

Using Technology to Enhance Instruction and Learning in Musical Arts Education in Nigeria

Eyiuche Rita Modeme

Department of Music, Faculty of Humanities,
University of Port Harcourt, Rivers State, Nigeria
Email: ritamodeme@yahoo.com

Abstract

Technology is a rapidly growing trend in the field of education today. Technologies have made rapid advances, and their applications to the music classroom have not been fully utilized. Researchers observed that the study of music in many parts of the world has gone far through electronic and computer technology but in Nigerian tertiary institutions, music teachers seem to use technology more for administrative tasks as opposed to music curriculum uses. This study, therefore, examines musical arts education and technologies. It discusses how technology could be used to enhance instruction and learning in the music classroom. The focus is on computer and internet usage for effective teaching and learning of music. The paper further considers technology and music education, types of technology devices, the benefits of technology in music education. The obstacles to the use of technologies in closing the gaps were fully identified. The study concludes that computerizing and networking music education in Nigeria tertiary institutions are imperative. It, therefore, recommends the mainstreaming of technology utilization (particularly the computer and internet) in music education system at all levels for the benefit of curriculum implementation and enhanced student learning.

Keywords: Computerization, Musical arts education, Networking, Technology, Nigeria.

Introduction

Technology is rapidly becoming one of the most widely used resources in the field of education today. Music education is no exception to that, but,

Nigerian music education, for some time now, tends to move in circles rather than progress in a straight course. Some of the problems include high cost of internet connectivity, lack of updated materials, lack of research co-operation among sister institutions, inadequate research fund, lack of consolidation/execution of research findings among others. Conversely, the study of music in many parts of the world has gone far through electronic and computer technology. In order to solve the above problems and for a meaningful progress, teaching and research activities in Nigeria tertiary institutions must be computerized and networked; especially if Nigerian music scholarship would not be left behind (Adedeji, 2004). Technology can have a wide range of benefits in music classroom. Effective use of technology has tremendous potential to enhance instruction and learning in the music classroom.

Music technology resources are able to provide a more persistent learning since it allows a drill and practice at desired level and desired amount. While technology can be very beneficial in the music classroom, music educators must work to ensure that they integrate technology in ways that are effective and have a positive effect on instruction and learning. In support of the above, the writer is of the view that it is the responsibility of educational system to provide graduates with the necessary skills that would help them excel in the job markets and fields of endeavour. Given this, schools would teach students the way of effective interaction and collaboration in the 21st century world of technology. It is through networking that students should be able to navigate the world in search of information for personal improvement and national growth. Hence, this paper will follow this sequential pattern: first, it looks at the explanations of musical arts education, definitions of technology and type of technology devices. Next, technology and music education, computer networks/types are discussed. The paper elucidates the indispensability of the computer and internet in Nigerian music education. The benefits of utilizing technology in musical arts education and obstacles to the usage in Nigerian tertiary institutions are also highlighted.

Musical Arts Education

Nzewi (2003, p. 13) opines that the term “musical arts” reminds us that in African cultures, the performance arts disciplines of music, dance, drama, poetry and costume are hardly separated in the creative thinking and performance practice of the people, though each has distinctive feature

with unique theoretical or descriptive terms in every culture. Furthermore, Nzewi cited in Modeme (2014, p. 68) adds that each branch resonates and reinforces the logic, structure, form, shape, mood, texture and character of the other, such that in the African musical arts, there are interrelationships that show how:

- The music reflects the dance, language, drama and/or costume.
- The dance bodily translates the music, language, drama and/or costume and scenery.
- The poetry and lyrics narrate the music, dance, drama and/or material objects.
- The drama enacts the music, dance, language, costume and/or material objects.
- The material objects, costume and scenery highlight music, dance, drama and/or language.

The implication is that, in the African indigenous musical arts milieu a competent musician is likely to be a capable dancer, visual-plastic artist, lyricist, poet and dramatic actor. The principles of recreation and entertainment are embedded to all the social and human objectives or contexts of an artistic display, while the central idea of recreating, acting or enjoying together informs the principle of “play” as a generic term, for the musical arts in some African cultures.

