



Academic pursuits in the study of music: Reflections on artificial intelligence

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Abstract

This article explores current and emerging trends in the use of artificial intelligence (AI) in the academic study of music amidst the ever-changing technologies. Through the technology determinism theory, technology-mediated learning, and unified theory of acceptance and use of technology the researcher engaged a qualitative research to examine the experiences of 10 lecturers and 40 students randomly sampled from Great Zimbabwe University (GZU), Midlands State University (MSU) and the University of Zimbabwe (UZ) on how they engaged in teaching, learning and research using AI. The fourth industrial revolution (4IR) brought novel ways of teaching-learning and research. Different AI has disrupted traditional models of education. Education now rides on AI hence the need to embrace them. There are AI resources to detect plagiarism, find answers to essay questions, provide meanings to terms, referencing systems to sources of information, analyse data, engage in music programming, mixing and mastering of music. Lecturers used Bard, Bing AI, ChatGPT, Gemini, Google Scholar, and WhatsApp to engage in teaching. Students used AI to write assignments and acquire knowledge in teaching-learning and research. Some institutions have a dilemma in accepting AI resources. The research informs that AI resources are both useful and destructive however, mature academics capitalise on the positive aspects of AI in the academic study of music. The involvement of humans in AI guarantees to verification of ideas, support to knowledge acquisition, and reinforcement of key concepts.

Introduction

The article explores how lecturers and students engaged artificial intelligence (AI) in the academic study of music at selected Zimbabwe universities. Academic study of music in Zimbabwe is offered at Great Zimbabwe University (GZU), Midlands State University (MSU) and the University of Zimbabwe (UZ). The study investigated academic music in teaching, learning and research, focusing on how AI resources were used. AI applications help to engage in teaching-learning and research. They simulate human skills to offer solutions to essential questions. People use AI to read, message, chat, draft scripts, design graphics, create stories, programme, arrange mix, and master musical sounds. This study examined Bard, Bing AI, ChatGPT, Gemini, Google Scholar and WhatsApp AI resources in music teaching, learning and research, including their merits and demerits in light of the institutions' envisioned academic study of music. The background contextually locates the paper within the global, regional and national trends given AI in music academy. The paper appeals to literature to investigate global and regional developments. Trends show that the African region,



including Zimbabwe, lags behind. Not much research has been undertaken on music and AI in Zimbabwe. Three theories were used to provide a framework for the study. Technology determinism theory guided the study as a construct of the society that ensures that human pursuits are executed efficiently as desired. Technology-mediated learning (TML) premises 1 and 2 were used to show humans' desire to engage in technology assistance. The unified technology acceptance and use of technology (UTAUT) explains why people use technology in executing tasks. Qualitative research with structured interviews was preferred for this study. The researcher interviewed participants using closed and open-ended questions via email, Facebook calls, face-to-face interaction, phone calls, WhatsApp calls, and WhatsApp chats to gather data. Data presentation and discussions are done under themes of AI in teaching, learning and research with participants' views in verbatim.

The world has witnessed increased use of technology-assisted teaching, learning and research in higher and tertiary education (Alexander, 2020). Using modern technology resources to execute complex tasks has prompted scientific researchers to think outside the box. The untimely spat of COVID-19 reduced certain institutions and their functions to become irrelevant (Stanistreet et al., 2020; Bozkurt et al., 2022). Confinement to the physical classroom was abandoned to give way to virtual classes in response to the COVID-19 contagion. Papaioannou et al. (2023) hold that, to ensure a guaranteed continuity of teaching and learning, some AI resources have been invented to allow online teaching and learning. The Western world has taken advantage of digital resources while the developing world lags due to poverty, misappropriation of resources, incessant wars and political instability (Chen et al., 2020b). Some African nations opt to finance security and health sectors more than education. The national budgets for several African nations have high expenditures on weapons of war, yet they do not engage in wars against their neighbours (K' Akumu, 2023). Investment in AI lags even though learners are techno-savvy.

Even though funding for education and research is guaranteed, there is a gap in using AI resources. Katiji et al. (2022) mention that digital resources are inadequate in Zimbabwe universities. In some institutions, resources are outdated, and they need replacement. The same study noted that internet tariffs were too high and disadvantaged users. The intermittent power supply also aggravated the connectivity problem, as most universities relied on the national power supply. The following Zimbabwe universities, GZU, MSU, and UZ, currently offer music studies. However, they face problems procuring adequate teaching, learning and research resources. The requisite digital resources keep evolving to a point where some devices become obsolete. Software must be upgraded occasionally, and if the users cannot upgrade, they become outdated. Some of the software used are Finale Note Pad, Sibelius, Cubase, Pro Tools, and Wav Lab. The researcher has used all the above packages; however, for the past 8 years, Sibelius 7, Wav Lab 6, Pro Tools 9 and Cubase 7 are common versions in use but need upgrading. Paradoxically, all universities strive to have students and staff engage in effective research, teaching, community engagement, innovation and industrialisation, yet music lecturers and students lag behind.

