

Integrating digital technologies into rural South African Grade 10–12 Music Education: A CAPS-Aligned systematic review for equity

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ABSTRACT

Integrating digital technologies into music education offers significant opportunities to enhance teaching and learning in rural South African secondary schools, yet persistent inequalities in infrastructure, teacher preparation, and resource allocation continue to constrain equitable implementation, particularly in Grades 10–12 where the Curriculum and Assessment Policy Statement (CAPS) prescribes specific music competencies. This systematic review synthesises literature on digital technology use in rural music education, with explicit attention to CAPS alignment, to examine its influence on learner engagement, skill development, and pedagogical practice. Peer-reviewed articles, policy documents, and empirical studies published between 2010 and 2025 were analysed. Databases including ERIC, Scopus, and Google Scholar were searched using keywords such as digital music education, rural schools, CAPS curriculum, and South Africa. After being evaluated for relevance, methodological quality, and focus on secondary school music education, 37 studies were included. Findings reveal that digital tools such as music notation software, virtual instruments, mobile applications, and online collaboration platforms enhance creativity, support differentiated instruction, and broaden access to diverse musical traditions, including indigenous South African repertoires. However, persistent challenges such as limited connectivity, inadequate teacher training, and weak policy support impede effective integration. Aligning digital technologies with CAPS strengthens curriculum delivery, promotes culturally responsive pedagogy, and helps reduce the rural–urban digital divide. Targeted professional development, improved infrastructure, and CAPS-aligned digital resources are recommended to support sustainable and equitable adoption in rural classrooms. This study contributes by offering a context-specific synthesis that integrates global evidence with rural South African realities, advancing knowledge on equitable technology-enhanced music education.

Keywords: CAPS Curriculum, Digital Technologies, Equity, Music Education and Rural Schools.

INTRODUCTION

It is prudent to foreground this study by providing a brief overview of South Africa's educational landscape so that the investigation of digital technologies in rural Grade 10–12 music classrooms under scrutiny can be properly contextualised. According to existing scholarship, the post-1994 education

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system has undergone significant transformation aimed at redressing historical inequalities and expanding access to quality education.¹

Policies aimed at equity, access, and quality have reshaped curriculum design, teacher development, and resource allocation.² The introduction of the Curriculum and Assessment Policy Statement (CAPS) sought to standardise learning outcomes and ensure consistent curriculum delivery across schools.³ Despite these reforms, disparities between urban and rural schools persist, particularly in access to digital technologies and specialist subjects such as music education.⁴ Rural schools often face infrastructural challenges, including limited internet connectivity, inadequate technological resources, and insufficient teacher training, which constrain effective curriculum implementation.

Music education, as part of the Creative Arts curriculum in Grades 10–12, plays a vital role in fostering creativity, cultural identity, and holistic learner development.⁵ However, the integration of digital technologies, now essential for contemporary music teaching and learning, remains uneven. Advancing digital technologies in rural classrooms offers an opportunity to enhance pedagogical practices, expand learners' musical exposure, and support culturally responsive teaching.⁶ Addressing these disparities aligns with national goals of educational equity, social cohesion, and the development of 21st-century skills necessary for participation in a digital society.

International scholarship highlights the transformative potential of digital technologies in music education, emphasising their role in enhancing creativity, collaboration, and learner engagement.⁷ Studies from Europe, North America, and Asia demonstrate how digital audio workstations, notation software, and online platforms support interactive and student-centred learning. These tools enable learners to compose, perform, and share music in innovative ways, fostering both technical skills and artistic expression. For instance, Shcholokova et al. highlight that:

Digital learning environments have gradually become a key component of the music educational ecosystem, where the combination of traditional performance, theory, and composition with innovative tools enriches teaching methods. Given the music specifics, the effective implementation of digital technologies requires a rethinking of pedagogical approaches that would ensure a high level of learning and develop students' creative potential. In the context of digitalization, the combination of individualized and project-based learning, in which the digital learning environment plays the role of an integrative platform for practice, reflection and artistic experimentation, becomes especially relevant.⁸

Drawing on this insight, it is evident that digital technologies not only provide new tools but also demand a reconfiguration of pedagogical approaches to fully realise learners' creative potential. By integrating individualised and project-based learning within digital environments, music education can foster active engagement, artistic experimentation, and reflective practice. International evidence demonstrates that when digital tools are purposefully integrated into curriculum design, they enhance both technical competencies and expressive capacities, support diverse learning styles and promote

¹ Saleem Badat and Yusuf Sayed, "Post-1994 South African Education: The Challenge of Social Justice," *The ANNALS of the American Academy of Political and Social Science* 652, no. 1 (2014): 127–48; Audrey Rozanne Lawrence, "Basic Educational Reform and Provision of Quality Education in South Africa (1994-2018): A Tentative Exploration of Policy in the Making" (Stellenbosch University, 2022).

² Vusi Gumede and Mduduzi Biyase, "Educational Reforms and Curriculum Transformation in Post-Apartheid South Africa," *Environmental Economics*, no. 7, Iss. 2 (2016): 69–76.