In line with this assertion, Emar (2003) points out that, like the many music programmes, the publication on African-sensitive musical arts education deals not only with music and musical arts education, but also with basic democratic rights. It deals with the responsibility one generation has toward the next. It also deals with people living together in local communities and in the global world. African-sensitive musical arts education deals with the above, because that is what musical arts education is all about. African-sensitive musical arts education can only be built through teamwork by professional people who themselves celebrate music within an Africa-rooted conceptual framework; scholars and researchers to bring forgotten and hidden African music out into the open; educators to design idiomatic ways and means of transmitting African musical traditions; artists to lead the way in creative processes, giving African music opportunities to challenge and be challenged by music from other cultures; and politicians and other decisions-makers to set the stage for full appreciation of an African-sensitive, musical arts education in African schools.

A primary capability and role of the musical arts is to build a socially disciplined mind and forestall or transform deviant social tendencies; in short, to instill self-confidence, social conscience and public morality (Nzewi, 2017, p. 75). Nzewi's definition of the musical arts educator is inclusive of all persons engaged in disseminating music, dance, drama and performative costume in the public domain: classroom teacher as well practitioners involved in musical arts production, commercialization, programming, recording, promotion, presentation, criticism, also research and publication businesses (Nzewi, 2013, p. 3). Musical arts education also calls for teaching, learning, integration, transmission and assimilation of musical knowledge to enhance individuals' musical thought system. It combines all aspects of musical arts in both theory and practice to full realization and propagation of musical diversity. Nzewi (2013) further stresses that, knowledge acquisition in the musical arts is then qualitatively regenerative and quantitatively limitless for life. Musical arts education proposes global, or all round musical knowledge, musicianship and scholarship. The above mentioned situations have underscored the need for enhancing instruction and learning in music education in Nigeria using technologies.

Technology Defined

The word technology is etymologically linked to the Greek word *technologia*, and often implies "systematic treatment" of a subject. Arnulf Gruber cited in Herbst and Tracey (2003), says *technologia* is 'the science and systematic treatment of (practical) arts,' while technology is a "system of means to particular ends that employs both technical artefacts and (social) information (know-how)." Technology refers specifically to "manufactured objects" that both "enhance human capabilities" and "enable human to perform tasks they could not perform otherwise." Engineers and anthropologists refer to these objects as hardware and artefacts respectively. The term technology usually refers to the use of electronic devices, computer hardware and computer software that is used in the performance, playback, recording, composition, sound recording, and reproduction mixing analysis and editing of music. Technology is also the application of scientific knowledge acquired overtime in solving man's day-to-day problems. The writer sees technology as the process by which human beings modifies nature so as to satisfy their needs and wants. Technology, as it is used in this text, refers to the most recently invented

state-of-the-art devices such as computers electronic keyboards, CDs, CD-ROMs and DVDs.

The term music technology means different things to different people, to some it means playing the keyboard, while others associate it with printed music. The use of recording equipment, microphones and amplifiers, computers and sampled sounds are envisaged. For some ethnomusicologists, music technology may suggest the science of acoustics, while for others it may refer specifically to the kind of technological aided documentation and analysis practised by Simha Arom in his study of the indigenous music of the Central African Republic (Arom & Voisin, 1998). Music technology, according to Crawford (2009) includes such items as computers, internet, synthesizers, MIDI (Musical Instrument Digital Interface), drum machines, sound modules, MP 3 players, minidisk players and more. These types could help in the teaching and learning of listening/aural skills composition, transcription and analysis. It is also the application of technology such as computers and software, to the creation and performance of music, whether it is the use of sequencer and editing software or electronic musical devices, musical technology and its definition expands as technology expands (<http://nafme-org>music-technology>).

According to Murray (cited in Pittis & Kwami, 2002, p. 61) music technology refers to “any situation in which electronic technology is used to control, manipulate or communicate musical information. Webster (2002) describes this technology as “inventions that help humans produce, enhance and better the area of sound organized to express feeling” (p. 416). Byrne and MacDonald (2002) explicate music technology in the classroom by itemizing the components of that technology. Thus they include electronic keyboards, sound modules, multi-track recorders, synthesisers, hardware sequencers (such as those contained in the on-board sequencer in keyboards), and a wide range of software applications that allow sequencing, notation, editing and recording through MIDI-based and acoustic means. Technology as it relates to music implies all the technical or mechanical applications in the production and performance of musical arts. Technology has assisted performers and music educators for centuries. The organ, harpsichord, piano and phonograph are all examples of technologies that were as amazing to those who originally used them as computers are to us today.