There is a debate on the relevance of AI in higher education institutions. The use of WhatsApp as AI is viewed as a social application more than an educational resource. Some consider it unprofessional, although it provides the cheapest AI functions. Users only need an Internet connection for WhatsApp to function efficiently. The researcher noted that WhatsApp is used by the majority of the populace in Zimbabwe's higher education. Some institutions also detest AI resources such as Bard, Bing AI, ChatGPT, and Gemini from mainstream music teaching and learning. They allege these resources breed lackadaisical graduates. Perhaps what needs to be considered is the positives and negatives of technology-driven applications. Hence, condemning AI is unfortunate for academia because there is room to explore and appreciate AI's worth.



To date, AI antiplagiarism applications such as Turnitin detect work that undermines acknowledging others' ideas. Although AI resources provide intelligible answers to the study of music, academics should interrogate AI to certify its effective use. Through that, one can differentiate the teaching, learning, and academic research work done by a human from that of a machine. In music, AI and human effort can be explored to analyse song text, data, frequency distribution in music programming, mixing and mastering music, writing essays and research for dissertations. This paper delves into ways music lecturers and students can engage with AI.

The advent of modern technology

The use of virtual resources for teaching and learning became prominent after the new millennium in the Western world (Palloff & Pratt, 2013). Duke (2002) says technology proves that people do not need to always engage physically in teaching, learning and research. Currently, people can engage in work without moving away from their geophysical space. That is a paradigm shift that prompts changes to the traditional *modus operandi*. Embracing such changes requires preparation, adequate resources and requisite human skills. The developing world requires equipment and human skills, and that gap currently hampers AI uptake. Some nations take time to measure up to the demands of the new millennium; Zimbabwe only migrated broadcasting to digitalisation in 2021, some years after the deadline (The Editor, 2022).

The Fourth Industrial Revolution (4IR)

The current global epoch 4IR shows that digital machines have permeated health, commerce, communication, research, industry and teaching-learning in higher education. The impetus of 4IR has changed how people interact; it ushered in a wind of change through AI applications across the globe. Such tools include virtual machine teaching and learning that emulate human skills. Rudolph et al. (2023) submit that it took three months for ChatGPT to gather 123 million monthly active users in the year it was rolled out, TikTok took nine months to reach 100 million, and Instagram took two and half years to reach the same level. Effectively, ChatGPT could be one of the fastest-growing AI applications. By implication, a month is too long for anyone to be active or inactive in using AI. The above denotes a shift from the traditional ways to the robust ways of engaging in education (Bates et al. 2020). Chen et al. (2020a) show how education systems are immersed in the digital revolution. Despite the above view, practical hands-on experience remains critical for the music academy. Palloff and Pratt (2013), Castelli & Sarvary (2021) and Neuwirth et al. (2021) say the use of virtual classrooms as alternatives to face-to-face met some resistance as some people did not see the value in that. Covid-19 spurred the need for digital resources to engage in teaching, learning and research as a compulsory alternative. Camilleri & Camilleri (2022) and Deepika et al (2021) inform that when Covid-19 came, the developed nations had alternatives such as Facebook, Google Meet, Microsoft Teams, Skype, Zoom, and several others to use. The above AI resources enable communication, conferencing, teaching, and learning of music when face-to-face communication is not tenable during pandemics. Though they bring ease to teaching-learning, adequate resources are needed. Institutions had to procure the requisite resources to guarantee the smooth running of education. Disruption of the traditional classes strained people to think outside to survive (Johnson, 2022; Venkatram, 2022).

Readiness for AI resources

For some university lecturers in Zimbabwe, the shift towards using AI and digital teaching and learning resources was a surprise. Students and the lecturers were caught unaware, as they were unprepared for this disruption (Katiji et al., 2022). Some music lecturers were sceptical and technophobic; hence, their propensity in the virtual space was slow even though their institutions provided the connectivity data (Katiji et al., 2022). To this end, Bard, Bing AI, ChatGPT, Gemini and Google Scholar are some AI tools that have taken the study of music at tertiary institutions with mixed reactions. The alluded AI applications aid in answering essay questions and dialoguing with virtual



tutors in tackling concepts. They differ from general digital technology in that they offer a simulation of teacher-learner interaction with opportunities to probe further to understand the subject matter. Kuleto et al (2021) hold that introducing AI in education yields user benefits. Despite the benefits of AI, Mills et al. (2023) warn that there is a dire need to curtail the possibilities of abuse in the learning process. The above affirms mixed views about AI in teaching-learning and academic research. Studies by Holland (2013), Huang et al. (2021) and Verma (2021) on AI in music education and perspectives have been undertaken in Asia, Eastern Europe and the West. However, in Zimbabwe, this is grey, especially AI in the study of music, hence the motivation to find how AI is used.