³ Oluwatoyin Ayodele Ajani, "Curriculum and Assessment Policy Statement (Caps) Document: The Challenges and Limitations to Its Effectiveness in South African Schools," *African Journal of Development Studies* 11, no. 3 (2021).

⁴ Sakhiseni Joseph Yende and Yolisa Madolo, "Examining the Key Challenges Confronted by Music Schools in South African Rural-Based Institutions with Blended Teaching and Learning," *Journal of African Education* 4, no. 1 (2023): 335.

⁵ Jansen E. van Vuuren, "Subject Music in Rural South African Schools: Challenges and Solutions within a Comparative Context" (University of Pretoria, 2011); Boitshepo Ntshole, Ndumato George Mugovhani, and Sakhiseni Joseph Yende, "Teaching and Learning of the Music Component of the Creative Arts Subject: A Case of Primary Schools in South Africa," *Journal of Foreign Language Education and Technology* 8, no. 1 (2023): 1–14.

⁶ Oluwatoyin Ayodele Ajani and Samantha Govender, "Bridging Digital Gaps in Rural Teacher Education: Curriculum Innovations for Inclusive and Technology-Driven Pre-Service Training," *Social Sciences* 6, no. 13 (2025): 1–17.

⁷ Olha Shcholokova et al., "Music Education and Digital Culture: Interaction of Integrative Thinking and Creative Technologies," *Per Musi* 26 (2025): e252617.

⁸ Shcholokova et al., "Music Education and Digital Culture: Interaction of Integrative Thinking and Creative Technologies."

collaboration. These findings underscore the importance of adapting digital innovations to local contexts, particularly in resource-constrained rural schools, where access and infrastructure challenges require contextually responsive implementation strategies. Consequently, this study seeks to examine how CAPS-aligned music education in Grades 10–12 can leverage digital technologies to enrich teaching and learning while addressing equity and accessibility gaps.

At the continental level, African research underscores the growing interest in digital learning as a means to expand educational access and relevance. Scholars note that mobile technologies, in particular, offer cost-effective solutions for resource-constrained contexts.⁹ Digital platforms have been used to document and preserve indigenous musical traditions, promoting culturally responsive pedagogy and strengthening learners' connections to local heritage.

In South Africa, basic education literature reveals uneven progress in digital integration. While urban schools are increasingly adopting educational technologies, rural schools continue to face challenges in infrastructure and capacity.¹⁰ Research indicates that teachers often lack adequate training to integrate digital tools effectively into CAPS-aligned music instruction.¹¹ Nevertheless, pilot projects and case studies demonstrate that when supported by professional development and infrastructure, digital technologies can improve learner engagement, musical skills, and access to diverse repertoires.

Despite growing scholarship on digital learning, limited research focuses specifically on integrating digital technologies in rural South African music classrooms for Grades 10–12.¹² Existing studies often address general adoption of ICT without examining CAPS-aligned music pedagogy or the unique challenges faced by rural teachers.¹³ Furthermore, there is insufficient evidence on sustainable implementation models that integrate indigenous musical knowledge with digital tools. The lack of systematic reviews synthesising international, continental, and local findings creates a fragmented understanding of best practices. Addressing these gaps is essential to informing policy, guiding teacher training, and supporting equitable digital transformation in rural music education contexts.

This study is motivated by the urgent need to bridge the rural–urban digital divide and ensure equitable access to quality music education in South Africa. Integrating digital technologies into rural classrooms can improve learner participation, support culturally responsive pedagogy, and preserve indigenous musical traditions through digital documentation and dissemination. Aligning these efforts with CAPS requirements ensures curriculum relevance and consistency while promoting 21st-century skills. By synthesizing existing research, this systematic review aims to inform policymakers, educators, and stakeholders on sustainable strategies for digital integration. Ultimately, the study seeks to contribute to inclusive education, social cohesion, and the transformation of music education in rural South African schools.

To guide this systematic review, the study proposes three key research questions that address the integration of digital technologies in rural Grade 10–12 music education. These questions aim to explore how digital tools can enhance learning, identify the challenges that hinder their effective use, and investigate strategies for sustainable and equitable implementation within CAPS-aligned classrooms.

1. How can digital technologies enhance creativity in rural Grade 10–12 music classrooms?
2. What challenges affect integrating digital tools into CAPS-aligned rural music education?
3. What strategies support sustainable, equitable digital technology use in rural music teaching?

⁹ Felix Owusu Ampratwum, "Educational Approaches Using Emerging Computing Technologies in Ghana A Qualitative Exploratory Study" (Colorado Technical University, 2025); C W Muraguri, "New Frontiers in Education: Navigating the Transformed Educational Landscapes in the 21 Century in Kenya," *Journal of Popular Education in Africa* 9, no. 11 (2025): 16–27.

