
Accessibility		
Competence		
Professional development		
Technical assistance		
Training		
Administrative support		
Personal interest in instructional technology		
Workshop and seminars		

Any other factor

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3. In your opinion what are the challenges or barriers to using technology in music teaching and learning in primary school teacher education?

Challenges or barriers to use of technology in music education	YES	NO
Funding for hardware		
Providing access for all students		
Technical issues		
Lack of enough time to prepare		
Training to use technology		
Administrative support		
Personal interest in instructional technology		
Lack of workshop and seminars		

Keeping abreast of new technologies		
Electricity sometimes off/not available		
Students can become too reliant on technology		
Problems with access to hardware		
Over reliance on technology		

Any other challenge or barrier.....

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5. In your opinion what are the possible solutions to the challenges faced on the use of technology in primary school teacher education?

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Appendix 3: Questionnaire for Tutors

I am a postgraduate student at the Technical University of Kenya pursuing Masters of Music in Music Education in the School of Creative Arts and Technologies, Department of Music and Performing Arts. The purpose of this questionnaire is to enable the researcher to evaluate the use of technology in primary school music teacher education in selected institutions in Kenya.

You are encouraged to answer all the questions because your responses are very important to the study. Your answers will be treated with confidentiality and used for this study; however, the results of the study will be aggregated and published as a masters' thesis and may be shared with the public. Do not write your name or sign on the questionnaire.

Thank you very much for accepting to participate in this study.

Sambu Alice (Sr)

INSTRUCTIONS

Please tick (✓) where appropriate and where an explanation is required use the spaces provided.

SECTION A: Demographic Information

Please tick (✓) where appropriate

1. Gender: Male ☐ Female ☐
2. Age: 20-29 ☐ 30-39 ☐ above 40 ☐
3. What is your highest academic qualification? Diploma ☐ Bachelor ☐ Masters ☐ PhD ☐
4. Teaching Subject Area:
5. How many years of teaching experience do you have?
6. What category is your Institution? Private ☐ Public ☐

SECTION B

1 a) Identify technologies available and in use in primary school music teacher education?

Please tick (✓) where appropriate

TECHNOLOGIES USED IN MUSIC LESSONS	YES	NO
Chalk board		
Overhead projectors		
Computers/Laptops		
Flip charts		
TV/Videos		
Audio CD/DVD		
Radios		
Pianos/Keyboards		
Recorder		
Local resources		
Smartphone/mobile phones		

Any other

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b. How often are these technologies utilized in music education lessons?

1. Frequently used []

2. Sometimes []

3. Not used []

c. Which technology is most used in music education lessons in your class?

.....

d. If your answer is **No 3** in **b** above what could be some of the reasons for not using technology in music education lessons?

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e. What technologies would you like to use in your class that aren't currently used?

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f. What do you think would improve your use of technology in your music education classes in primary schools in future?

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2. Identify the factors that influence the use of technology in music education lessons?

Please tick (✓) where appropriate

Factors influencing the use of technology in music lessons	YES	NO
Availability of technology		
Accessibility		
Competence		
Professional development		
Technical assistance		
Training		
Administrative support		
Personal interest in instructional technology		
Workshop and seminars		

Any other factor

3. What are the challenges or barriers to using technology in music teaching and learning in primary school teacher education?

Factors influencing the use of technology in music lessons	YES	NO
Funding for hardware		
Providing access for all students		
Technical issues		
Lack of time to prepare		
Training to use technology		
Administrative support		
Personal interest in instructional technology		
Lack of workshop and seminars		
Keeping abreast of new technologies		
Electricity sometimes off		
Students can become too reliant on technology		
Problems with access to hardware		

Any other factor

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6. In your opinion what are the possible solutions to the challenges faced in the use of technology in primary school teacher education?

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Appendix 4: In-depth Interview Guide for Music Tutors and Principals

Guiding Questions

- Tell me a little bit about yourself, and this primary teacher education institution - for example, how many music classes are there and how times is music taught?
- What technological devices do you use on a regular basis for instructions?
- How would you describe your feelings about the use technology in your institution?
- What technological teaching and learning resources are available in your institution for teaching music?
- Approximately what percentage of the overall school budget is spent on buying technological software?
- What courses use technology, and how frequently are they used as instructional tool?
- What kinds of technologies do you find most useful for your student teachers, and why?
- What technologies do you find least useful in your learning?
- How would you describe your own expertise with technology?
- What would give you more confidence using technology in the classroom?
- How important is technology to students' learning?
- Have these technologies changed the way you teach your course. If so, How?
- In your experiences, what barriers exist for technology to be more useful in your institution?
- What are the possible solutions to the challenges/barrier that exists in the use of technology in primary school teacher education?
- What do you think technology in college courses will be like in the future?
- In your opinion is there anything that can be done at the policy level to help improve the use of technology in primary school music teacher education?

