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DIGITAL LITERACY AMONG MUSIC TEACHER EDUCATORS IN GHANA: IMPLICATIONS FOR TECHNOLOGY-ENHANCED MUSIC INSTRUCTION

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Abstract
Integrating digital technologies into teacher education has become a central concern in contemporary educational reform efforts across Africa. In music education, digital literacy has emerged as a critical competency for teacher educators preparing future teachers for technology-enhanced learning environments. This study examined the digital literacy levels of music teacher educators at Peki College of Education in Ghana and explored the implications of their digital competencies for music instruction. Guided by a qualitative case study design and the Technological Pedagogical Content Knowledge (TPACK) framework, data were collected over three months through semi-structured interviews with four music teacher educators, a focus group discussion with ten students, classroom observations, and document analysis. Findings revealed that participants possessed moderate levels of digital literacy and demonstrated competence in the use of commonly available digital platforms such as WhatsApp, Facebook, YouTube, and Zoom. However, limited proficiency was observed in the use of specialised music technology applications, including music notation and audio production software. The study further identified infrastructural challenges, inadequate professional development opportunities, and unequal access to digital resources as major constraints to effective technology integration. The findings suggest that strengthening digital literacy among music teacher educators is essential for enhancing pedagogical innovation, student engagement, and the quality of music teacher preparation in Ghana. The study recommends sustained professional development programmes, institutional investment in digital infrastructure, and the integration of music technology training into teacher education curricula.

Keywords: Digital Literacy, Music Teacher Education, Technology Integration, Teacher Educators, Digital Pedagogy

Introduction

Digital technologies have transformed educational practice worldwide, and digital literacy is now regarded as a fundamental competency for educators in twenty-first-century learning environments (Pérez-Escoda et al., 2019; Spante et al., 2018). Teacher educators are expected not only to use technology but also to model its effective use and prepare future teachers for digitally mediated classrooms. In Ghana, the Ministry of Education's (2015) ICT in Education Policy promotes the integration of ICT into teaching and learning and the development of teachers' ICT competencies, and the Standards-Based Curriculum (NaCCA, 2019) has similarly raised expectations that teachers will use digital tools in their practice. Yet disparities persist in access to digital resources, technological skills, and professional development (Nkansah & Oldac, 2024). Music education offers distinctive opportunities for technology, including notation software, digital audio workstations, online collaboration platforms, multimedia resources, and virtual performance environments. Realising these opportunities depends largely on the digital literacy of the teacher educators who prepare future music teachers (Campanini, 2023). Although digital literacy and technology integration have been widely studied in general education, the evidence narrows sharply in two steps: studies of Ghanaian teachers and students are comparatively few and concentrate on general ICT use, and music teacher educators, whose practice depends on specialised tools for notation, audio production, and performance, are almost entirely unexamined in Ghana. This study therefore investigates the digital literacy levels of music teacher educators at Peki College of Education and the implications of these competencies for technology-enhanced music instruction.

The study was guided by four research questions: (1) What is the level of digital literacy among music teacher educators at Peki College of Education? (2) Which digital technologies do they use in music instruction, and for what purposes? (3) What challenges constrain their integration of digital technologies? (4) What are the implications of their digital competencies for technology-enhanced music instruction in teacher education?

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Literature Review

Digital Literacy and Professional Competence in Teacher Education

Digital literacy has evolved from a narrow concern with operating computers and devices into a multidimensional construct that includes technological, cognitive, social, ethical, and pedagogical competencies (Pérez-Escoda et al., 2019). It involves accessing, evaluating, creating, and sharing information through digital technologies while engaging critically with digital content (Spante et al., 2018). Within teacher education, it is now considered an essential element of preparedness (Ng, 2012). Teacher educators' digital competencies significantly influence pre-service teachers' technology integration practices: when teacher educators model technology-enhanced instruction, their students are more likely to adopt innovative approaches, whereas inadequate digital literacy among faculty limits meaningful integration (Nikolopoulou, 2022). International bodies such as UNESCO (2018) advocate systematic competence development for educators, and Ndibalema's (2025) systematic review concludes that persistent digital literacy gaps continue to constrain twenty-first-century skills in sub-Saharan African higher education.