¹⁰ Simbulele Carol Cwala, "Digital Transformation in the Basic Education Sector: A Case Study of Selected Disadvantaged Schools in the Western Cape" (2022); Mbhoneza Kabanda, "Are School Leaders Ready for AI? Exploring the Leadership Gap in Sub-Saharan African Education," *Exploring the Leadership Gap in Sub-Saharan African Education* (October 31, 2025), 2025.

¹¹ Oratilwe Penwell Mokoena and Solly Matshonisa Seeletse, "AI in Rural Classrooms: Challenges and Perspectives from South African Educators," *International Journal of Current Educational Studies* 4, no. 2 (2025): 30–52.

¹² Yende and Madolo, "Examining the Key Challenges Confronted by Music Schools in South African Rural-Based Institutions with Blended Teaching and Learning."

¹³ Vikela Liso Sithole and Ifeanyi Mbukanma, "Prospects and Challenges to ICT Adoption in Teaching and Learning at Rural South African Universities: A Systematic Review.," *Research in Social Sciences and Technology* 9, no. 3 (2024): 178–93.

Together, these questions provide a structured framework for examining the existing literature, identifying gaps, and forming practical recommendations to improve music education through digital innovation in rural South African schools.

LITERATURE REVIEW

Opportunities of Digital Technologies in Music Education

Digital technologies present valuable opportunities to enhance music education in ways that extend beyond the limitations of traditional classrooms.¹⁴ For music teachers, it is essential to consider how technology can be meaningfully integrated into lesson planning to enrich teaching and learning. Hayles identifies two approaches to technology integration: differentiation and assimilation.¹⁵ Assimilation refers to incorporating digital tools into existing music education practices while preserving the core elements of the conventional curriculum.¹⁶ In this approach, technology functions as a support resource rather than a replacement for established teaching methods.

Using an assimilation lens, teachers can adopt practical strategies such as computer-assisted instruction to teach music theory, digital sheet music to support performance, assessment software to evaluate learners' skills, and online resources to explore the historical and cultural contexts of musical works. These applications strengthen traditional pedagogy while improving efficiency, access to information, and learner engagement.¹⁷

Moreover, digital tools foster creativity, collaboration, and personalised learning by allowing learners to interact dynamically with musical concepts. The technical potential of technologies such as sound processing, digital imaging, and visualisation of musical structures opens new pathways for artistic thinking.¹⁸ Through experimentation with composition and sound manipulation, students deepen their understanding of music theory and performance while developing innovative problem-solving skills essential for contemporary musical practice.

Web 2.0 and Participatory Learning

Revenko frames Web 2.0 technologies, such as social media, blogs, and collaborative platforms, as a dynamic musical culture where learning becomes participatory rather than passive.¹⁹ In this environment, students are not only consumers of music but also active contributors, sharing content, collaborating with peers, and co-creating musical works.²⁰ Learning in such spaces evolves through shared experiences, fostering social interaction and community-driven knowledge. This perspective positions digital technologies as tools for more engaging and interactive pedagogy, enabling music education to extend beyond the classroom walls and into socially mediated, experiential learning environments.

Music, Technology, and Creativity

Several scholars have highlighted the intersection between music, technology, and innovation. Integrating information technology into music education stimulates creative thinking and enables

¹⁴ Hyesoo Yoo, "To-Resource: Technology-Integrated Instruction—New Possibilities for Teaching Culturally Diverse Musics," *UPDATE: Applications of Research in Music Education* 43, no. 2 (2025): 5–11.

¹⁵ N Katherine Hayles, "How We Think: Transforming Power and Digital Technologies," in *Understanding Digital Humanities* (Springer, 2012), 42–66.

¹⁶ Flutura Gatica Rexhepi, Rreze Kryeziu Breznica, and Burhan Reshat Rexhepi, "Evaluating the Effectiveness of Using Digital Technologies in Music Education," *Journal of Educational Technology Development and Exchange (JETDE)* 17, no.1(2024): 273–89.

¹⁷ Yoo, "To-Resource: Technology-Integrated Instruction—New Possibilities for Teaching Culturally Diverse Musics."

¹⁸ Andrew King and Evangelos Himonides, "Music, Technology, and Education," *Critical Perspectives*, 2016.

¹⁹ Vira Revenko, "Education and Music Culture in the Context of Web 2.0," *International Journal of Emerging Technologies in Learning (IJET)* 16, no. 10 (2021): 96–107.

²⁰ Carol Kelleher et al., "The Score Is Not the Music: Integrating Experience and Practice Perspectives on Value Co-Creation in Collective Consumption Contexts," *Journal of Service Research* 22, no. 2 (2019): 120–38.

students to express emotions through digital media.²¹ This integration promotes cognitive flexibility, encouraging learners to explore musical ideas through composition, performance, and digital experimentation. By combining music education with technology, students can develop both technical competence and artistic expression, aligning with contemporary skills needed in creative industries.²² However, most studies rely on self-reported data from students and teachers, with limited longitudinal research or triangulation, highlighting a need for more robust empirical evidence.

