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CURBING DIGITAL DIVIDE IN EDUCATION THROUGH LEVERAGING ACCESS TO DIGITAL LEARNING IN MARGINALISED COMMUNITIES IN CHRIS HANI WEST

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Abstract

The digital divide remains a persistent challenge in South Africa's education system, disproportionately affecting learners in rural and marginalised communities. This article examines strategies for curbing the digital divide through leveraging access to digital learning in Chris Hani West, a predominantly rural district in the Eastern Cape Province. The study explores key barriers to digital inclusion, including limited access to digital devices, high costs of internet connectivity, inadequate ICT infrastructure, language and accessibility constraints, and weak policy implementation at school and district levels. Drawing on a qualitative desktop-based review of academic literature, government reports, and relevant case studies, the article analyses how these challenges constrain equitable access to digital learning opportunities. The study further highlights the socio-economic and cultural factors that shape digital adoption and usage among learners and households in marginalised communities. The findings underscore the need for coordinated context-sensitive interventions such as affordable connectivity solutions, device provisioning programmes, infrastructure investment, multilingual and accessible digital content, and stronger institutional support for ICT integration in education. The article concludes that leveraging digital learning effectively in Chris Hani West requires not only technological solutions, but also inclusive policies and sustainable partnerships aimed at promoting equity, digital literacy, and long-term educational transformation.

Keywords: digital divide, digital inclusion, digital learning, Chris Hani West, education, marginalised communities

1. Introduction

In the 21st century, access to quality education is no longer a luxury but a fundamental right. The digital age has ushered in an era where learning resources and opportunities are increasingly available online. However, this transition to digital learning has revealed disparities in access, with underserved communities facing significant challenges in bridging the digital divide (Caena & Redecker, 2019). The digital age has unlocked a world of possibilities, breaking down geographical barriers and democratising education in unprecedented ways. Digital learning provides the potential to provide tailored and flexible learning experiences, expand the reach of expert educators, and foster a culture of lifelong learning. These developments hold the promise of a brighter future for learners of all backgrounds.

The impact of these disparities on educational equity is profound. The traditional view of educational equity as providing each student with an equal opportunity to succeed has been strained (McFarlane, 2019; Nyagadza etal., 2022). Now, equity must address the unequal access to the tools and resources essential for academic success in the digital age. This study sets out to shed light on the extent of these disparities, their far-reaching consequences on educational equity, and the quest for viable solutions. It is a call to action, a call to recognize that equitable access to digital learning resources is not a matter of convenience but a cornerstone of justice and progress (Sofyani etal., 2020). The barriers created by the digital divide threaten to perpetuate existing inequalities, resulting in an educational system where the opportunities available to a student are largely determined by their zip code and socioeconomic status (Faura-Martinez etal., 2021). In essence, this study aims to contribute to a more inclusive and equitable educational landscape, where quality education is not just a right in principle but a reality in practice, accessible to all, irrespective of their socioeconomic status or geographic location.

However, beneath this hopeful landscape lies a stark reality. The transition to digital learning has unveiled glaring disparities in access, with underserved communities and marginalized populations encountering significant hurdles in bridging the digital divide (Mahyoob, 2020). This digital divide is a multifaceted issue that encompasses a range of disparities, including disparities in access to devices, internet connectivity, digital literacy, and educational resources. This study aims to shed light on the extent of these disparities, their impact on educational equity, and potential solutions to ensure that all students have access to digital learning resources

2. **Literature Review**

The digital divide, exacerbated by the COVID-19 pandemic, has laid bare the stark inequities in access to digital learning resources. In an era where education increasingly relies on digital platforms, many students in rural communities find themselves on the wrong side of this digital chasm (Nhemachena, 2021). This digital inequality threatens to perpetuate and, in some cases, deepen the existing disparities in academic achievement and future opportunities, setting the stage for a troubling cycle of inequality. The digital divide is a multifaceted challenge that hinders the educational progress of students in marginalised communities. The lack of access to digital learning resources creates disparities in learning opportunities, limits exposure to diverse educational materials, and poses challenges for students in preparing for a digitally driven future (Eastern Cape Department of Education Annual Report, 2024/25). As technology continues to play an increasingly prominent role in education and employment, addressing the digital divide becomes paramount to ensuring educational equity and breaking the cycle of disadvantaged marginalised communities.