Because the literature uses digital literacy and digital competence with overlapping and sometimes inconsistent meanings (Spante et al., 2018), this study states how it uses each. Digital literacy is treated as the broader construct: the capacity to access, evaluate, create, and communicate information critically and responsibly through digital technologies (Pérez-Escoda et al., 2019). Digital competence refers to the applied, demonstrable knowledge, skills, and attitudes through which that capacity is exercised in a professional role, as articulated in frameworks such as DigCompEdu (Caena & Redecker, 2019; Punie & Redecker, 2018). Digital competence is thus the observable expression of digital literacy in particular tasks. The study adopts digital literacy as its umbrella construct and uses digital competence when referring to proficiency with specific tools or teaching tasks, such as music notation or audio production. Digital competence is also increasingly treated as part of teacher professionalism (Caena & Redecker, 2019). Teachers are now expected to design digital learning experiences, facilitate online collaboration, analyse digital assessment data, and learn through virtual networks (Punie & Redecker, 2018). Digitally competent teachers are more likely to use student-centred pedagogies and support higher-order thinking (Hämäläinen et al., 2021). Researchers nonetheless caution against reducing competence to technical expertise, since effective integration requires understanding how technologies serve pedagogical and content-specific goals (Carretero et al., 2018; Zhang & Zhu, 2023).

The TPACK Framework

Research on technology integration is commonly informed by the Technological Pedagogical Content Knowledge (TPACK) framework, which holds that effective integration arises from the interaction of technological, pedagogical, and content knowledge (Mishra & Koehler, 2006). The framework challenges the assumption that technology automatically improves learning and stresses that tools must support particular pedagogical approaches within specific disciplines (Koehler et al., 2019). TPACK is especially useful in music education, which combines artistic content, performance-based pedagogy, and increasingly sophisticated technological resources, although Campanini (2023) notes that it remains under-applied in popular and contemporary music education, where technological fluency is often assumed rather than systematically developed. Teacher confidence depends on opportunities to build interconnected knowledge, so professional development focused solely on technical skills seldom transforms instruction (Voogt et al., 2019).

TPACK and digital literacy are related but not synonymous. Digital literacy is the broader capacity to use digital technologies critically and productively, whereas TPACK specifies the integrated knowledge teachers need to teach particular content with technology. TPACK therefore provides the pedagogical and content-specific lens through which digital literacy can be understood in teaching: it asks not only whether educators can operate a tool but whether they can use it to represent musical content and support learning.

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In this study, digital literacy is the phenomenon under investigation, and TPACK is the interpretive lens used to judge what that literacy means for music instruction.

Digital Literacy in Teacher Education and Music Teacher Education

Effective programmes integrate technology throughout the curriculum rather than treating it as an isolated subject (Tondeur et al., 2020), yet many institutions, particularly in developing contexts, struggle with infrastructural limitations, limited access to resources, and insufficient faculty expertise (Tondeur et al., 2021). African studies generally show that teacher educators possess basic digital skills centred on email, messaging, and presentation software but lack confidence with advanced educational applications. Recent Ghanaian evidence agrees: Dzidzornu and Xu (2025) found moderate digital literacy among student teachers but weaker competence in advanced applications, and Nkansah and Oldac (2024) reported a persistent gap between students' everyday digital habits and the specialised skills required for academic and professional purposes.

In music education, technology can boost motivation, participation, creativity, and self-directed learning by letting learners experiment and receive immediate feedback. Cuervo et al. (2023) found that structured opportunities to develop digital competences, particularly through service learning, strengthened pre-service music teachers' confidence. Teacher competence nevertheless remains a critical determinant of success; in a large survey during the COVID-19 pandemic, Váradi et al. (2023) found wide variation in music teachers' confidence, from creative adaptation to difficulty transferring familiar routines online.