In the last 20 years, many tools have become available to music educators that can significantly enhance student learning. These devices

include computers and electronic keyboards plus the high-tech equipment, listed above. Technology provides ideal media for music education. Incorporating technology into the music curriculum can create exciting and productive classes, lessons, and outcomes. The best way to select the ideal use for technology is to focus on the curricular goals and desired educational outcomes and then select the materials or devices that will best accomplish the stated goals. There are two general categories of goals for music curricula at all levels: skills and knowledge. Skills refers to the ability to play musical instruments, sing, create and perform music. Knowledge refers to understanding and comprehending information about music. In support of this fact, Glazar (2020) opines that it is a common practice to integrate ICT into classrooms worldwide. Akuno and Ondieki (2017) affirm that the technology has greatly influenced the evolution of music styles in the world, resulting in a rich and varied soundscape as the learning environment. This has transformed the ways teachers teach and the ways learners learn.

Types of Technological Devices

Technological devices are either passive or interactive. A passive device merely plays music or displays information. Passive devices include the phonograph record player, cassette tape deck, television, video cassette player, DVD player, and overhead projector. With passive devices, the student perceives the material but there is no interaction with the device or medium. For example, a class listening to a recording of musical composition is taking part in a passive exercise. Tape and CD players are passive devices, they merely play an audio recording of a piece of music. If the goal is simply to play a musical recording, then a CD player is a fine choice. Certainly, music lessons and classes can be enhanced with the use of passive devices such as videos of performances, instrument demonstrations, and the like. Devices that engage the user directly are referred to as interactive. Playing a video game and using a computer are interactive activities. Researchers have observed that interactive learning is much more effective than passive learning. Technology offers many forms of interactive learning. It is important for music educator to be aware of the full capabilities of these tools that can help the students to better perform, create and understand music (Rudolph, 2012, pp.1-2).

Technology and Music Education

Since 1970s of the twentieth century, computerization in musical education history can be characterized by two moments. First, the programme product was created mainly for demonstration of new computer capabilities as they were in need of practical development. Secondly, conducted experiments primarily pursued the aim to prove computer effectiveness and practicability in teaching and learning music. The term computerization means the act of performing, processing, storing, or controlling through the use of an electronic computer ([www.yourdictionary.com>computer](http://www.yourdictionary.com/computer)). The definition of computerization also involves the process of taking activities or tasks not previously done on the computer and shifting them to being done on the computer. Shifting from keeping patient records in the computer is an example of computerization ([www.lexico.com>definition>com...](http://www.lexico.com/definition/computerization)).

Computerization in this context implies the use of the computer application to all aspects of music scholarship in Nigerian Tertiary Institutions. A computer is an electronic device that can accept data through an input device (e.g. keyboard), store the data in memory (either main or auxiliary), and manipulate the data according to instruction residing in memory and produce output through an output device (e.g. printers) in a specific format (Adekunle, 2005). Computer and its usage show a variety of forms and techniques in teaching and learning process, in solving a large number of tasks. This covers almost all the musical – theoretical disciplines. Thus, the computer in music education can act as a universal means of didactics (Khussainora, Chsherbotayeya, Maimakova, Argingazina & Sagatova, 2018).

Kassler and Howe cited in Adedeji (2004) highlights areas of computer application to music include thematic cataloguing, input and output music writing, recording and reproducing music, musical analysis, musical composition and sound processing. With few graduate teachers of music and increasing students' enrolment into music programmes, it becomes imperative that music educators adopt technology to expand students' knowledge and provide action-packed programmes. In the area of composition, some music software like sibelus, finale, and noteworthy composer are available. Of them, sibelus is the most comprehensive, easily operated and less deficient. When in use, this software plays back what has been notated and affords the user the opportunity to effect corrections in the composition where necessary. Nwamara (2007, p. 53) observes that the benefits of the computer to the composer do not end with the ability

to play back the composers works. They extend to easy, faster and cleaner scoring and arranging. The techniques of computer technology permit the indexing of music. Today, many software exist that aid transcription of music. Notable amongst them are finale, Sibelius and the noteworthy composer. Writing and printing of music have been made easier and aesthetically pleasing. Computer notation (though not without its problems) is now becoming popular in Nigerian music education. It needs to be integrated since it is neater and easily compatible with computer-printed assignments and term-papers, submitted by students.