In recent years, the educational landscape has undergone a transformation with the integration of digital technologies. From online courses and interactive multimedia content to virtual classrooms, digital learning resources have the potential to revolutionise education and create more inclusive learning environments (Eastern Cape Department of Education Annual Performance Plan, 2025/26). However, not all students have equal access to these resources, and disparities are particularly pronounced in rural schools. Factors such as limited infrastructure, socioeconomic constraints, and geographic isolation contribute to a persistent digital divide, exacerbating educational inequalities.

2.1 Theoretical Framework- The Digital Divide Theory

The Digital Divide Theory focuses on the gap between those who have access to modern information and communication technology (ICT) and those who do not, often due to economic or social factors (Dayagbil, Palompon, Garcia, & Olvido, 2021). It reflects the understanding that unequal access to digital resources can exacerbate existing social and economic inequalities. The Digital Divide theory focuses on the gap between those with and without access to modern information and communication technology (ICT) due to economic and social factors and provides a lens through which we explore the specific challenges faced by individuals in marginalised communities (Sutcliffe & Bannister, 2020).

The theoretical foundation guides the study in the examination of economic disparities, infrastructure limitations, and other key factors contributing to the digital divide ultimately informing strategies to enhance educational equity and promote inclusive access to digital learning resources (Schafer, 2018). Therefore, the Digital Divide Theory is used as a foundational framework to investigate and analyze the disparities in access to digital learning resources within marginalised communities. The application of the Digital Divide Theory in this study allows researchers to investigate the reasons behind unequal access and inform strategies for promoting educational equity. The link lies in using the Digital Divide theory as a lens through which to analyze and address the challenges identified in the study (Serumaga-Zake, & Van Der Poll, 2022). By understanding these reasons, the research can propose targeted interventions and policy recommendations to bridge the divide and enhance educational equity in marginalised communities.

2.2 Conceptualising the digital divide in education

The digital divide in education comprises multiple dimensions which include access to infrastructure, affordability of digital devices, quality of connectivity, and the requisite digital literacies for effective use (AlYoussef, 2020). According to Nyathi and Joseph (2024) providing infrastructure without accompanying digital skills development does not ensure meaningful access. This view is supported by Moraleja and Pereja (2022) who emphasise that access is both physical and functional and students must have reliable devices and the competence to use them effectively for learning.

In South Africa, historical inequalities have reinforced digital disparities. The apartheid legacy created uneven access to basic services, which persists into the digital era (Mpofu & Machingauta, 2024). Rural and peri-urban areas such in Chris Hani West have limited or no access to high-speed internet due to constrained school budgets, and lower levels of teacher Information and Communication Technology competence (Mhlanga & Moloi, 2020). These conditions deepen the educational divide and limit the potential for digital learning to enhance educational outcomes.

2.3 Digital Learning and educational outcomes

Digital learning encompasses e-learning platforms, digital instructional resources, online assessment tools, and virtual classrooms (Muslimin, & Indrawati, 2024). Dube, (2020) suggests that where digital learning is implemented effectively, it can improve learner engagement, personalise instruction, and support differentiated learning. For instance, in the United States, studies show that blended learning models improved mathematics achievement compared to traditional instruction (Cafun & Ramrathan, 2021).

In the African context, where classroom overcrowding and teacher shortages are common, digital learning offers possibilities for scaling quality instruction. In Kenya, the Digital Literacy Programme (DLP) has provided tablets and digital content to primary schools, resulting in reported gains in literacy and numeracy (Dube, 2020). Similarly, in Rwanda, the One Laptop per Child initiative enabled schools to integrate digital tools in teaching, although challenges remained around connectivity and teacher training (Devkota, 2021).

3. Methodology

A qualitative semi-systematic literature review was adopted for the study to gain an understanding on curbing digital divide in education through leveraging access to digital learning in marginalised communities in Chris Hani West. Both grey and academic literature identified using 'digital divide' and 'digital learning' as the key words in marginalised communities in Chris Hani West.

3.1 Literature Review Collection

Literature review was combined with abstraction since some of the issues raised in the article require in-depth analysis and not mere empirical evidence that is in the form of numbers as in quantitative studies or direct quotations of qualitative studies. The focus is not on the number of articles written on digital divide in education but rather on the content of existing debates in curbing digital divide in education through leveraging access to digital learning in marginalised communities in Chris Hani West.This study used Scopus, Google Scholar, Sabinet, and Web of Science databases to search for relevant articles on curbing digital divide in education through leveraging access to digital learning in marginalised communities in Chris Hani West in ensuring comprehensive coverage.