Social Media, African Higher Education, and the Ghanaian Context

Platforms such as WhatsApp, YouTube, Facebook, and Zoom support communication, content sharing, feedback, and peer collaboration, and can foster communities of practice (Yeboah & Nyagorme, 2022). Concerns about distraction, information quality, privacy, and professional boundaries mean that effective educational use still requires strong digital literacy. African higher education has undergone substantial digital transformation, accelerated by the COVID-19 pandemic, which also exposed structural inequalities (OECD, 2021; UNESCO, 2021). Recurring challenges include inadequate internet infrastructure, unreliable electricity, limited resources, and scarce professional development, and Ndibalema (2025) attributes digital literacy gaps more to institutional and infrastructural constraints than to individual unwillingness. Smartphones have become particularly important because they offer relatively affordable access. Ghana's ICT in Education Policy emphasises the digital competencies needed in knowledge-based societies, and Colleges of Education occupy a strategic position in implementing it (Ministry of Education, 2015). Ghanaian studies report positive attitudes toward technology but substantial challenges in infrastructure, training, technical support, and resources (Dzidzornu & Xu, 2025), with educators using technology mainly for communication and information retrieval rather than transformative pedagogy (Nkansah & Oldac, 2024).

Taken together, the literature offers three levels of evidence. First, research on digital literacy in general is extensive and has produced robust conceptual frameworks (Pérez-Escoda et al., 2019; Spante et al., 2018). Second, studies of Ghanaian teachers and students' document uneven competence and constraining conditions, but most examine student teachers' technology use or general technology integration (Dzidzornu & Xu, 2025; Nkansah & Oldac, 2024). Third, music teacher educators, whose practice depends on notation, audio production, and digital performance tools, are the least studied group: international work on music teachers and pre-service music teachers (Cuervo et al., 2023; Váradi et al., 2023) has not been matched by evidence from Ghanaian Colleges of Education. This study addresses that gap.

Methodology

A qualitative case study design was used to explore participants' experiences, perceptions, and practices regarding digital technologies in music instruction at Peki College of Education, a public College of Education whose Creative Arts programme prepares pre-service teachers to teach music in Ghanaian basic

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school. A single-institution case allowed an in-depth examination of a context-dependent phenomenon shaped by institutional culture, resources, professional development, and policy. The study was guided by the TPACK framework (Mishra & Koehler, 2006), which provided the conceptual lens for examining participants' digital competencies and instructional practices. Purposive sampling was used to select four music teacher educators and ten student teachers enrolled in music education courses at Peki College of Education. The four teacher educators took part in individual semi-structured interviews, and the ten students were later brought together for a focus group discussion. These four Lecturers include two male and two female. All the male lecturers have their PhD in Music Education and are on the rank of lecturer. One of the male lecturers has nineteen (19) years teaching experience and is the Head of Creative Arts Department where music forms part of the programme. The other male educators also have ten (10) years of teaching music programmes. Whiles the female lecturers are about completing their PhD. Currently, they are on the rank of Assistant Lecturer with 12 and 10 years of teaching experience respectively. The students who also participated in the survey were ten (10) in number. Five males and five females. Two females were selected from level 200, one female was selected from level 300 ad two female were selected at level 400 while two males were selected from level 200, one male at level 300 and two male were also selected at level 400. Participants were eligible if they were actively involved in music teaching and learning, meaning that they taught or were enrolled in music education courses during data collection, and had experience using digital technologies for instruction. Such experience was defined as having used digital technologies for at least one of the following: lesson delivery, assessment, communication with students, or music-specific activities such as notation, composition, audio recording and production, or performance. Participants also had to be willing to be interviewed or to take part in the focus group discussion and, in the case of teacher educators, to be observed.

Including two participant groups, together with four data sources, supported both data-source triangulation (teacher educators' and students' perspectives) and methodological triangulation (interviews, a focus group discussion, observations, and documents). Data collection took three months. There was no fixed daily timetable; the researcher met participants according to their own schedules. Four complementary methods were used. Semi-structured interviews with the four teacher educators, the primary method, lasted about 30 minutes each, were audio-recorded with consent, and addressed participants' understanding of digital literacy, experiences and perceived competencies, instructional applications, challenges, and professional development. The ten students were grouped for a focus group discussion moderated by the researcher, who posed open-ended questions and prompts on their experiences, attitudes, challenges, benefits, preferences, and concerns regarding the use of social media in music instruction. The group format allowed students to respond to one another, share examples, and suggest improvements, and surfaced shared themes, differing viewpoints, and common challenges that individual interviews might not. The discussion was audio-recorded with participants' consent and supplemented by detailed notes. Classroom observations examined the technologies used, teacher-student interactions, student engagement, and challenges, allowing reported practices to be compared with actual implementation. Document analysis of course outlines, ICT policy documents, curriculum materials, and technology integration guidelines clarified institutional expectations.