Digital Technologies in Rural Music Education

In rural schools, digital technologies present opportunities and challenges. Limited access to devices, internet connectivity, and trained teachers often constrains implementation, despite the potential benefits.²³ When available, digital tools can bridge resource gaps, providing learners with access to diverse musical repertoires, notation software, and virtual instruments. This integration can improve the engagement, creativity, and collaboration of learners, even in resource-limited settings.²⁴ Research shows that rural students exposed to digital music tools demonstrate increased motivation, deeper understanding of music concepts, and improved performance outcomes.

Despite the advantages, the literature identifies persistent barriers to effective integration of digital technologies in rural music classrooms. Infrastructure deficits, including unreliable electricity and poor internet, limit access to online learning platforms. Teachers often lack sufficient professional development to implement CAPS-aligned digital music pedagogy effectively, while curricula are often rigid, providing limited space for innovative teaching practices. Moreover, equity concerns arise when learners have unequal access to personal devices or digital platforms outside school, which can exacerbate existing socio-economic disparities.

These insights underscore the relevance of examining digital technologies in rural South African music classrooms within a CAPS-aligned framework. Although international and continental research highlights opportunities for creativity, collaboration, and participatory learning, there remains limited evidence on rural school contexts in South Africa. The current study addresses this gap by systematically reviewing the literature on digital music education in rural secondary schools, identifying opportunities and barriers, and proposing strategies to support equitable, culturally responsive, and sustainable integration of digital technologies.

THEORETICAL FRAMEWORK

This study adopts Digital Divide Theory and Culturally Responsive Pedagogy (CRP) to understand the integration of digital technologies in rural South African Grade 10–12 music classrooms. The Digital Divide Theory posits that access to information and communication technologies (ICTs) varies across populations due to both economic and social disparities. Globally and nationally, there are significant differences in technological access between countries, geographic regions, and demographic groups.²⁵ Within a country, rural and urban areas often demonstrate unequal access to devices, internet connectivity, and digital resources. Several factors contribute to this divide, with wealth disparities among the most significant. Increased income allows individuals and institutions to acquire and use technology, while poverty and financial limitations restrict access to knowledge and digital tools.²⁶

²¹ Jorge Guzmán, "The Music Education and His Relations with Science, Technology, Society and Innovation.," *Mendive-Revista de Educacion* 19, no. 2 (2021): 1; Lanting Zhang, "Integration of Information Technology into Music Education to Cultivate Creative Thinking among Middle School Students," *Journal of Contemporary Educational Research* 6, no. 1 (2022): 93–98.

²² Yidi Ma and Chengliang Wang, "Empowering Music Education with Technology: A Bibliometric Perspective," *Humanities and Social Sciences Communications* 12, no. 1 (2025): 345.

²³ Yende and Madolo, "Examining the Key Challenges Confronted by Music Schools in South African Rural-Based Institutions with Blended Teaching and Learning."

²⁴ Dan Shen, "Integrating Multimedia Technology into Folk Music Education: Impacts on Student Engagement and Learning," *International Journal of Inclusive Education* 30, no. 9 (July 29, 2026): 2596–2620, <https://doi.org/10.1080/13603116.2025.2567422>.

²⁵ Jan A G M Van Dijk, "A Theory of the Digital Divide 1," in *The Digital Divide* (Routledge, 2013), 29–51.

²⁶ Ravi S Sharma et al., "Beyond the Digital Divide: A Conceptual Framework for Analyzing Knowledge Societies," *Journal of Knowledge Management* 12, no. 5 (2008): 151–64.

Consequently, rural schools frequently experience limited opportunities to integrate digital technologies effectively into teaching and learning, particularly in specialised subjects such as music.

Culturally Responsive Pedagogy, on the other hand, aims to create inclusive, engaging learning environments that recognise and leverage students' diverse cultural backgrounds.²⁷ Effective teaching goes beyond conventional instructional strategies by integrating students' cultural identities, lived experiences, and perspectives into curriculum design and classroom practice.²⁸ This approach encourages critical thinking, enhances academic performance, and fosters positive self-identity among learners.²⁹ In the context of music education, CRP enables teachers to incorporate indigenous musical traditions and culturally relevant repertoires alongside contemporary digital tools, ensuring that learning is both meaningful and locally resonant.

These two theories complement each other in understanding the challenges and opportunities of digital music education. While the Digital Divide Theory highlights structural inequalities and access issues that affect technology integration, Culturally Responsive Pedagogy provides a framework for ensuring that digital tools are implemented in ways that respect and enhance learners' cultural knowledge and identity. Together, they offer a holistic lens to examine both the material and pedagogical dimensions of digital integration.

The justification for using these theories lies in their ability to address the dual concerns of access and relevance. By combining insights from the Digital Divide Theory with CRP, this study can critically analyse how infrastructural limitations, socio-economic disparities, and culturally responsive teaching practices intersect to influence the adoption and effectiveness of digital technologies in rural music classrooms. This theoretical framework ensures that the study not only investigates technological challenges but also foregrounds equitable, culturally meaningful learning experiences for all students.