3.2 Data Analysis

The selected articles were then subjected to content analysis whereby the presence of themes was determined from the sampled articles. This analysis was manually, with no computer software. Texts were read through to determine recurrent aspects in the texts. Latent coding is a strategy whereby aspects that share meanings were grouped together was then used. Thematic analysis was then deployed to group the identified aspects into themes (Kumar, 2019).

4. Results and Discussions

The results showed that despite the potential benefits, barriers to digital learning are significant in marginalised communities. This section is going to discuss barriers that impede the successful implementation of digital tools in Chris Hani West schools.

4.1 Infrastructure deficits

Infrastructure deficits remain one of the most critical barriers to digital learning in Chris Hani West. Fletcher & Griffiths, (2020) mentioned that large parts of the district, particularly rural towns and deep rural villages, continue to experience unreliable, slow, or non-existent broadband connectivity. Internet infrastructure such as fibre networks and stable mobile broadband coverage is often concentrated in urban centres, leaving many schools dependent on weak signal strength or costly mobile data solutions (Alphonce & Mwantimwa, 2019). As a result, access to online learning platforms, digital libraries, cloud-based educational tools, and virtual classrooms is severely constrained. According to Devkota (2021). even where schools possess computers or tablets, the lack of stable internet connectivity limits their effective use for teaching and learning.

Electricity supply challenges further compound infrastructure limitations. (Harun etal., 2021). pointed out that consistent and reliable electricity is essential for powering digital devices, charging laptops and tablets, and maintaining network infrastructure. However, many schools in Chris Hani West face frequent power outages, rolling blackouts, or outdated electrical systems that cannot support modern digital equipment (Haleem etal., 2022). In some remote and under-resourced schools, electrification remains incomplete or unreliable, forcing educators to rely on traditional teaching methods even when digital tools are available. Power interruptions disrupt online lessons, damage sensitive equipment, and reduce both teachers' and learners' confidence in using technology as a dependable learning resource (Park, Ramirez & Sparks, 2021).

Additionally, poor physical infrastructure within schools such as inadequate classrooms, lack of secure storage facilities, and insufficient ICT laboratories poses further challenges. Without secure spaces, schools are reluctant to house expensive digital equipment due to risks of theft or vandalism. Overcrowded classrooms also make it difficult to integrate digital devices into daily teaching practices (Tiekam, 2019). These infrastructural constraints collectively hinder the sustainability and scalability of digital learning initiatives in the district.

4.2 Lack of digital devices

Limited access to digital devices remains a major challenge for learners in Chris Hani West and significantly deepens the digital divide. Many learners do not own personal devices such as laptops, tablets, or smartphones that are essential for accessing digital learning platforms (Dayagbil etal., 2021). Although some schools are

equipped with computer laboratories, the ratio of learners to devices is often very high, resulting in limited usage time and the need for learners to share devices (Zhao, Llorente, & Gómez, 2021). This restricts meaningful engagement with digital content and reduces opportunities for developing digital literacy skills.

At the household level, ownership of internet-enabled devices is particularly low in marginalised and rural communities within the district. According to Serumaga-Zake and van der Poll (2022) most households prioritise basic needs such as food and shelter over digital technologies, making it difficult for learners to access online educational resources outside school hours. Consequently, learners are unable to complete online assignments, participate in virtual discussions, or revise digital learning materials at home, placing them at a disadvantage compared to learners in better-resourced areas. According to Büchi (2021) the consequences of limited device access became especially evident during emergency remote teaching periods, such as the COVID-19 lockdowns. While some schools and universities transitioned to online or blended learning, many learners in Chris Hani West were excluded due to the lack of personal devices and connectivity (Khoza, 2021). This resulted in interrupted learning, increased learning losses, and widened educational inequalities. Learners from households without digital devices were effectively cut off from formal education during these periods (Kali & Das, 2021).