The interview and observation protocols were structured around the TPACK domains. Interview questions explored technological knowledge (familiarity and confidence with digital tools), pedagogical knowledge (how technologies supported teaching approaches), content knowledge (music-specific uses such as notation, composition, recording, and performance), and the intersections among them (technological pedagogical, technological content, and technological pedagogical content knowledge). The observation schedule recorded, for each lesson, which technologies were used, for what musical and pedagogical purpose, and how students responded. TPACK therefore informed data collection as well as interpretation. Data were analysed thematically using Braun and Clarke's (2022) six-phase framework, applied iteratively rather than linearly. The audio recordings of the interviews and the focus group discussion were transcribed verbatim, which preserved the original data for analysis, and the transcripts were read repeatedly alongside

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observation notes and documents, with analytical memos recording early impressions. Transcripts were then coded manually, line by line. Semantic codes captured the explicit content of participants' accounts (for example, smartphone literacy, social media integration, internet accessibility, and music software limitations), whereas latent codes captured underlying assumptions and meanings (for example, digital confidence and digital inequality). Codes were merged and refined as patterns emerged. Related codes were organised into candidate themes using mind maps and thematic matrices, then reviewed against the coded extracts and the full dataset. For example, infrastructure, resource availability, and connectivity were combined into a single theme on structural barriers. Four themes were finalised, defined, and named, and were finally interpreted in relation to TPACK and existing scholarship.

Reflexive thematic analysis treats coding as an interpretive process and does not require inter-rater reliability statistics (Braun & Clarke, 2022). The first author coded all data as the sole coder; rigour was maintained through reflexive memoing, a documented record of coding decisions, and discussion of emerging themes among the authors.

Trustworthiness was addressed using the criteria of credibility, dependability, confirmability, and transferability (Lincoln & Guba, 1985; Nowell et al., 2017). Credibility was enhanced through data-source and methodological triangulation, which enabled the researchers to compare evidence obtained from different sources and methods and identify areas of convergence and divergence. Dependability was supported by maintaining an audit trail comprising audio recordings, interview transcripts, observation notes, analytical memos, coding records, and thematic maps, thereby documenting the research process and the development of themes. Confirmability was strengthened through reflexive memoing, in which the researchers documented their assumptions, professional experiences as music educators, and potential influence on data interpretation. These records supported critical reflection on the relationship between the evidence, analytical decisions, and emerging interpretations. Transferability was addressed through thick description of the institutional context, participant characteristics, research procedures, and findings, enabling readers to assess the relevance of the findings to other Colleges of Education and comparable educational settings. Given the context-specific nature of the study, the findings are intended to support contextual understanding rather than statistical generalisation. Where member reflection was conducted, participants' feedback on summaries of their interview accounts was also considered in assessing the accuracy of the researchers' interpretations.

Permission was granted by the management of Peki College of Education. Participants received information about the study's purpose and procedures and gave informed consent, including consent to audio-recording and classroom observation. Participation was voluntary, and participants were free to refuse or to discontinue their involvement at any time without consequence. Confidentiality was protected by substituting participants' names with pseudonyms: the four teacher educators are referred to as Edem (TE1), Afi (TE2), Kodzo (TE3), and Selorm (TE4), and the students who took part in the focus group discussion are referred to by pseudonyms such as Delali (ST1), Senyo (ST2), and Elorm (ST3). Identifying details were also removed from transcripts and reports, and recordings and transcripts were stored securely and were accessible only to the research team.