Today, there is virtually no aspect of musical processes that is not realizable with the computer technology and the internet, including global music teaching, research, marketing, audio and video recording, editing, mixing, mastering, harmonization and orchestration. The musical revolution brought about by the computer has in no small measure contributed to the advancement of the comparative study of world music, especially in "arts" and popular forms (Adedeji, 2004, p. 2). Researchers have also observed that many of our teachers and students are yet to employ this 'computechnique' of notating music. Many students who now use computer music notation for their assignments learnt it through self-effort. Some researchers have also observed that Nigeria music scholars have contributed in no small measure to the development of music education at the global level through their compositions, research, writings and performances, the field is not progressing as such at home, as evidenced from a number of problems yet unsolved. For example, technological backwardness, the problem of notation, lack of systematized body of theory, lack of sufficient literatures uncooperative attitudes among colleagues, low level of scholarship in terms of teaching and research and inequality which characterize the standard of regional academic activities.

Nigerian academics therefore need to acquire the skill in order to give the students meaningful and relevant music education. Music educators should see technology as an aid to effective teaching rather than a threat to their profession. There is still the need for the involvement of experts and specialists for a proper redirection. In order for technology to be effectively integrated in the music classroom, music educators must not only be aware of the technology available but must also remain informed of the most effective ways of implementing technology into instruction and learning. Since it is experimentally proved that the effectiveness of training on musical subjects with the use of computer technologies

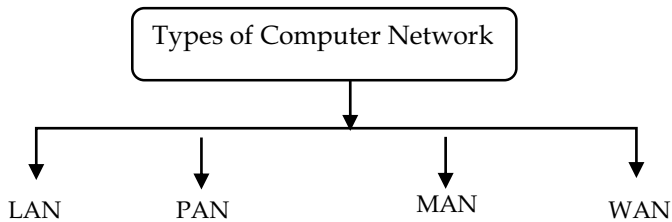
increase, students' creative activity rises. Computer programs can significantly educate ear to music and musical thinking due to their intense teaching and learning opportunities. The place and purpose of technology in music education must be found before beginning to properly apply the technology. Simply making technology available is not enough. The main prospect of computer technologies usage is modeling of human activities. This applies to all kinds of musical activity, where computer technologies can be used such as in composition, performance, teaching and learning. Most theories and literature courses of Western music could now be taught via computer.

There is software on Western music theory, history, harmony, composition and orchestration. Besides, subjects such as piano, voice, orchestral instruments among others are also treated by experienced music educators and performers on music software and special CDs. Using technology in the classroom can also help to address the concept of notation. There is software that is designed for this as (Nart, 2016) discusses. Software like Sibelius, finale, encore, autoscere, overture, rhapsody, music time and magic score school could be given as examples for notation software. Computer has firmly established in the music world, making a versatile musical instrument for the composer and performer. Therefore, there is an urgent need of computer technologies usage in music education not only as a teaching and learning tool, but also as an object of study in Nigeria. Adedeji (2004) as cited in Idamoyorbo (2011) has also explicated various functions of computer technology in music education and advocated for a development of ideal computer music programme and software for the advancement of African music theory. He further argues for the crucial need of computerizing music education and research in Nigeria. The above studies call for a more functional computer music technology in Nigerian music education.

Computer Network

A computer network is a group of computers linked to each other that enables the computer to communicate with another computer and share their resources, data and applications (avatpoint.com). Besides, a network is a collection of computers, servers, mainframes, network devices, peripherals, or other devices connected to one another to allow the sharing of data. An example of a network is the internet which is generally known as the largest computer network covering the world. Internet connects millions of people all over the world (www.computerhope.com>jargon).