Theoretical framework

According to Robson and Tsou (2023), the study used technology determinism theory, holding that technology dictates how society functions. Furthermore, society and technology are intertwined; technologies are developed by people to serve as required in society. Technologies are derived from the activities undertaken in institutions of learning, factories and homes (Robson & Tsou, 2023). They assist in keeping the people on top of situations and remain relevant. The researcher also appeals to Bower's (2019) technology-mediated learning (TML) based on premise one and premise 2. In articulating premise 1, Bower (2019) states that technology is mediatory in enabling students to realise their learning goals. The researcher views AI as a form of TML that facilitates the realisation of learning goals and motivates users to embrace AI. Premise 2 informs that the learning contexts, the beliefs of learners and their knowledge through the practice environment provide a holistically connected stimulus to all the facets of teaching and learning. The above premises relate to the unified theory of acceptance and use of technology (UTAUT), according to Venkatesh et al. (2003) and Venkatesh et al. (2016). The key features of UTAUT explain why people embrace AI based on ease of use emanating from performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh, 2022). The researcher holds that music lecturers and students opt to use AI through the four variables if the AI resources are efficacious in their academic activities.

Methodology

According to Lichtman (2023) and Savin (2023), the researcher used qualitative research to engage with music lecturers and students from three tertiary institutions in Zimbabwe. The study of music in Zimbabwe constitutes a small section of the academia, and a few institutions offer tuition at undergraduate and postgraduate levels. Three universities, GZU, MSU and UZ, offer academic studies in music. The researcher randomly selected four female and six male lecturers from the above universities' institutions with consideration to gender balance. Rahman et al. (2022), the researcher randomly sampled 40 students (24 males and 16 females) based on the student population. Grounded on anticipated merits, the researcher elected to subject the participants to a structured interview with open and closed-ended questions to solicit views on using AI resources in assignments, projects and research (Ruslin, 2022). Email, face-to-face interactions, Facebook calls, voice phone calls, WhatsApp calls and WhatsApp chats were used to collect data. Participants consented to their involvement with guaranteed rights to withdraw any time they wished. The researcher pledged confidentiality and respect for all. The data were collated for analysis to derive meaning and implications and draw findings and conclusions.

Data presentation

This section presents the ideas and views that the participants revealed regarding the use of AI in teaching, learning, and research in music. The researcher uses participants' direct lived experiences, verbatim expressions, and ideas to present and analyse how AI affected their teaching, learning, and research in music.



Teaching music with Artificial Intelligence

It was noted that the majority of the lecturers viewed the use of AI as a positive development. They held that Bard, Bing AI, ChatGPT, Gemini, and Google Scholar were useful in studying music. Some concepts mentioned included music analysis, music theory, popular music, music production and performance. One female lecturer said, “I get some of my latest reading materials from Google Scholar, and recently, ChatGPT has proved to be effective, and I like it. Academics should keep informed on current trends. The internet can present information that is not factual, hence the need to verify authenticity”. Another lecturer mentioned that over-reliance on AI was a problem. He said that “the world has changed. Technology-aided teaching creates lazy students and a lazy generation of people. I cannot call them academics because they do not own knowledge”. One senior lecturer informed that “the pace at which the technology is changing is a cause for concern because it threatens to the role of lecturers”. On a different note, two lecturers who had just finished their doctoral degrees argued that, “the world needs to embrace the AI because that is where the world is going. Resistance is detrimental”. They further held that music production was now AI-driven. Without it, things would be difficult. Another lecturer viewed AI as a force that will change humanity forever. He remarked that “one day we will wake up with no need for a lecturer hence people should be careful. If students can learn without a lecturer, it means lecturers are unnecessary”. The researcher noted that Cubase 13, Fruity Loops 21 and Wavelab 12 have some AI applications for mixing and mastering music productions. Experience informs that without AI mixing and Master of Music Production, it may take a long time to complete. AI enables music programming through plugins¹ to make intelligible music productions.

