




# The role of technology in bridging the educational gap in rural South African high schools: The case of Lebopo Circuit, Capricorn District, Limpopo Province

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## ABSTRACT

The integration of technology can facilitate access to quality learning materials, enhance teaching methodologies, and improve learners' engagement. However, the implementation of technology in these contexts also presents significant challenges, including infrastructure limitations, digital literacy gaps, and the need for sustainable support systems. This study explores the potential of technology to bridge the educational gap in rural South African high schools. It highlights the historical inequality in education and the benefits of technology integration, such as access to online learning platforms, digital libraries, and interactive software. Social constructivism and the Technology Acceptance Model were used to underpin the study. A qualitative research approach and a descriptive case study research design were employed. Semi-structured interviews and observations were used as data collection methods. The sample consisted of eight participants, including four high school principals knowledgeable in Information and Communication Technology (ICT) and four teachers proficient in implementing ICT within the curriculum. Through interviews and document review, the research identified significant challenges faced during technology integration initiatives. The research may contribute to the body of knowledge on the integration of ICT in education. The findings of this research are expected to contribute to the existing body of knowledge on ICT integration in education, benefiting the Department of Basic Education (DBE), district and circuit managers, curriculum designers and advisors, teachers, and learners. The research recommends teachers' professional development and enhanced support systems to facilitate the successful integration of technology in rural educational environments.

**Keywords:** Technology, Rural Schools, Digital Divide, Bridging Gap

## INTRODUCTION

The educational landscape in rural South Africa is characterized by significant disparities, with high schools often lacking the resources and infrastructure available in urban centres. The DBE has been working on providing digital content and resources, including e-books and online learning platforms, to schools across

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the country, with a particular focus on underserved areas.<sup>1</sup> Mncube, et.al. highlight that many schools in rural areas operate in structures that are not conducive to learning, lacking basic technologies, internet access and reliable electricity.<sup>2</sup> The Department of Basic Education (DBE) is actively engaged in improving the educational landscape in rural South Africa by focusing on infrastructure development, technology integration, and teacher support. Lombo and Subban state that the DBE's National School Infrastructure Norms and Standards aim to ensure that all schools, including those in rural areas, meet minimum infrastructure requirements, with ongoing projects to build and upgrade facilities.<sup>3</sup>

Despite the infrastructure challenges faced by many South African schools, the integration of technology in rural high schools is a critical area of focus for improving learning outcomes. This education gap contributes to unequal access to quality education, perpetuating cycles of poverty and limiting opportunities for rural youth. Adu and Mtsi state that the integration of technology in rural South African high schools is actively addressing the educational gap by enhancing access to resources, improving teaching methodologies, and boosting learners' engagement.<sup>4</sup> The integration of digital tools, connectivity, and innovative pedagogical approaches can empower rural schools to overcome traditional limitations, enhance learning outcomes, and prepare learners for the demands of the 21st century.<sup>5</sup> All learners, regardless of their socioeconomic background or geographic location, have the opportunity to participate in and benefit from digital learning environments.

The educational gap between urban and rural high schools in South Africa is a complex issue rooted in historical inequalities and socio-economic disparities. This disparity significantly affects the quality of teaching, access to resources, and ultimately, learner outcomes. While this issue has historical roots, it remains a critical and ongoing challenge as of today, demanding immediate attention. Technology is widely recognized as a powerful tool to bridge this gap, offering potential solutions for democratizing access to educational resources, enhancing teaching methodologies, and fostering 21st-century skills. However, successful implementation hinges on overcoming significant challenges related to infrastructure, teacher training, and content relevance to ensure technology truly bridges, rather than widens, the existing divide.

The purpose of this study is to investigate and understand the various ways in which technology can be leveraged to bridge the educational gap in rural high schools across South Africa. The study is guided by the following questions:

1. What is the current state of technological infrastructure and access in rural high schools in South Africa?
2. How does technological infrastructure impact the delivery of quality education?
3. What are the perceptions and challenges faced by educators and learners in rural South African schools regarding the integration and utilization of technology for teaching and learning?