A computer network can be categorized by size. A computer network is mainly of four types namely:



- LAN (Local Area Network)
- PAN (Personal Area Network)
- MAN (Metropolitan Area Network)
- WAN (Wide Area Network)

LAN (Local Area Network)

A Local Area Network (LAN) is a group of computers and peripheral devices which are connected to each other in a small or limited area such as school, laboratory, home, and office building. It is a widely useful network for sharing resources like files, printers, games, and other application. The simplest type of LAN network is to connect computers and printer in someone's home or office. The LAN should be put in place to allow the fastest access to information within a university community while LAN connects computers within a small geographical area (as in a University Campus), WAN involves a larger geographical area such as a country.

WAN (Wide Area Network)

WAN is a network that extends over a large geographical area such as states or countries. It is quite bigger network than the LAN an MAN. Wide Area Network is not limited to single location, but it spans over a large geographical area through a telephone line, fibre optic cable or satellite links. WAN is widely used in the field of business, government and education. It can be used to connect two campuses of same institution in different geographical zones/locations. In line with the above submission. Adedeji (2004) states that:

The absence of WAN in Nigerian music scholarship is due to lack of foresight, fund and functional professional body. The WAN implies the networking of all the academic music in

Nigeria via the net. This could be spearheaded by the musicological society of Nigeria. The wide gap between the high standard of the older generation could be removed through strong inter-connectivity between the two ends.

WAN also enhances distance-learning programmes. Sandwich, week-end and every part-time lectures are more effective and less hazardous through WAN. Internet connection is an example of WAN and it is one of the biggest WAN in the world. Other examples of WAN are mobile broadband and connections such as 3G and 4G. The internet is generally known as the largest computer network covering the world.

Internet

The word internet is derived from two words – Interconnection and Network (Orji cited in Iwu, 2015). Internet is a careful global collection of many different types of computer that are linked together. Badiru cited in Egbule (2015) observes that “the internet has become a household name globally since its commercialization in the mid-1990s” (p. 386). The internet is referred to as the information superhighway. It is a worldwide network system of computer networks through which sharing of information is not only possible but also easy. Internet today, is undoubtedly the largest computer network and the largest storehouse of information. Through the internet, music students can share information and communicate from anywhere with an internet connection. It has the ability to provide all the facilities previously reserved for bulletin boards, computer servers, fast speed telephone cables, fiber optic cables, laser links and even satellite links. In this age, the internet is for anyone who plans to learn, teach, work play, govern, serve, buy or sell in the information society. It is a network of networks. Just like the “super” library, the internet is a huge ocean of information on issues ranging from books, education, movies, current affairs, sports, arts, culture, and technological development among others.

In line with the above submissions, Mbonu as in Egbule (2015) defines the internet as “the global connection of millions of computers in a single network for the purpose of research and information sharing” (p. 387). Corroborating, Uzoma cited in Egbule (2015), observes that once a computer workstation is linked to the internet, such a computer automatically becomes a classroom where one can just sit and learn. He further observes that online universities have been set up and many

people have got degrees and certificates online just sitting by their computers connected to the internet. The internet links millions of people and thousands of educational institutions and many other types of organization worldwide and enables them to communicate with one another. The internet which is sometimes called “the net”, is a worldwide system of computer network through which sharing of information is possible from any other computer.

While the world has moved so far, Nigerian Music Education in Tertiary Institutions cannot afford to ignore the internet in its teaching and research. Latest and updated teaching materials in most subjects are available on the internet. Research paper writing could not be sensibly relevant to the global context if it fails to refer to updated research findings on the net. With the availability of the internet, the students can no longer complain of shortage of textbooks. These new ways of learning from the internet are complementary to traditional classroom teaching rather than taking its place. The research has not advocated for the adoption of online study programme to replace traditional classroom education, but rather that the computer technology and the internet be maximally utilized to complement the traditional pedagogical and didactic approaches. Within internet services, the average teacher has an unusually large amount and types of resources available to him. The instructional possibilities of the internet include:

- Electronic mail (e-mail) generally used for corresponding and disseminating information. E-mails are important learning resource for both students and teachers.
- Newsgroup: Discussion group in the internet.
- Chat Room or Messaging: Communication between groups or individuals on computers and other internet service providers. This provides excellent opportunity for teachers and students to discuss assignments or difficult concepts.
- Developing a classroom home page: The home page can cover information about the class, such as the syllabus, exercise, literature, conferences and the institution’s biography.