Findings

Thematic analysis produced four interconnected themes describing music teacher educators' digital literacy and its implications for technology-enhanced instruction. Illustrative quotations are identified by pseudonyms and participant codes; teacher educators' quotations (TE) come from the individual interviews, and students' quotations (ST) from the focus group discussion.

Theme 1: Foundational Digital Literacy Competence

Participants generally had foundational competencies and were confident operating smartphones, laptops, projectors, browsers, email, and social media, which they used for lesson preparation, communication, information retrieval, content sharing, and administration. Digital tools were seen as integral rather than

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optional, and observations confirmed that devices and online resources were regularly used to supplement lessons and provide musical examples. Competence nevertheless varied with age, prior experience, access to training, and institutional support. Participants with formal ICT training showed greater confidence and versatility than those who relied on self-directed learning, suggesting that disparities may affect the consistency of technology-enhanced instruction.

Edem (TE1) described how he used his devices to prepare and present musical examples:

> "Almost everything I do begins on my phone or my laptop. When I am preparing a lesson on, say, Ewe highlife or choral techniques, I search YouTube for good recordings, save them, and then connect my laptop to the projector so that the class can listen and watch together. Without that, I would be explaining the sound with only words."

A student confirmed this practice. Delali (ST1) said in the focus group discussion: "In class he plays examples from his laptop through the projector, and sometimes he sends the same recordings to our WhatsApp group afterwards so we can listen again." An observation note from one of Edem's lessons is consistent with both accounts: a laptop was connected to a projector and two YouTube recordings of choral performances were played to illustrate part-singing, with students asked to identify the voice entries.

Theme 2: Predominance of social media-Based Instructional Practices

Social media was the most accessible and frequently used category of technology. Participants named WhatsApp, YouTube, Facebook, and Zoom as their main instructional tools because they were familiar, widely accessible, cost-effective, and compatible with students' existing habits. WhatsApp was used most often, with groups serving as virtual learning spaces for announcements, sharing lecture notes, coordinating assignments, facilitating discussion, giving feedback, and answering questions outside class hours. YouTube recordings of performances, rehearsals, demonstrations, and analyses supplemented teaching and prompted students to compare interpretations and reflect. Zoom became important after the COVID-19 pandemic for remote instruction and collaboration. These platforms compensated for infrastructural limitations while supporting flexible, learner-centred approaches.

Afi (TE2) explained why WhatsApp and YouTube were her main tools:

> "I use WhatsApp mostly because everyone already has it and it uses very little data. Students may not afford to buy data for something new, but they will find a way for WhatsApp. I share notes, audio and short videos there, and YouTube gives me recordings of performances that I cannot bring to class."

Students in the focus group discussion echoed these reasons. Senyo (ST2) said:

> "We prefer WhatsApp because it is cheap and we are used to it. If the lecturer posts an assignment or a recording at night, we can open it when the network is good, and we can ask questions without waiting for the next lecture."

Theme 3: Limited Competence in Specialised Music Technologies

Only a small number of participants regularly used professional music software such as Sibelius, Finale, Audacity, GarageBand, and Soundtrap. Many were unfamiliar with these tools, uncertain about their instructional uses, and had never received formal music technology training. The finding reveals a clear distinction between general digital literacy and discipline-specific technological competence. Participants attributed the gap to insufficient training, limited institutional investment, inadequate technical support, and restricted access to licensed software. Because these educators prepare future teachers for digital learning environments, the limitation may constrain pre-service teachers' development of advanced digital pedagogical skills.

Kodzo (TE3) was candid about his unfamiliarity with specialised music software:

> "To be honest, I have heard of Sibelius and Finale, but I have never been trained to use them. I learned to write scores by hand, and that is how I teach. If someone showed me how to use notation software step by step, I would gladly use it, but we have not had that kind of training here."

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Theme 4: Structural Barriers

Internet connectivity was identified as a major obstacle: weak coverage, inconsistent access, and limited bandwidth repeatedly disrupted online demonstrations, video streaming, and virtual sessions. Participants also reported shortages of computers, projectors, audio and recording equipment, and specialised applications, and observations showed that available resources were often shared among departments. Finally, professional development was lacking. General ICT workshops rarely addressed pedagogical uses of music technologies, so many participants depended on self-directed learning, peer support, and experimentation. Overall, music teacher educators have foundational competencies and use social media actively, but substantial challenges remain in specialised knowledge, institutional support, and infrastructural capacity.