Appendix 5: University Recommendation for Research



THE TECHNICAL UNIVERSITY OF KENYA

Haile Selassie Avenue, P. O. Box 52428 - 00200 Nairobi. Tel: +254 (020) 343672, 2249974, 2251300, 341639

Fax: 2219689 Email: vc@kenpoly.ac.ke, Website: www.tukenya.ac.ke

Faculty of Social Sciences and Technology

School of Creative Arts and Technologies

Department of Music and Performing Arts

20th February 2018

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: Sr. Sambu Alice - Reg. No. ACMV/06495P/2015

Sr. Sambu is a Masters student at Technical University of Kenya, currently working on her Master's thesis "*An evaluation into the use of technology in teaching and learning of music in primary teachers training colleges in Kisii County.*"

This letter is to request whoever she may approach during research data collection, to kindly assist her to enable her successfully complete her research.

Should you have any question regarding the same, please, feel free to contact the undersigned.

Thanks in advance.

Sincerely,

CHAIRMAN
DEPARTMENT OF MUSIC
AND PERFORMING ARTS

Dr. PHILIP KABATA PHO OF KENYA

Chair, Department of Music & Performing Arts

Appendix 6: Letter from National Commission for Science, Technology and Innovation



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 3310571, 2219420
Fax: +254-20-318245, 318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. NACOSTI/P/19/2213/30290

Date: 23rd May, 2019

Sr. Alice Sambu
The Technical University of Kenya
P.O. Box 52428 - 00200
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "*An evaluation into the use of technology in teaching and learning of music in primary teachers training colleges in Kisii County, Kenya*" I am pleased to inform you that you have been authorized to undertake research in **Kisii County** for the period ending 23rd May, 2020.

You are advised to report to **the County Commissioner and the County Director of Education, Kisii County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit a **copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.


BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Kisii County.

The County Director of Education
Kisii County.

National Commission for Science, Technology and Innovation is ISO9001:2008 Certified

Appendix 7: Research Clearance Permit

THIS IS TO CERTIFY THAT: **Permit No. : NACOSTI/P/19/2213/30290**
SR. ALICE SAMBU **Date Of Issue : 23rd May, 2019**
of TECHNICAL UNIVERSITY OF KENYA, **Fee Received :Ksh 1000**
925-502 Nairobi, has been permitted to
conduct research in Kisii County

on the topic: AN EVALUATION INTO THE
USE OF TECHNOLOGY IN TEACHING AND
LEARNING OF MUSIC IN PRIMARY
TEACHERS TRAINING COLLEGES IN KISII
COUNTY, KENYA

for the period ending:
23rd May, 2020

Applicant's Signature

Director General
National Commission for Science,
Technology & Innovation

THE SCIENCE, TECHNOLOGY AND
INNOVATION ACT, 2013

The Grant of Research Licenses is guided by the Science,
Technology and Innovation (Research Licensing) Regulations, 2014.

CONDITIONS

- 1. The License is valid for the proposed research, location and specified period.**
- 2. The License and any rights thereunder are non-transferable.**
- 3. The Licensee shall inform the County Governor before commencement of the research.**
- 4. Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies.**
- 5. The License does not give authority to transfer research materials.**
- 6. NACOSTI may monitor and evaluate the licensed research project.**
- 7. The Licensee shall submit one hard copy and upload a soft copy of their final report within one year of completion of the research.**
- 8. NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice.**

National Commission for Science, Technology and Innovation
P.O. Box 30623 - 00100, Nairobi, Kenya
TEL: 020 400 7000, 0713 788787, 0735 404245
Email: dg@nacosti.go.ke, registry@nacosti.go.ke
Website: www.nacosti.go.ke

REPUBLIC OF KENYA

NACOSTI
National Commission for Science,
Technology and Innovation

Serial No.A 24740
CONDITIONS: see back page