Others include: streaming audio and video, web white boarding, file transfer, among others. Adedeji (2004) mentions some of the relevant websites as follows: computer-music.com, which deals extensively with every aspect of computer music education, google.com, altavista.digital.com, infoseek.com and yahoo.com, where one can search for information

on any topic, iwritethemusic.com, which provides music resources for composers. Several other outlets are available by clicking on the websites of universities of the developed world. For instance, new generation of Nigerian composers can listen to or view the scores of contemporary art compositions of senior colleagues from all over the world via the net and thereby improve themselves. This is necessary in producing our contemporary music in global perspectives. Nigerian academics could join international academic bodies via the net. This is another vital aspect of internationalizing our music education. Therefore, the use of these internet tools also help to bring the needed materials when the user makes use of search engines, meta-search engines, subject directory, the visible web page, electronic referral, virtual library and facsimile. Another aspect of networking is the need for current information on Nigerian music to be put on the internet for world consumption. This is better done by insiders in the profession. For instance information on Celtic traditional music on the internet can be found at www.celtic.stanford.edu/irish, while traditional music can be found on www.itma.ie. Each music department by now should have been on the net displaying information on salient issues such as academic programmes, admission prerequisites among others.

Benefits of Utilizing Technology in Music Education

Many literatures state a variety of benefits of using technology in the music classroom as follows: Technology boosts musical creativity and accessibility both on the part of the teacher and learner. Teachers generate their own materials through new software application or websites that provide free software or adapt existing materials. A variety of apps have a simple interface and teach a lot about music while making use of typical classroom devices. Wherever their smartphone goes, it can also spark creativity in those with little or no musical talent. In support of the above, Cortez (2017) in his paper “tech in the music classroom creates efficiencies, improves accessibility, highlights how creativity and accessibility can be increased as a result of technology. “Thanks to technology, even the most amateur musicians can learn about composition” Advances in digital technology enhance student’s ability to create and analyse music.

Technology also benefits the field of music education through the creation of resources that are able to give students and all musicians a place to network and share their skills. Cayari (2018) in his article “connecting music education and virtual performance practices from

YouTube,” discusses this idea of sharing and networking and explains how “various online musical communities have emerged that allow people to interact through discussing, learning and performing music.” Platforms such as YouTube allow students to explore and learn more about musical performance on their own and can promote interests in specific areas of music. This can certainly benefit an individual student and help them to discover more about specific musical interests and skills they hope to achieve as a result of their music education. Technology advances have allowed teachers to plan lessons, grade student work, and communicate faster and easier. Besides being a time saver, however, using technology in the classroom offers music teachers a few more bells and whistles. Teachers’ technology literacy helps them to access up-to-date information thereby overcoming the ever challenging information update in resource usage and manipulation.

Using technology in music classrooms allows teachers to differentiate, or make learning meaningful to many. Its resources provide enabling environment for a lesson delivery in which students are encouraged to learn and develop. It is a means or method of increasing the overall effectiveness of learning process and retention. Technology allows students to work at their own pace. In the article “Music Software in the Technology Integrated Music Education,” Nart (2016) opines that the students’ role is important to consider. The benefits mentioned are derived from the approach that includes “student centered; multiple sense organs involving; creativity and productivity targeted are developed for teachers and learners who are following the technological developments and open to develop”. According to Nart, the benefits that can be developed are a result of educational outcomes that can be seen when technology is implemented and directly meets the needs of individual students. As a result, the student is at the center of the learning process and technology is used in a way that is effective for all individuals in the classroom.