Connectivity and shared equipment were the most immediate frustrations. Selorm (TE4) described how they disrupted teaching:

> "The network is very unstable. Sometimes I prepare to show a video in class, and it keeps buffering until the period is over. The projector is also shared between departments, so if another department has booked it, I have to teach without it."

The absence of music-specific training was also stressed. Afi (TE2) noted:

> "The workshops we attend are general ICT workshops, how to use Word or PowerPoint. Nobody teaches us how to use technology for music, for example, recording a choir or editing audio. We learn from colleagues or by trying things ourselves."

Discussion of Findings

From a TPACK perspective, participants showed reasonable technological knowledge related to communication tools, but evidence of deeper technological pedagogical content knowledge was comparatively limited (Mishra & Koehler, 2006). Heavy reliance on WhatsApp, Facebook, and YouTube mirrors patterns across African higher education, where educators adopt accessible technologies to overcome infrastructural constraints (Ghavifekr & Rosdy, 2018), and is consistent with Yeboah and Nyagorme's (2022) finding that Ghanaian students' acceptance of WhatsApp is driven largely by accessibility and compatibility with existing habits rather than pedagogical sophistication. Such platforms support communication and engagement but cannot substitute for specialised tools for composition, notation, recording, and performance analysis (Cuervo et al., 2023).

The limited competence in specialised tools matters because each category of music technology serves a distinct musical purpose. Notation software such as Sibelius and Finale supports the representation, arrangement, and analysis of scores and underpins the teaching of music literacy and composition. Audio editors and digital audio workstations such as Audacity, GarageBand, and Soundtrap support recording, editing, production, and collaborative creation, allowing learners to compose, evaluate their own performances, and work directly with sound. Performance teaching depends on recording, playback, and analysis tools and on virtual rehearsal environments. WhatsApp, YouTube, and Zoom can circulate recordings and support demonstration, but they offer little support for these processes, and general-purpose videoconferencing was not designed for synchronous music-making, a difficulty reflected in the problems teachers experienced in transferring musical routines online (Váradi et al., 2023).

In TPACK terms, what participants appeared to lack was less general technological knowledge than technological content knowledge (how software represents and transforms musical material) and the technological pedagogical content knowledge needed to teach music through it. This helps explain why confident everyday users of technology could still be hesitant about notation and production software, and why general ICT workshops that target technological knowledge alone are unlikely to close the gap (Voogt et al., 2019). Participants' own accounts illustrate this distinction. Kodzo (TE3) explained: "WhatsApp and YouTube are what I can manage. I can send a recording to the students, and they can listen, but if you ask me to produce a score or edit audio, I would not know where to begin." Observations pointed the same way: in one observed lesson on part-singing taught by Selorm (TE4), a YouTube recording of a choral piece was

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played through a phone speaker and the audio file was then shared with the class on WhatsApp, where notation software could have been used to display and analyse the score, or recording software to capture and review students' own singing. Participants located the cause in institutional conditions rather than personal reluctance. As Elorm (ST3) put it in the focus group discussion, “It is not that the lecturers do not want to. There is no software on the computers, and nobody has been trained, so they use what is available, which is the phone,” which is consistent with Ndibalema's (2025) attribution of digital literacy gaps to institutional and infrastructural constraints.

The findings pose a teacher education challenge: if teacher educators have limited music technology expertise, pre-service teachers may graduate without the competencies needed for technology-enhanced instruction, echoing Campanini's (2023) observation that technological fluency is often assumed but rarely built systematically. Strengthening digital literacy among music teacher educators is therefore a strategic investment in the quality of teacher preparation across Ghana.