4.3 Affordability and economic barriers

Affordability remains one of the most significant obstacles to digital learning in Chris Hani West. Although South Africa has made progress in expanding mobile network coverage, the cost of internet connectivity and data remains prohibitively high for many households in rural and semi-rural districts (Khoza & Biyela, 2020). Families in Chris Hani West often rely on irregular incomes, social grants, or subsistence livelihoods, making it difficult to prioritise spending on data bundles over basic needs such as food, transport, and electricity (Mpofu, 2025). As a result, learners are unable to consistently access online learning platforms, educational videos, and digital resources outside school hours, reinforcing educational inequality (Woldegiorgis, 2022).

In addition to data costs, the initial capital required to acquire digital devices poses a major barrier. Laptops, tablets, smartphones, and supporting accessories such as chargers and headphones are largely unaffordable for low-income households (Khoza, 2021). Even when learners own basic smartphones, these devices are often shared among family members, have limited storage capacity, or are incompatible with educational applications (Dube, 2020). In many cases, devices are lost, damaged, or rendered unusable due to lack of electricity for charging or poor network coverage in remote villages.

Furthermore, schools in Chris Hani West also face financial constraints that limit their ability to compensate for household-level affordability challenges. Many public schools, particularly no-fee schools, lack sufficient funding to provide learners with devices or subsidised data (Devkota, 2021). While government and private-sector initiatives have distributed tablets or laptops to some schools, these interventions are often inconsistent, short-term, or insufficient to meet demand (Jansen, 2019). Furthermore, the ongoing costs associated with device maintenance, software updates, and connectivity are rarely budgeted for, threatening the sustainability of digital learning initiatives.

4.4 Language and accessibility issues

Language and accessibility challenges significantly limit the effectiveness of digital learning initiatives in Chris Hani West. According to Woldegiorgis (2022) most digital educational content, learning management systems, and online resources are developed and delivered primarily in English with minimal localisation into indigenous South African languages such as isiXhosa, which is the first language of most learners in the district. This linguistic mismatch creates comprehension difficulties, particularly for younger learners and those from rural households where English exposure is limited. As a result, learners may struggle to fully engage with digital lessons, instructions, and assessments, negatively affecting learning outcomes and widening educational inequalities (Mahyoob, 2020).

The lack of contextualised and culturally relevant digital content further exacerbates language barriers. Many online resources do not reflect the local realities, examples, or learning contexts familiar to learners in Chris Hani West (Bates, 2018). This disconnect can reduce learners' motivation and confidence, as digital learning environments may feel alien and inaccessible (Sofyani etal., 2020). While some teachers attempt to translate or explain content in isiXhosa during face-to-face interactions, such support is often unavailable when learners access digital materials independently outside the classroom (Sima etal., 2020).

Accessibility challenges are even more pronounced for learners with disabilities, particularly when digital platforms are not designed in line with universal design and inclusive education principles. Muslimin and Indrawati, (2024) mention that learners with visual impairments may struggle to use platforms that lack screen-reader compatibility, adjustable font sizes, or audio-based learning options. Similarly, learners with hearing impairments are disadvantaged when video-based content does not include subtitles or sign language

interpretation (Mpofu, & Machingauta, 2024). For learners with motor impairments, platforms that require precise mouse movements or prolonged keyboard use can be difficult to navigate without adaptive technologies

4.5 Institutional and policy barriers

Institutional and policy barriers play a significant role in perpetuating the digital divide in Chris Hani West, despite the existence of progressive national and provincial frameworks that promote e-learning and the integration of ICTs in education (Nyathi, & Joseph, 2024). South Africa has adopted several policies, including the White Paper on e-Education, the National Development Plan (NDP) 2030, and provincial ICT-in-education strategies, all of which emphasise digital transformation and inclusive access to learning technologies. However, the translation of these policies into practical outcomes at district and school levels remains inconsistent.

One of the key challenges is weak policy implementation and poor coordination between national, provincial, and district education structures. In many cases, policies are adopted at higher levels without adequate consultation with schools or consideration of local contextual realities, such as rural infrastructure constraints and capacity limitations (Mhlanga, & Moloi, 2020). This results in fragmented implementation, where some schools receive digital resources while others are left behind, reinforcing inequalities within the same district. Additionally, resource misallocation and limited budget prioritisation constrain progress toward digital inclusion. Education budgets in marginalised districts such as Chris Hani West are often overstretched due to competing priorities, including school nutrition programmes, infrastructure backlogs, and learner support services (Moraleja & Pereja, 2022). As a result, funding for ICT infrastructure, device procurement, system maintenance, and digital content development is frequently inadequate or deprioritized.