Technological innovations in teaching and learning have provided new ways of teaching and learning. It may take the form of power point, World Wide Web (www) mind tools and simulation software among others. The use of technological resources has introduced pedagogical innovations in teaching and learning e.g. interactive e-board. Technology motivates the students to learn. Students fell more successful in school, are more motivated to learn and have increased self-confidence and self-esteem when using computer-based instruction particularly when students are allow to take some control of their learning or at times,

at least feel as though they are in control of their own decisions and music making. Through this control, effective student-centered learning can be created with this comes the notation of more individualized learning process that is often the focus. Even artistic students are tech savvy. Using technology in music class amps up the fun. Isman cited in Gokalp Parasiz (2018) affirms the reasons for the use of technology in education as follows:

- Providing rapid spread of information
- Design of the individual learning environment
- Design of the active learning environment
- Learning to think critically
- Co-operative working opportunity
- Increasing interpersonal communication
- Global training opportunity
- Increased motivation to learn information

Obstacles of Technology Usage in the Music Classroom

Obstacles to the use of technology in the music classroom since technology plays a large role in education; there are some basic obstacles associated with the use of technology in the music classroom. They are: Teachers' Attitude: Implementing technology into the classroom is something that is often encouraged, however, this is not always preferred by some teachers. Many teachers are not gifted to change. Some do not want to discuss about the use of technology in teaching because of fear of failure. Many teachers have undoubtedly been successful and feel comfortable with the 'old' ways and some may be reluctant to take the chance of failing by using unfamiliar equipment, especially around evaluation time. To many of them that are ignorant of technology, they look at technology as difficult and unattainable task. Teachers should keep in mind that they must equip their students to be musical in both the present and in a future where technology will play an increasingly important role. Many students already know a great deal about new technology because they or their parents have invest(ed) in computers, electronic keyboards or other electronic equipment at home. Invite people who are 'community resources' (including students) to share their knowledge with your classes and thereby help your students heighten their musical understanding while you learn more about the available technology. Collaboratively, the study carried out by Modeme and Adeogu (2021) revealed that the present crop of students are seen to be more knowledgeable in the use of

technology than their music teachers. Research studies report that students are digital natives as against their music teachers who are seen as digital immigrants (Prensky, 2001).

Availability and Reliability of Materials: Another factor that can limit the effectiveness of implementation of technology is its availability to students. Crawford cited in Wash (2019) opines that, “for teachers to include technology in their teaching, resources need to be accessible and maintained, appropriate technological support provided and professional development encouraged” (p. 67). In order for educators to implement technology in an effective manner, this study maintains the idea that professional development and support should be available and when they are not, challenges could be seen and the outcomes of implementing technology may not be successful or beneficial.

High Cost of Internet Connectivity: Although it is important to keep learning (because technology itself is changing rapidly), very little time, money, or effort is needed to learn to use technology effectively and efficiently in the classroom. But the high cost of internet connectivity in developing nations and especially in Nigeria should not be argued especially now the nation is experiencing recession. The value of dollar to Naira is currently very high which may have accounted for the high cost of connecting to the internet. The effect is that some music teachers are finding it difficult to connect and maintain the internet facilities.

Fear of Wasting Time: Teachers are pressed with time during the work week and the school year. They find it difficult to learn a new information and to come to the class to implement it. Because classroom time is limited, music teachers may fear that time spent on computers is wasted and that other worthwhile music activities will be sacrificed if computers are introduced into their curricula. On the surface, this fear seems justified, teachers rarely have enough contact time with students. But, as always, careful planning is the key to good use of music instruction time. Judicious use of technology can help students learn more efficiently. In fact, the use of technology can mean that some types of information that require many repetitions by the learner can be taught and mastered faster with the help of a computer. This allows more time for learning about the aesthetic facets of music.

Educational Policies: Challenges that impact the implementation of technology in the music classroom also occur as a result of educational policies. The policies of the past are credited with limiting the ways in which technology can be utilized in the classroom. In line with the above submissions, Crawford (2013), explains that “the education policy

restrictions need to change accordingly and allow access to interactive information exchange platforms and many applications and resources currently unavailable to schools due to access restrictions” (p. 717). The obstacles created by these policies are a reality that many educators face when planning to implement technology into the music classroom. Websites that would be beneficial for students to access are often restricted and students are unable to view content that is appropriate for the classroom. While teaching methods are currently evolving so is the internet. As Crawford (ibid) further states that “the web has shifted from just being a medium in which information is transmitted and consumed, to a platform where content is created, shared, remixed and repurposed” (p. 719). As technology’s role and purposes continue to change, so should educational policies. These policies can be shifted and appropriate information needs to be filtered so that students and educators can have access to it.