Conclusion

This study examined the digital literacy of music teacher educators at Peki College of Education and its implications for technology-enhanced music instruction. Participants possessed foundational competencies and were confident with smartphones, laptops, internet resources, and social media, which had become part of everyday practice. WhatsApp, YouTube, Facebook, and Zoom were the most frequently used instructional technologies, reflecting educators' adaptability in a resource-constrained setting. However, competence in specialised music technologies such as Sibelius, Finale, Audacity, GarageBand, and Soundtrap was considerably lower, revealing a gap between general digital literacy and discipline-specific competence, consistent with Nkansah and Oldac's (2024) evidence that everyday digital habits do not automatically yield specialised skills. This gap raises concerns about the preparedness of future music teachers.

Technology integration was further constrained by inadequate infrastructure, unreliable connectivity, limited software and equipment, and a lack of targeted professional development, reflecting wider African realities in which aspirations for digital transformation exceed available resources (Ndibalema, 2025). Through the TPACK lens, participants have varied technological knowledge but have not yet developed the integrated technological, pedagogical, and content knowledge needed for transformative instruction; social media supports engagement but not deeper innovation without discipline-specific competence.

This study has limitations. As a single-institution qualitative case, it offers depth rather than statistical generalisability, and its findings should be read as transferable to similar Colleges of Education only with attention to context. Participants' self-reports may overstate or understate their competence, although observations and documents were used to check them. Future research should examine music teacher educators across several Colleges of Education, use mixed methods to measure competence more precisely, and evaluate the effects of music technology training on teacher educators' practice and on student teachers' preparedness.

Recommendations

Based on the findings, the study recommends the following.

1. **Sustained, music-specific professional development.** Colleges of Education, with the Ministry of Education and the bodies responsible for teacher education, should provide continuing professional development that is hands-on and tied to classroom tasks in notation, audio recording, and music production, rather than generic ICT workshops. Training should develop technological pedagogical content knowledge, not tool operation alone, and can be reinforced through peer mentoring and communities of practice, building on the WhatsApp groups that educators already use.

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2. **Institutional investment in digital infrastructure.** Institutions should prioritise reliable connectivity and power, equipped music or computer laboratories, projectors, audio and recording equipment, and licensed software, with transparent arrangements for sharing resources across departments. Where licences are unaffordable, free and open-source tools such as Audacity and MuseScore, and educational licensing arrangements, offer practical alternatives.
3. **Integration of music technology into teacher education curricula.** Music technology should be built into Creative Arts and music education programmes so that student teachers learn to use, and to teach with, notation and production tools, and so that teacher educators model such use in their own courses.
4. **Technical support and enabling policy.** Colleges should establish dedicated technical support, and national policy should translate the ICT in Education Policy into discipline-specific expectations, including digital competence benchmarks for teacher educators, that institutions can monitor and report against.

References

Braun, V., & Clarke, V. (2022). *Thematic analysis: A practical guide.* Sage.

Caena, F., & Redecker, C. (2019). Aligning teacher competence frameworks to 21st-century challenges: The case for the European Digital Competence Framework for Educators (DigCompEdu). *European Journal of Education, 54*(3), 356–369. https://doi.org/10.1111/ejed.12345

Campanini, A. (2023). A place for TPACK in popular music education: A review of existing literature. *Journal of Popular Music Education, 7*(3), 269–284. https://doi.org/10.1386/jpme_00108_1

Carretero, S., Vuorikari, R., & Punie, Y. (2018). *DigComp 2.1: The digital competence framework for citizens*. Publications Office of the European Union.

Cuervo, L., Bonastre, C., Camilli, C., Arroyo, D., & García, D. (2023). Digital competences in teacher training and music education via service learning: A mixed-method research project. *Education Sciences, 13*(5), 459. https://doi.org/10.3390/educsci13050459

Dzidzornu, A. A. K., & Xu, X. (2025). Assessing digital literacy competency among student teachers in Ghana: Perceptions, challenges, and pathways for improvement using the UNESCO ICT-CFT. *Discover Education, 4*, 481. https://doi.org/10.1007/s44217-025-00889-6

Ghavifekr, S., & Rosdy, W. A. W. (2018). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science, 4*(2), 403–412.