METHODOLOGY

Study Design

This study adopted a systematic, descriptive review design to investigate the integration of digital technologies in rural South African Grade 10–12 music classrooms. The focus was on alignment with the CAPS and on promoting equitable learning opportunities for all learners.³⁰ The review sought to synthesise both national and international literature to provide a comprehensive understanding of how digital tools can enhance music education, identify barriers to implementation, and inform strategies for effective, CAPS-aligned digital integration in rural contexts. By employing a systematic review approach, the study ensures transparency, replicability, and rigour in synthesising available evidence, highlighting trends, gaps, and best practices relevant to digital music pedagogy.

The review was based on a wide range of information sources, including peer-reviewed journal articles, conference proceedings, dissertations, governmental and policy reports, and educational publications.³¹ The databases and repositories accessible included the University of South Africa library portal, ProQuest, EBSCOhost, JSTOR, ERIC, LearnTechLib, Google Scholar, and South African university thesis repositories. These sources provided a diverse set of perspectives, encompassing both empirical and theoretical contributions to the field of digital music education and educational technology integration.

Search Strategy

A systematic search strategy was employed using advanced search functions across the selected databases. Keywords and phrases were combined in multiple configurations, including: “digital

²⁷ Manuel Caingcoy, “Culturally Responsive Pedagogy: A Systematic Overview,” *Diversitas Journal*, 2023.

²⁸ Yi-Huang Shih, “Culturally Responsive Curriculum: A Systematic Overview,” *Edelweiss Applied Science and Technology* 8, no. 6 (2024): 6917–25.

²⁹ Geneva Gay, *Culturally Responsive Teaching: Theory, Research, and Practice* (teachers college press, 2018).

³⁰ Hyejin Kim, Justine S Sefcik, and Christine Bradway, “Characteristics of Qualitative Descriptive Studies: A Systematic Review,” *Research in Nursing & Health* 40, no. 1 (2017): 23–42.

³¹ Lisa Hartling et al., “A Descriptive Analysis of Overviews of Reviews Published between 2000 and 2011,” *PloS One* 7, no. 11 (2012): e49667.

technologies in music education,” “rural schools,” “South Africa,” “CAPS curriculum,” “Grade 10–12,” “equity,” and “ICT integration.” Searches were restricted to English-language publications from 2000 to 2025, ensuring both contemporary relevance and historical coverage. The review was conducted between February 2026 and April 2026. Given the limited literature specifically addressing digital music education in rural South African schools, the search was expanded to include relevant international studies, resulting in 412 non-duplicate articles.

Inclusion and Exclusion Criteria

Aspect	Inclusion Criteria	Exclusion Criteria
Population/Context	Studies focused on rural school settings, particularly South African or comparable international rural contexts	Studies focusing exclusively on urban schools or non-rural contexts
Educational Level	Studies addressing secondary education, specifically Grades 10–12 (or equivalent)	Studies focused on early childhood, primary school, or higher education institutions
Subject Focus	Research related to music education and/or digital music pedagogy	Studies not related to music education or arts-based learning
Language	English-language publications	Non-English publications without available translation
Time Frame	Publications from 2000–2025	Studies published before 2000 (unless highly seminal and relevant)
Relevance	Studies directly addressing digital integration, pedagogy, equity, or CAPS-aligned music education	Studies with only peripheral or indirect relevance to the research topic

Database search and article screening

Titles and abstracts were screened to ensure relevance to rural music education, CAPS alignment, digital technology integration, and equitable learning outcomes. Studies focusing exclusively on urban schools, unrelated disciplines, or higher education contexts were excluded. From an initial 1,201 records identified through database searching, 800 duplicates were removed, leaving 401 records for title and abstract screening. Following this stage, 140 records were excluded based on irrelevance to the study objectives. A total of 261 full-text articles were evaluated for eligibility, of which 199 were excluded because they did not meet the inclusion criteria. The main reasons for exclusion included unrelated populations or contexts, lack of focus on digital technologies in music education, and absence of CAPS alignment or Grade 10–12 relevance. Ultimately, 62 studies met the eligibility criteria and were included for full-text assessment; however, after final quality appraisal and relevance screening, 37 studies were retained for the final systematic review. This rigorous selection process ensured that only literature directly addressing digital technology integration in rural CAPS-aligned music education was included (see Figure 1).