From the above, one notices that there is due acknowledgement of the use of AI. While some participants embraced the merits of AI, some regarded that as a disruption; hence, they had no interest. Although the views are understandable, self-drive is necessary to use some trending AI resources. Most lecturers mentioned that their universities did not offer supporting workshops to inform on AI resources. One lecturer said, “I always search the internet to find the latest AI tools because I do not want to lag”. He said, “All the knowledge I have about AI is a result of personal explorations; hence, I know the current trending technologies”. The above view is true; one should check the latest AI resources. AI applications on the internet have attracted users among lecturers and learners seeking knowledge. It was observed that students met submission deadlines using AI for quick answers to essays and seminar presentations. One lecturer mentioned that some students did not use AI tools properly; hence, they failed to own their essays, which was unfortunate for university education. Regardless of the above, most lecturers held that AI was useful to those grounded in knowledge of their specialisation because they could interrogate it. Otherwise, regurgitating ideas from AI applications, whether in teaching or learning, does not benefit the students. They insisted that passing examinations, essays and projects was not the end. More importantly, grasping knowledge was more important than just earning high grades. The essence of AI is to equip students with knowledge, and lecturers’ involvement should ensure that learners gain the envisioned knowledge.

Artificial intelligence and learning

The learners regarded AI as a reprieve to the congested schedules for lectures and strict deadlines for assignments. Consequently, it eased the way through studies. They also noted that AI produced learners who lacked rigour in scholarship. One graduate student submitted, “How can you own ideas that you have not read and understood? Students ought to read and understand, not merely write

¹ These are AI applications used in music production software to enable extra functions which a music producer can use to mix and master music. Some of the features include equalisation, dynamics processing, stereo balancing and noise removal.



assignments using AI. We now have lazy learners". Several other learners held that the role of lecturers was being taken over by AI. It removed interaction between teachers and learners. Even though AI-enabled users to derive answers to questions, participants reasoned that AI responses could only be verified by knowledgeable users. They thought the future was gloomy because ownership of knowledge and skills was weak. However, students analysed song text using AI, Bard, Bing AI, ChatGPT, and Gemini. They also used AI to generate meanings. AI-enabled speech-to-text transcriptions and users discussed ideas with their peers. Muscore four and Sibelius 7, being AI-driven, enabled the study of form, rhythm structures, texture of sound, chords and pitch levels. The above packages indicated red as the pitch got out of range. In response, users adjusted the keys. In music production, learners examined sound through spectrum analyser plugins using Cubase 13 and Wavelab 12. Further, they analysed frequency distribution with equalisers to balance sound output. The above AI processes are done with visual displays to reinforce the audio output on monitors. The above thoughts suggest that AI and the human factor complement to engage in evocative interaction with concepts. They further noted that although their lecturers had gained knowledge through reading books and handouts, this was hard without AI. In that regard, they felt using AI was an ideal replacement for using hard copies of literature.

Studying before AI caused difficulties in acquiring knowledge, but it helps to interrogate AI and cross-check perversions confidently. In the same way, AI can also provide 21st-century knowledge in studying music. The above universities' modular system² was viewed as causal to the abuse of AI since it is not complemented with efforts to conceptualise knowledge. When using AI to write essays and dissertations, participants stated that the purpose of academic work is defeated when students cannot own their work. Even though some students memorised their work without ownership, there was no scholarship. Learners need to express their academic ideas in ways that reveal experiential knowledge. However, AI cannot derive empirical context except for the user. The participants understood that AI was here to stay, hence the need to embrace and utilise it positively. Importantly, learners should combine AI with traditional ways of learning. Music as a practical subject thrives in face-to-face interactions, especially performance practice; hence, the participants use AI-generated audio-visual tutorials to complement the lecturers. A blended approach³ was embraced in institutions to support resources for lecturers and students. The lecturers accepted that AI was useful, and users should embrace it positively. Using AI requires personal resolve to get the best since the temptation to make shortcuts is highly likely.

Inclusion of AI in research

The inclusion of AI in research attracted attention from participants as it ignited interest. The lecturers welcomed AI for research due to the ease of sourcing information and deriving different referencing systems and antiplagiarism checks. They submitted that AI was effective if users were informed of their subject matter. With novices, AI would mislead them if information is not verified. It is sensible for users to gain knowledge before engaging AI to get credibility. One lecturer said, "AI tools are like a big supermarket where one has to make an informed choice of what they may want to buy". Another lecturer submitted that "AI tools help to refresh knowledge; hence, solid knowledge of subject matter is critical. I can select what is relevant based on my knowledge". Most learners argued that they needed to grow and use AI to expand their worldview and knowledge. Hence, the prerequisite of grounded knowledge was questioned. They further said that 4IR is digitally driven people can rely on AI for educational endeavours. The 4IR has bred a digital community that thrives through using

² This is teaching-learning model adopted by all universities in Zimbabwe where three modules are taught within 36 hours in 6 weeks half of semester (quarter of the academic year) and examinations are done in the 7th week. The next quarter begins soon after the end of the preceding one.