## LITERATURE REVIEW

The role of technology in bridging the educational gap in rural South African high schools holds the potential and the challenges associated with integrating technology into these underserved educational settings. Mwapwele et al. highlight that the main obstacles for integrating ICTs into rural education are inadequate

<sup>1</sup> Michack Mandla Masango, Linda Van Ryneveld, and Marien Alet Graham, "Barriers to the Implementation of Electronic Textbooks in Rural and Township Schools in South Africa," *Africa Education Review* 17, no. 6 (November 1, 2020): 86–118, <https://doi.org/10.1080/18146627.2022.2064310>.

<sup>2</sup> Dumisani Wilfred Mncube et al., "Exploring the Problems of Limited School Resources in Rural Schools and Curriculum Management," *UMT Education Review* 6, no. 2 (October 24, 2023): 1–31, <https://doi.org/10.32350/UER.62.01>.

<sup>3</sup> N Lombo and M Subban, "Physical Infrastructure Challenges in Rural Schools: Reflections to Promote Quality Education," *Administratio Publica* 32, no. 1 (2024): 69–101.

<sup>4</sup> Kemi O. Adu and N. Mtsi, "The Role of Information and Communication Technologies (ICTS) In Promoting Stem Education in South Africa: Implication for Teacher Education and Development," *Journal of Ecohumanism* 4, no. 4 (June 26, 2025), <https://doi.org/10.62754/joe.v4i4.6830>.

<sup>5</sup> Welile Ntombifuthi Msimango, "Empowering Pre-Service Teachers to Enhance Inclusive Education Through Technology," in *Empowering Pre-Service Teachers to Enhance Inclusive Education Through Technology* (IGI Global, 2025), 59–86, <https://doi.org/10.4018/979-8-3693-8759-7.ch003>.

professional development for teachers and a lack of dependable and affordable internet connectivity.<sup>6</sup> Together, these problems make it difficult for rural schools to use digital technologies and internet resources efficiently, which results in educational inequalities. Pillay highlights that the digital divide in South Africa is mostly caused by unequal access to information and communication technologies across various socioeconomic classes and is a major obstacle to effective collaboration and democratic governance.<sup>7</sup> He further states that a large part of the population has been cut out of digital platforms and interaction opportunities as a result of these inequalities, which are made worse by variables including financial inequality, geographic location, and educational level.<sup>8</sup>

Lembani et al. state that the digital divide in rural schools includes the lack of affordable and high-speed internet infrastructure, insufficient access to personal computers or laptops, and limited digital literacy skills among learners and educators. They further indicate that the lack of dependable technical support and maintenance further causes the problem by causing frequent malfunctions and decreased functionality of the technology that is accessible.<sup>9</sup> Mhlanga highlights that rural areas face significant challenges in digitally transforming their education due to challenges such as inadequate infrastructure, limited access to technology, and a lack of digital literacy among both educators and learners.<sup>10</sup> These obstacles hinder the country's ability to fully embrace technologies and leverage them for educational advancement. Chisango and Marongwe elaborate that the digital divide in rural schools is characterized by limited access to functional computers and reliable internet connections, which are fundamental for digital learning. They further elaborate that even when some digital devices are available, frequent power outages and a lack of secure storage facilities contribute to their underutilization or damage.<sup>11</sup>

Buthlezi, Chatikobo, and Dalvit emphasize that the digital divide in South Africa has been hindered by the limited access to information and communication technologies in rural areas over the past decade.<sup>12</sup> This restricted access impedes the ability of ICTs to create job and educational opportunities for rural communities.