4.6 Social and Cultural barriers

Social and cultural barriers significantly contribute to the persistence of the digital divide in Chris Hani West by shaping attitudes, behaviours, and access to digital learning resources. According to AlYoussef (2020) in many rural and marginalised communities, digital technologies are not yet fully embedded in everyday life, and their educational value may be poorly understood by parents and caregivers. As a result, digital literacy is often not prioritised at household level, with limited encouragement for learners to engage with online learning platforms or develop digital skills outside the classroom (Fletcher, & Griffiths, 2020).

Furthermore, strong reliance on traditional teaching and learning methods can hinder the adoption of digital tools in education. Some community members and even educators may perceive face-to-face instruction and printed materials as more legitimate or effective than technology-mediated learning (Alphonce & Mwantimwa, 2019). This cultural preference can create resistance to change, reducing the uptake and effective use of digital resources even where infrastructure exists. Gender norms also play a critical role in shaping access to digital technologies. In certain households, male learners may be given preferential access to digital devices such as smartphones or computers, while female learners are expected to prioritise household responsibilities (Tiekam, 2019).

5. ***Strengthening Digital Infrastructure in South Africa***

The South Africa government should partner with telecommunications companies and government programmes for example SA Connect to extend broadband and 4G/5G coverage to rural schools. There is need to establish community Wi-Fi hotspots at schools, libraries, Thusong centres, and community halls to provide shared internet access. Schools are encouraged to use offline and low-bandwidth solutions, such as preloaded tablets and local servers with digital content, for areas with unstable connectivity. The South African government is recommended to install solar power systems in schools to mitigate electricity disruptions and reduce dependence on the national grid. The government is encouraged to provide with backup power solutions such the UPS systems to protect ICT equipment and ensure continuity of learning.

5.1 Improving access to digital devices

The South African government is encouraged to implement government-funded learner device programmes targeting under-resourced schools. Schools are recommended to introduce device-sharing schemes, such as classroom tablet banks and rotating laptop trolleys. The schools can support the Bring-Your-Own-Device (BYOD) with Safeguards. The schools can implement the BYOD initiatives which are feasible, while ensuring equity measures for learners who cannot afford devices. The government is recommended to provide secure school-managed platforms to protect learners' data and ensure appropriate usage.

5.2 Reducing affordability barriers

The government of South Africa is encouraged to negotiate zero-rated educational platforms with mobile network operators for curriculum-aligned content. This promotes the use of educational apps that consume minimal data. The government is recommended to expand ICT grants and subsidies for rural schools through provincial and district education budgets.

5.3 Building digital skills and capacity

The schools are recommended to provide continuous ICT skills training for teachers, focusing on digital pedagogy and blended learning. There is need to introduce peer mentoring and digital champions within schools to support ongoing learning and troubleshooting. Integrate digital competencies into the Performance Development Management System (PDMS) for educators. Schools can embed digital literacy modules into the curriculum from early grades. More so, the schools are encouraged to offer after-school ICT clubs and coding programmes to build confidence and practical skills.

5.4 Promoting inclusivity and equity

The government should ensure equal access to digital devices and learning opportunities for girls and boys. There is need to support programmes that encourage girls' participation in STEM and digital skills training. Schools are recommended to provide assistive technologies and accessible digital platforms for learners with special needs. Teachers should be trained in inclusive digital education practices.

5.5 Ensuring sustainability of digital learning initiatives

The government should allocate budget for maintenance, upgrades, and technical support rather than one-off equipment purchases. There is need to train local technicians or school staff to manage basic ICT maintenance. Schools need to integrate digital learning into daily teaching practices, assessment methods, and school development plans. The schools are encouraged to move beyond emergency or pilot projects toward institutionalised blended learning models.

6. Conclusion

Curbing the digital divide in education remains a critical challenge for achieving equity and social justice in marginalised communities such as Chris Hani West. This study has shown that limited access to digital devices, inadequate ICT infrastructure, high connectivity costs, and weak institutional implementation of e-learning policies continue to exclude many learners from fully participating in digital learning opportunities. These challenges not only hinder academic achievement but also reinforce existing socio-economic inequalities within the education system. Leveraging access to digital learning presents a viable pathway for addressing these disparities. Strategic investment in ICT infrastructure, provision of affordable and appropriate digital devices, improvement of internet connectivity, and targeted capacity-building for educators and learners are essential interventions. Equally important is the need for strong policy coordination, effective resource allocation, and community engagement to ensure that digital learning initiatives are sustainable and contextually responsive.