Lack of Electricity Supply: Our nation is still experiencing poor electricity supply most of the time. At times, the electricity supplied will be so epileptic that no meaningful technological works are done with them during school hours. This is a very serious challenge to the use of music technologies in teaching and learning.

Lack of Financial Resources: This adversely hindered the acquisition of music technology facilities for learning.

Lack of Wherewithal in Technology Usage: The truth is that many music teachers do not have the wherewithal in the use of technology devices. If this is so, the use of technology in teaching and learning will be a dream. Therefore, it is imperative that music teachers must be handy in the operations of technology so as to be able to prepare our learners for the challenges of 21st century global workforce.

Conclusion

The emergence of technology in the education system in Nigeria as it is in other developed countries of the world has come to stay. The import of technology on enhancing teaching and learning is no longer in doubt. There is a consensus that the development of any country depends upon the quality of education programs offered to citizens. Technologies, despite their known limitations are believed to be beneficial in this regard. The computer and the internet are especially useful to enhance student engagement in learning and positively impact student performance and achievement in music education. Moreover, their usefulness is more apparent in the 21st century, where the time is an era of information rich that the conventional modes of teaching could hardly handle. Teachers

who are major stakeholders in the education enterprise should therefore avail themselves of the opportunity to be familiar with and utilize technology facilities and equipment for classroom teaching and learning situations and management purposes. This paper hereby suggests that music education in Nigerian tertiary institutions should be computerized and networked in order to work for the effective functioning of this technology in the music education system.

Recommendations

Based on the findings of this paper, the following recommendations are made: Following the fact that some music teachers are not comfortable with the use of technology in their daily lesson plans because they lack the knowledge, they are reluctant to try new things. The easier way to come out of this mess is to provide the music teachers with workshop. Each teacher is assigned to a net generation teacher or professional. During the process of interaction and tutoring, the music teacher will easily be transformed as they work together. The professional could gradually change the orientation of the digital process. This will make the music teacher to gain confidence in himself. He will grow professionally and develop self-worth. Consequently, he will learn to be effective in instruction using technological inputs without fear or intimidation. This process would induce a healthy school climate for effective teaching and learning to take place. More technicians are to be trained and sent to schools to help in the maintenance of technological devices. This will definitely bring down the high maintenance cost. The federal and state governments should help to subsidizing the cost of technological devices so as to make them affordable for both the music teachers and the students. There should also be an adequate provision of technological tools to enhance their operation in music classrooms.

Time: As teachers are known to always have tight schedules, they should as a matter of fact make out time to learn how to use the technological tools in teaching and learning. Since using music technology in teaching has greatly aided in playing back the students melodic and harmonic compositions hence, saving time which would otherwise be wasted in singing the melodies and harmonies in parts. Music teachers should be motivated to enroll in some technological courses where they could be exposed to activities that would help them to apply digital technology in teaching music. Technology-based seminars and workshops should be organized on regular basis for music teachers and students to

upgrade their digital literacy. Free access to internet connectivity should be granted to them as a way of motivating them to acquire more digital education. The music teachers are to be constantly trained and retrained so as to have the wherewithal in the use of modern devices in teaching and learning. More so, Department of Music and Lecturers should possess computers that are internet-ready and connected. Review of academic programmes and curricula to meet the current technological challenges is long overdue. The music curriculum in use needed to be restructured to integrate technology, advocating for the introduction of music technology into the current music curriculum. This would offer opportunities for functional music teaching and learning which in turn help the music teachers to be competent in technology-based education. This should be done throughout the country.

The educational policy restriction need to change accordingly and should aim at reducing the cost of acquiring technology facilities such as hardware and software. Hence, formulating policy that allows the transfer of the technology at low cost so that institutions may have access to the technology at affordable process. More so, introduction of computer education as a compulsory elective should be made mandatory in all Departments of Music in Nigerian tertiary institutions. The federal and state governments of the nation should join hands in the provision of steady electricity supply. At least all the tertiary institution in Nigeria should be provided with automatic generators to ensure steady power supply. This will enhance the use of technology in teaching and learning of music. Corroborating with other researchers, the writer affirms that most of the recommendations above would not be realized without funding. Since the government is insensitive to the issue of funding the higher institutions better, each department should embark on projects that could generate some funds for the kick off. This is very crucial.

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