Hämäläinen, R., Nissinen, K., Mannonen, J., Lämsä, J., Leino, K., & Taajamo, M. (2021). Understanding teaching professionals' digital competence. *Computers & Education, 173*, 104304. https://doi.org/10.1016/j.compedu.2021.104304

Koehler, M. J., Mishra, P., Kereluik, K., Shin, T. S., & Graham, C. R. (2019). The technological pedagogical content knowledge framework. In M. J. Spector, M. D. Merrill, J. Elen, & M. J. Bishop (Eds.), *Handbook of research on educational communications and technology* (pp. 101–111). Springer.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry.* Sage.

Ministry of Education. (2015). *ICT in education policy.* Government of Ghana.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Ndibalema, P. (2025). Digital literacy gaps in promoting 21st-century skills among students in higher education institutions in sub-Saharan Africa: A systematic review. *Cogent Education, 12*(1). https://doi.org/10.1080/2331186X.2025.2452085

Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education, 59*(3), 1065–1078. https://doi.org/10.1016/j.compedu.2012.04.016

Nikolopoulou, K. (2022). Digital competence in higher education: A systematic review. *Education Sciences, 12*(10), 1–18. https://doi.org/10.3390/educsci12100685

ISSN: 2971-6004
https://www.uniafricajournalofeducation.com

Nkansah, J. O., & Oldac, Y. I. (2024). Unraveling the attributions of digital literacy skills and knowledge gap in Ghana's higher education: Undergraduate students' voices in a phenomenological study. *Education and Information Technologies*. https://doi.org/10.1007/s10639-024-12483-8

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods, 16*(1), 1–13. https://doi.org/10.1177/1609406917733847

Organisation for Economic Co-operation and Development. (2021). *21st-century readers: Developing literacy skills in a digital world.* OECD Publishing.

Pérez-Escoda, A., García-Ruiz, R., & Aguaded, I. (2019). Dimensions of digital literacy based on five models of development. *Culture and Education, 31*(2), 232–266. https://doi.org/10.1080/11356405.2019.1603274

Punie, Y., & Redecker, C. (2018). *European framework for the digital competence of educators: DigCompEdu.* Publications Office of the European Union.

Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital competence and digital literacy in higher education research: Systematic review of concept use. *Cogent Education, 5*(1), 1–21. https://doi.org/10.1080/2331186X.2018.1519143

Tondeur, J., Howard, S. K., & Yang, J. (2021). One-size does not fit all: Towards an adaptive model of educational technology integration in schools. *Journal of Research on Technology in Education, 53*(1), 1–15. https://doi.org/10.1080/15391523.2020.1809894

Tondeur, J., Scherer, R., Siddiq, F., & Baran, E. (2020). Enhancing pre-service teachers' technological pedagogical content knowledge. *Computers & Education, 152*, 103863. https://doi.org/10.1016/j.compedu.2020.103863

UNESCO. (2018). *A global framework of reference on digital literacy skills for indicator 4.4.2.* UNESCO Institute for Statistics.

UNESCO. (2021). *Reimagining our futures together: A new social contract for education.* UNESCO.

Váradi, J., Józsa, G., Fodor, A. Sz., Molnár-Tamus, V., & Szűcs, T. (2023). Investigating music teachers' ICT skills and technical possibilities in the field of online music education during the COVID-19 pandemic. *Heliyon, 9*(5), e16463. https://doi.org/10.1016/j.heliyon.2023.e16463

Voogt, J., Fisser, P., Roblin, N. P., Tondeur, J., & Van Braak, J. (2019). Technological pedagogical content knowledge: A review of the literature. *Journal of Computer Assisted Learning, 35*(2), 109–121. https://doi.org/10.1111/jcal.12329

Yeboah, D., & Nyagorme, P. (2022). Students' acceptance of WhatsApp as a teaching and learning tool in distance higher education in sub-Saharan Africa. *Cogent Education, 9*(1), 2077045. https://doi.org/10.1080/2331186X.2022.2077045

Zhang, X., & Zhu, C. (2023). Digital competence among higher education teachers: A systematic review and framework. *Educational Technology Research and Development, 71*(4), 1457–1482. https://doi.org/10.1007/s11423-023-10203-6