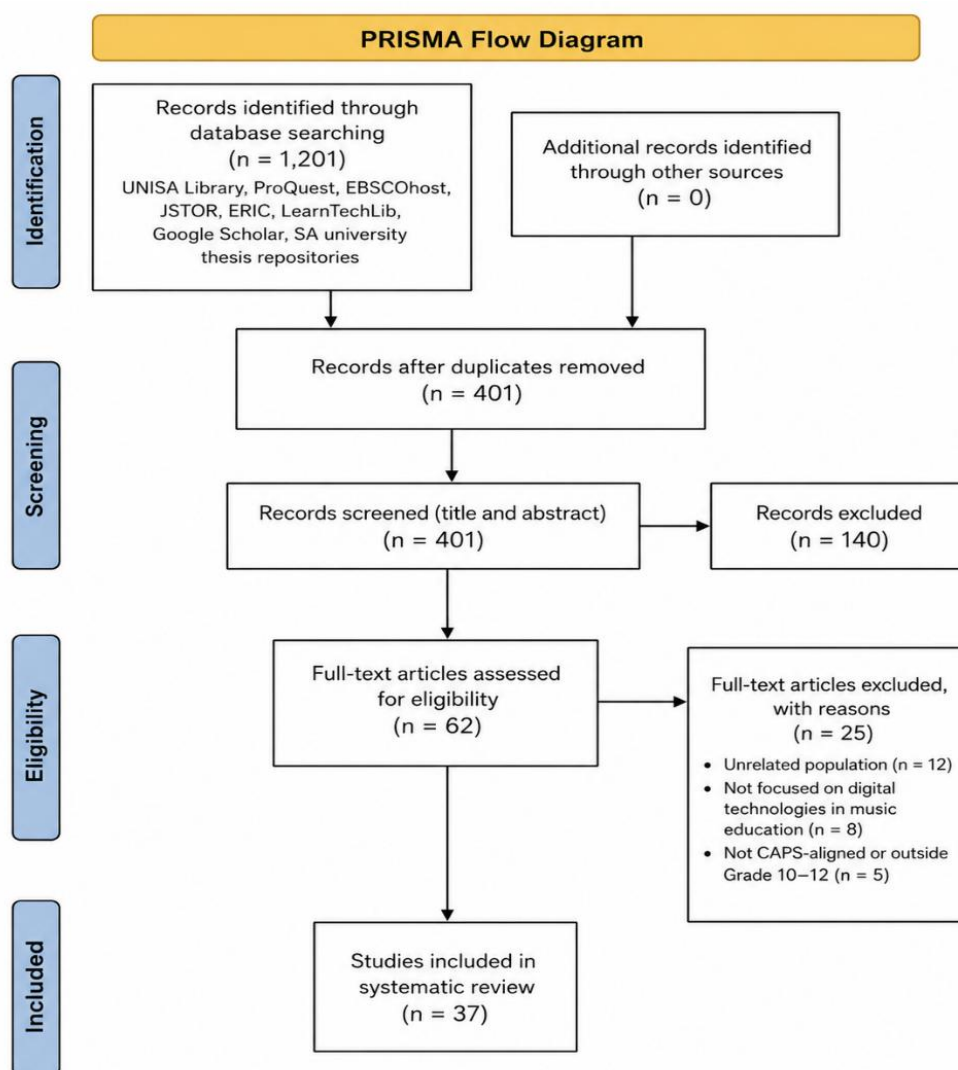


Figure 1: PRISMA flow diagram of database search and article screening

Data Extraction and Synthesis

Data from the selected studies were systematically extracted and categorised according to thematic relevance, including digital tools, pedagogical approaches, implementation challenges, and strategies for equitable integration. The descriptive analysis focused on identifying patterns, synthesising evidence across contexts, and highlighting gaps in knowledge. The synthesis provided insights into best practices for integrating digital technologies into CAPS-aligned music education, addressing socio-economic and infrastructural barriers prevalent in rural South African schools. This methodological approach allowed for a nuanced understanding of both technological and pedagogical dimensions, informing recommendations for sustainable and culturally responsive digital integration in rural music classrooms.

PRESENTATION OF FINDINGS

The thematic analysis of the literature explores key patterns and insights regarding digital technology integration in rural Grade 10–12 music education. It identifies core themes, including creativity enhancement, barriers to CAPS-aligned implementation, and strategies for sustainable, equitable adoption. This approach synthesises the findings of national and international studies to inform practice and policy.

Digital technologies improve creativity in rural Grade 10–12 music classrooms

Digital technologies improve creativity in music education by equipping learners with tools to compose, experiment, and perform in innovative ways. Applications such as music notation software, digital audio workstations, and virtual instruments enable students to explore sound, arrange compositions, and collaborate with peers beyond the physical classroom. These tools transform music learning from a predominantly teacher-led activity into an interactive and participatory process, in which learners actively construct musical knowledge through practice and experimentation.

Yang observes that the integration of digital innovations has significantly reshaped music teaching and learning, particularly through interactive, personalised, and accessible learning experiences. Although Yang's discussion focuses on higher education, the insights are equally relevant to secondary schooling. The shift toward technology-enhanced learning reflects broader educational trends in which digital tools support learner-centred pedagogies, foster engagement, and expand access to resources across disciplines.³²

In rural Grade 10–12 classrooms, digital technologies can address resource constraints by providing access to virtual instruments, diverse musical repertoires, and multimedia learning materials. Learners who may lack exposure to varied instruments or formal training can experiment with sound and composition through digital platforms.³³ These technologies also support personalised learning, allowing students to progress at their own pace while exploring musical styles that reflect their cultural identities, including indigenous South African traditions. Furthermore, digital tools encourage collaboration and cultural expression by allowing learners to share, critique, and refine musical works within and beyond their local contexts. Through online platforms and mobile applications, students can engage in co-creation and peer feedback, fostering both social learning and artistic growth. By promoting experimentation, collaboration, and culturally relevant expression, digital technologies nurture creative thinking and build artistic confidence among learners in rural music classrooms.