³ This is a combination of virtual and AI resources and the traditional face-to-face in teaching and learning music.



AI. The current learners are techno-savvy and can confidently surf through AI more than the old generation. One lecturer admitted that “the young learners can survive in the digital environment more than the old generation. We are laid back”. Another lecturer said, “I like how AI provide referencing styles in research; it was not there around the 1990s when I did my degree”. Indeed, the academic landscape has morphed into a terrain with innumerable AI resources offering assistive research features. The study reveals that AI eased literature review especially. They also facilitate the researchers’ engagement in discussions and application of ideas in studies. Nvivo 10 was an effective AI-driven software for thematic data analysis. Through Nvivo, researchers derived themes from interviews and focus group discussion data. The information was collated in line with the research objectives. Two lecturers and ten students asserted using Nvivo 10 to analyse qualitative data. About 30 students used speech-to-text transcriptions with AI to transcribe data, communicate, and write notes.

The researcher thinks lecturers and learners should balance their engagement with AI. While over-reliance on AI has some benefits to gather knowledge, dislike of AI may be counter-productive. Undeniably, AI resources have made it easy for participants to engage in research. Some students, however, informed me that a lack of time to read and acquire knowledge leads to focusing on answers minus conceptualisation. Research remains critical in academia. However, sole reliance on AI facilities deprives participants of opportunities to interact with knowledge. Academics should be honest and credible to produce reputable research results. This is what separates academics and those outside the domain. The next section presents the emerging ideas from the study.

Insights from the study

Based on participants' views and experiences, AI in teaching-learning music is relevant to the current times as it provides ways to advance knowledge. Through AI, there are possibilities to derive answers to questions and explanations of music concepts and theories. In real-time, song text analysis is possible through AI applications such as Bard, Bing AI, ChatGPT, Gemini and Google Scholar. Software such as MuseScore 4 and Sibelius 7 enable transcription of music, analysis of sound, rhythms and melodies, form and chord progressions. In music production, AI helps music producers engage in recording, programming, mixing and mastering. Students engage as individuals or groups to analyse frequency content and mix sounds to acceptable standards. The lecturers are facilitators to ensure learners use AI effectively and avoid abuse. Sometimes, learners are anxious to pass tests; hence, they abuse AI to submit assignments and essays quickly. The ease of use and efficiency of AI has spurred its acceptance. Knowledge acquisition requires the resilience of AI users.

In research, AI enables the transcription of interviews and focus group discussions. Lecturers and students benefit from using Nvivo 10 to analyse thematic data in response to the research objectives. Speech-to-text conversion is an AI merit that enables the audio transcription of the text. Researchers can analyse meanings and draw inferences from data. AI removes the laborious process of transcribing the recorded audio to text using pen and paper. The AI provides functions that allow users to operate efficiently. The dissemination of research benefits from AI as the articles are accessible on the Internet by readers through AI resources. However, AI should always be scrutinised to verify the credibility of information. Not all users check the authenticity of materials if they do not understand the subject matter. Skilled and well-informed academics are needed to assist the learners in verifying ideas from AI resources. Interaction between lecturers and learners remains critical to engage in academic endeavours. Although AI resources are expedient, the practical involvement of lecturers as facilitators is vital in teaching, learning and research of music.



Conclusion

The study examined the use of AI resources in music academy. The researcher focused on the universities that offer tuition in music in Zimbabwe: GZU, MSU and UZ. It is concluded that the utilisation of AI resources is increasing among university music lecturers and learners. They used AI to transcribe and analyse text, rhythms, melodies, and chords when teaching music students. Bing AI, ChatGPT, Gemini Google Scholar and WhatsApp were commonly used by lecturers and students. Musescore 4 and Sibelius 7 were used to explore the theory of music and analysis of music notation. AI in music production enables music programming, mixing, and mastery. The students used AI to write assignments, essays and dissertations. Despite its adeptness, WhatsApp was not accepted as an official resource. However, participants thrived informally using it for research, tutorials, dissemination of lecture notes and communication. The study also revealed the fear of lecturers losing relevance; however, they are needed to support using AI effectively in music teaching learning and research. AI resources save time for both lecturers and students.

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