2. References

Alphonce, S., & Mwantimwa, K. (2019). Students' use of digital learning resources: Diversity, motivations, and challenges. Information and Learning Sciences, 120(11/12), 758–772. https://doi.org/10.1108/ILS-06-2019-0048

AlYoussef, I. (2020). An empirical investigation on students' acceptance of (SM) use for teaching and learning. International Journal of Emerging Technologies in Learning (iJET), 15(4), 158–178. https://doi.org/10.3991/ijet.v15i04.11660

Bates, A. (2018). Teaching in a Digital Age: Guidelines for Designing Teaching and Learning for a Digital Age. London: Tony Bates Associates Ltd.

Buchi, M. (2021). Book Review: Jan Van Dijk, The Digital Divide. Cam-bridge: Polity Press 2020. New Media & Society, Epub ahead of print.

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. doi:10.1111/ejed.12345

Cafun, W., & Ramrathan, L. (2021). Inequality in Imagination amongst Marginalised Learners: Teachers Pounding Away with a Hammer. Open Journal of Social Sciences, 9(12),351-367

Dayagbil, F. T., Palompon, D. R., Garcia, L. L & Olvido, M. M. J. (2021). Teaching and Learning Continuity Amid and Beyond the Pandemic. Frontiers in Education 6, 1–12. https://doi.org/10.3389/feduc.2021.678692.

Devkota, K. R. (2021). Inequalities Reinforced Through Online and Distance Education in the Age of COVID-19: The Case of Higher Education in Nepal. International Review of Education, 67(1),145–165. https://doi.org/10.1007/s11159-021-09886-x

Dube, B. (2020). Rural Online Learning in the Context of COVID-19 in South Africa: Evoking an Inclusive Education Approach. REMIE: Multidisciplinary Journal of Educational Research 10(2),135 - 157
Jansen, J. D. (2019). Inequality in Education: What is to Be Done? South African Schooling: The Enigma of Inequality (pp. 355-371): Springer.

Faura-Martinez, U., Lafuente-Lechuga, M., & Cifuentes-Faura, J. (2021). Sustainability of the Spanish University System During the Pandemic Caused by COVID-19. Educational Review, 74 (3), 645–663. https://doi.org/10.1080/00131911.2021.1978399.

Fletcher, G., & Griffiths, M. (2020). Digital transformation during a lockdown. International Journal of Information Management, 55, 102185. https://doi.org/10.1016/j.ijinfomgt.2020.102185

Haleem, A., Javaid, M., Qadri, M.A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. Sustainable Operations and Computers, 3, 275–285. https://doi.org/10.1016/j.susoc.2022.05.004

Harun, Z., F. M. Hamzah, S. Mansor, A. S. Mahmud, H. Hashim, M. T. H. Sultan, N. M. Z. N., & Mohamed, S. (2021). COVID-19 Effects on Students' Teaching and Learning Perspectives in Malaysian Varsities. Pertanika Journal of Social Science and Humanities 29 (4), 2729–2748. https://doi.org/10.47836/pjssh.29.4.34

Kali, S., & Das, S. (2021). Smart Classroom and E-learning. International Journal of English Learning & Teaching Skills, 3(4),2417 – 2438

Khoza, S. (2021). Can Teachers' Identities Come to the Rescue in the Fourth Industrial Revolution? Technology, Knowledge and Learning, 2(4),1-22

Magalhães, P., Ferreira, D., J, Cunha & Rosário, P. (2020). Online vs Traditional Homework: A Systematic Review on the Benefits to Students' Performance. Computers & Education 152 (3), 1 - 7.