Challenges affect integrating digital tools into CAPS-aligned rural music education

The effective integration of digital technologies into CAPS-aligned rural music education is limited by several interrelated challenges. Infrastructure deficits remain a primary barrier, with unreliable electricity, limited internet connectivity, and inadequate access to digital devices restricting consistent and meaningful technology use in classrooms. These limitations make it difficult for teachers to implement digital tools regularly or to sustain technology-enhanced learning activities.³⁴ Teacher preparedness is another significant concern. Many educators in rural schools have limited access to professional development opportunities that build digital literacy and pedagogical skills aligned with CAPS requirements.³⁵ Without adequate training, teachers may lack confidence in using digital tools or struggle to integrate them in ways that support curriculum outcomes and learner engagement.

Socio-economic inequalities further exacerbate the digital divide. Learners often have unequal access to devices, connectivity, and digital resources outside school, limiting opportunities for practice, collaboration, and independent learning. This disparity reinforces existing educational inequalities between rural and urban contexts.³⁶ Additionally, policy gaps and limited institutional support hinder sustainable implementation. Insufficient funding, unclear guidelines, and lack of coordinated support structures reduce schools' capacity to adopt and maintain digital initiatives. Collectively, these

³² J. Yang, "Digital Innovations in Music Education: Assessing the Impact of Technology-Enhanced Learning in University-Level Music Programs," *International Journal of Social Science and Humanities Research* 12, no. 4 (2024): 132–41.

³³ Olena Aliksiichuk et al., "Modern Digital Approaches to Training Music Teachers: Evolution from Classical to Interactive," *International Journal on Culture, History, and Religion* 7, no. S11 (2025): 273–96.

³⁴ Yende and Madolo, "Examining the Key Challenges Confronted by Music Schools in South African Rural-Based Institutions with Blended Teaching and Learning."

³⁵ Godfrey Chitsauko Muyambi and Mmankoko Ziphorah Ramorola, "Unveiling Educators' Readiness to Teach through Digital Media (DM): The Case of South Africa," *Education and Information Technologies* 30, no. 10 (2025): 13807–34.

³⁶ Yende and Madolo, "Examining the Key Challenges Confronted by Music Schools in South African Rural-Based Institutions with Blended Teaching and Learning."

challenges impede equitable access to digital music education and restrict its potential to enrich teaching and learning in rural classrooms.

Strategies support sustainable, equitable digital technology use in rural music teaching

Sustainable and equitable integration of digital technologies in rural music education requires a comprehensive, multi-faceted approach that addresses infrastructure, pedagogy, culture, and policy.³⁷ Targeted teacher professional development is essential to building digital literacy and equipping educators with pedagogical skills that align technology use with CAPS requirements.³⁸ Continuous training enables teachers to confidently integrate digital tools, design learner-centred activities, and assess musical outcomes effectively in technology-enhanced environments. Equally important is investment in infrastructure, including reliable electricity, stable internet connectivity, and affordable digital devices.³⁹ Without these foundational resources, technology initiatives remain inconsistent and unsustainable. Long-term implementation depends on coordinated efforts from government and stakeholders to ensure that rural schools are adequately resourced and supported.

Izu highlights the importance of integrating Indigenous music into curricula to advance transformation, address historical marginalisation, and promote cultural inclusion.⁴⁰ Drawing from this insight, the development of CAPS-aligned digital resources that incorporate indigenous South African musical traditions can enhance cultural relevance while supporting curriculum goals.⁴¹ Such resources enable learners to engage with their cultural heritage through modern platforms, fostering both identity and creativity.

Furthermore, partnerships between government departments, schools, higher education institutions, and community organisations can strengthen resource sharing, technical support, and capacity building. These collaborations promote sustainability by leveraging local knowledge and shared responsibility. By combining infrastructure development, teacher training, culturally responsive content, and supportive policy frameworks, rural schools can achieve equitable and sustainable digital integration that enriches music education and promotes inclusive learning outcomes.

DISCUSSION

This article has argued that digital technologies, when thoughtfully integrated, can significantly enhance creativity and pedagogical innovation in rural Grade 10–12 music classrooms. It has also highlighted that the transformative potential of technology is contingent upon contextual realities, including infrastructure, teacher preparedness, and socio-economic conditions. The findings of this article mention that while digital tools offer opportunities for composition, collaboration, and access to diverse musical resources, their effective use remains uneven in rural settings. Consistent with previous research, the findings of the current article reveal that structural inequalities continue to shape access to digital learning, thereby reproducing existing educational disparities. Evidently, without targeted interventions, the promise of digital inclusion in rural music education remains only partially realised.

The article's findings show that infrastructure deficits such as unreliable electricity, weak internet connectivity, and limited device availability pose persistent barriers to integrating technology into CAPS-aligned music teaching. These findings are consistent with studies that highlight how resource constraints in rural schools hinder the adoption of innovative pedagogies. The importance of

³⁷ Andrew Enaifoghe, "Bridging the Digital Divide in the South African Public Sector: Assessing Digital Literacy Gaps and Capacity-Building Strategies," in *Digital Equity and Literacy* (IntechOpen, 2025).

³⁸ Department of Basic Education, "Action Plan to 2019: Towards the Realisation of Schooling 2030. Taking Forward South Africa's National Development Plan 2030," 2015, [https://www.education.gov.za/Portals/0/Documents/Publications/Action Plan 2019.pdf](https://www.education.gov.za/Portals/0/Documents/Publications/Action%20Plan%202019.pdf).

³⁹ Knowledge Malusi Nkanyeni Gigaba, Eric Blanco Niyitunga, and Dominique Emmanuel Uwizeyimana, "Assessing the Prospects of Digital Infrastructure in Promoting Rural Economic Development in South Africa," *Journal of Infrastructure, Policy and Development* 9, no. 2 (2025): 8817.

⁴⁰ Benjamin Izu, "Policy Gaps and Opportunities for Integrating Indigenous Music into South African Higher Education Curricula," *International Journal of Educational Development in Africa*, 2025, 20-pages.

⁴¹ Department of Basic Education, "Republic of South Africa.," *Annual Performance Plan 2018/2019*. (Pretoria, 2019).

Digital Divide Theory⁴² and Culturally Responsive Pedagogy⁴³ in enabling meaningful technology integration. Again, the findings of the current article show that many music teachers lack sustained professional development opportunities to build such competencies. This finding corroborates the results of previous studies that found that teacher confidence and training are critical determinants of successful digital adoption.

Using a framework of analysis largely informed by the central tenets of equity, digital inclusion, and creative pedagogy, the study examined how rural music educators navigate systemic constraints while attempting to integrate technology into CAPS-aligned curricula. In so doing, the article has argued and revealed that adaptive strategies such as offline digital resources, mobile-based applications, and collaborative partnerships can mitigate contextual limitations, as highlighted earlier. The approach and analysis in the article were informed by what this paper considers a nexus that gradually grew from the intersection of policy expectations, classroom realities, and community contexts. Cumulatively, these factors shape the sustainability of digital initiatives in rural schools.

The current article has established that equitable technology integration requires more than device provision; it requires systemic support, ongoing teacher training, and policies responsive to rural contexts. This finding is in congruence with the findings of previous studies that advocate for context-sensitive approaches to the implementation of educational technology. The results of this article reveal that when digital tools are aligned with culturally relevant pedagogy and accessible resources, they can foster learner creativity, collaborative music-making, and broader participation in the arts. Ultimately, the study underscores that sustainable and equitable digital integration in rural music education depends on coordinated efforts among educators, policymakers, and communities to bridge the digital divide and unlock the creative potential of all learners.

RECOMMENDATIONS

Based on the findings of this study, several key recommendations are proposed to support the effective integration of digital technologies in rural Grade 10–12 music education in alignment with CAPS. First, rural schools should prioritise targeted professional development programmes for music educators, focusing on digital literacy, CAPS-aligned pedagogical strategies, and the creative use of music technologies. This training should be ongoing and context-specific to ensure sustained teacher confidence and competence. Second, urgent attention should be paid to improving infrastructure in rural schools. This includes ensuring reliable electricity supply, stable internet connectivity, and access to affordable digital devices such as computers, tablets, and audio equipment. Without these foundational resources, meaningful integration of digital tools remains limited. Third, there is a need to develop culturally responsive digital music resources that reflect indigenous South African musical traditions. Such resources can strengthen curriculum relevance, enhance learner engagement, and promote cultural identity within music education. Finally, collaborative partnerships should be strengthened between schools, the Department of Education, higher education institutions, non-governmental organisations, and local communities. These partnerships can support resource sharing, technical assistance, and capacity-building initiatives, thereby promoting sustainable implementation of digital technologies in rural education contexts.

CONCLUSION

This study concludes that digital technologies have significant potential to transform rural South African Grade 10–12 music education by improving creativity, collaboration, and access to diverse musical traditions. When effectively integrated, these tools can enrich teaching and learning while supporting CAPS-aligned outcomes. However, the study also highlights persistent structural challenges, including inadequate infrastructure, limited teacher preparedness, socio-economic inequalities, and policy constraints, which continue to hinder effective implementation. These challenges indicate that technology alone is not sufficient to improve educational outcomes without broader systemic support.

⁴² Van Dijk, “A Theory of the Digital Divide 1.”

⁴³ Sharma et al., “Beyond the Digital Divide: A Conceptual Framework for Analyzing Knowledge Societies.”

Therefore, equitable integration requires a holistic and multi-dimensional approach that combines infrastructure development, sustained teacher training, culturally relevant digital content, and strong institutional collaboration. Addressing these factors collectively will allow rural schools to fully benefit from digital innovations in music education.

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