Mahyoob, M. (2020). Challenges of E-Learning During the Covid-19 Pandemic Experienced by Efl Learners. Arab World English Journal, 11(4), 1-15

Makumane, M., & Fru, R. (2021). Learners' Attitudes towards Multilingualism: The Case of French in Lesotho. African Identities, 3(2), 1-19

McFarlane, A. E. (2019). Devices and Desires: Competing Visions of a Good Education in the Digital Age. British Journal of Educational Technology, 50 (3),1125–1136. doi:10.1111/bjet.12764

Mhlanga, D, & Moloi, T. (2020). COVID-19 and the digital transformation of education: What are we learning on 4IR in South Africa? Education Sciences, 10(7), 180-191. https://doi.org/10.3390/educsci10070180

Moraleja, M.O., & Pereja, A.T. (2022). Online distance learning barriers and their implication in the delivery of instruction in the new normal. International Journal of Educational Management and Development Studies, 3(3), 209-226. https://doi.org/10.53378/352919

Mpofu, P., & Machingauta, T. T. (2024). Challenges and strategies for effective online examinations in higher education institutions: Insights from lecturers and students. International Journal of Educational Management and Development Studies, 5(2), 187–208. https://doi.org/10.53378/353068

Mpofu, P. (2025). Bridging the digital divide: Exploring technology adoption and equity in secondary education in Eswatini. International Journal of Educational Management and Development Studies, 6(3),348-372. https://doi.org/10.53378/ijemds.353267

Muslimin, T., & Indrawati, R. A. (2024). Digitalization and education equity in remote areas: Challenges and strategic solutions. Journal of Education, Humaniora and Social Sciences, 7(2), 364–375.

Nhemachena, A. (2021). Hakuna Mhou Inokumira Mhuru Isiri Yayo: Examining the Interface between the African Body and 21st Century Emergent Disruptive Technologies. Journal of Black Studies, 52(8),864-883.

Nyagadza, B., Pashapa, R., Chare, A., Mazuruse, G., & Hove, P. K. (2022). Digital technologies, Fourth Industrial Revolution (4IR) & Global Value Chains (GVCs) nexus with emerging economies' future industrial innovation dynamics. Cogent Economics & Finance, 10(1),1-15.

Nyathi, T., & Joseph, R. M. (2024). Empowering South African educators: Navigating the challenges of digital teaching and learning competencies. SA Journal of Human Resource Management/SA Tydskrif vir Menslikehulpbronbestuur, 22(0), a2591. https://doi.org/10.4102/sajhrm.v22i0.2591

Park, A., Ramirez, P., & Sparks, P. (2021). Special issue editorial: Digital inclusion and digital divide in education revealed by the global pandemic. International Journal of Multicultural Education, 23(3),1–6. https://doi.org/10.18251/ijme.v23i3.3187

Rwodzi, C. (2018). Exploring teacher initiatives on teaching digital literacies in English. Doctoral dissertation. University of Pretoria. Retrieved from https://repository.up.ac.za/handle/2263/67890

Schäfer, M. (2018). The fourth industrial revolution: How the EU can lead it. European View, 17(1),5-12.

Serumaga-Zake, J. M., & van der Poll, J.A. (2022). Addressing the impact of Fourth Industrial Revolution on South African Manufacturing Small and Medium Enterprises (SMEs). Sustainability,1(3),11703. Available at: https://doi.org/ 10.3390/su132111703

Sima, V., Gheorghe, I.G., Subić, J., & Nancu, D. (2020). Influences of the Industry 4.0 Revolution on the human capital development and consumer behavior: A systematic review. Sustainability, 12,1-28.

Sofyani, H., Riyadh, H.A., & Fahlevi, H. (2020). Improving service quality, accountability and transparency of local government: The intervening role of information technology governance. Cogent Business & Management, 7(1),1-20

Sutcliffe, M., & Bannister, S. (2020). Research on the 4th Industrial Revolution: Implications for Local government in the context of skills development Final Report. City Insight. Available at https://cdn.lgseta.co.za/resources/ Accessed on 20Januay 2026

Tiekam, A. (2019). Digital leadership skills that South African leaders need for successful digital transformation. Doctoral dissertation. University of Pretoria. Retrieved from https://repository.up.ac.za/handle/2263/74033

Velsberg, O., Westergren, U. H., & Jonsson, K. (2020). Exploring smartness in public sector innovation – creating smart public services with the Internet of Things, European Journal of Information Systems, 29(4),350-368.

Woldegiorgis, E. T. (2022). Mitigating the digital divide in the South African higher education system in the face of the Covid-19 pandemic. Perspectives in Education, 40(3),197–211. https://doi.org/10.38140/pie.v40i3.5671

Zhao, Y., Llorente, A.M.P., & Gómez, M.C.S. (2021). Digital competence in higher education research: A systematic literature review. Computers & Education, 168, 104212. https://doi.org/10.1016/j.compedu.2021.104212