Faloye and Ajayi explain that learners from low-income families in rural areas are less likely to have personal computers, smartphones, or data plans, which hinders their ability to engage in digital learning environments. Additionally, they indicate that even when some access is provided, the quality of connectivity in rural areas is frequently inadequate, resulting in slow internet speeds and regular disconnections, which further deepens the digital divide.<sup>13</sup> Kassar emphasizes that socioeconomic disparities, geographic location, and educational attainment significantly influence South Africa's digital divide.<sup>14</sup> These factors interact in a complex manner, making it challenging for individuals from disadvantaged socioeconomic backgrounds, those residing in isolated or underdeveloped areas, and those with limited educational opportunities to access and utilize digital technologies.

<sup>6</sup> Samwel Dick Mwapwele et al., "Teachers' ICT Adoption in South African Rural Schools: A Study of Technology Readiness and Implications for the South Africa Connect Broadband Policy," *The African Journal of Information and Communication* 24 (2019): 1–21.

<sup>7</sup> Sareesha Pillay, "Implications of Socio-Economic Issues on the Practice of Co-Creation and Governance in South Africa," *Administratio Publica* 27, no. 4 (2019): 88–109.

<sup>8</sup> Pillay, "Implications of Socio-Economic Issues on the Practice of Co-Creation and Governance in South Africa."

<sup>9</sup> Reuben Lembani et al., "The Same Course, Different Access: The Digital Divide between Urban and Rural Distance Education Students in South Africa," *Journal of Geography in Higher Education* 44, no. 1 (January 2, 2020): 70–84, <https://doi.org/10.1080/03098265.2019.1694876>.

<sup>10</sup> David Mhlanga, "Industry 4.0: The Challenges Associated with the Digital Transformation of Education in South Africa," *The Impacts of Digital Transformation* 13, no. 51 (2020): 13–26.

<sup>11</sup> Grasia Chisango and Newlin Marongwe, "The Digital Divide at Three Disadvantaged Secondary Schools in Gauteng, South Africa," *Journal of Education*, no. 82 (2021), <https://doi.org/10.17159/2520-9868/i82a09>.

<sup>12</sup> Mbalenhe Buthlezi, Tatenda Chatikobo, and Lorenzo Dalvit, "United in Diversity? Digital Differences and Inequalities within a South African Rural Community," *Information, Communication & Society* 24, no. 3 (February 17, 2021): 455–69, <https://doi.org/10.1080/1369118X.2020.1864000>.

<sup>13</sup> Samuel T Faloye and Nurudeen Ajayi, "Understanding the Impact of the Digital Divide on South African Students in Higher Educational Institutions," *African Journal of Science, Technology, Innovation and Development* 14, no. 7 (2022): 1734–44.

<sup>14</sup> Sophie Lythreathis, Sanjay Kumar Singh, and Abdul-Nasser El-Kassar, "The Digital Divide: A Review and Future Research Agenda," *Technological Forecasting and Social Change* 175 (February 2022): 121359, <https://doi.org/10.1016/j.techfore.2021.121359>.

Combrink et al. assert that insufficient access to technology hinders both learners and educators from fully engaging in the digital economy and society.<sup>15</sup> This digital divide increases pre-existing inequalities, restricting opportunities for skill enhancement, information access, and involvement in online learning environments. Odularu et al. emphasize that the core problem of the digital divide in rural schools arises from the difficulties encountered by learners in underprivileged areas, hindering their ability to fully participate in online learning and develop essential digital literacy skills vital for their future academic and professional success. They indicated that a comprehensive approach, which includes improving infrastructure (such as ensuring access to broadband internet), providing devices (such as computers or tablets), and delivering extensive training in digital skills, is the solution.<sup>16</sup> Lesame highlights that learners in rural schools are at a disadvantage when it comes to accessing online educational materials, participating in virtual classrooms, and developing the digital competencies necessary for the 21st-century workforce.<sup>17</sup>

This lack of digital skills can perpetuate a cycle of poverty and inequality, as rural school learners are less prepared for higher education and employment opportunities that increasingly demand digital proficiency. Modjadji states that rural schools struggle with inadequate internet access, insufficient digital devices, and a lack of infrastructure to facilitate technology-enhanced learning environments.<sup>18</sup> This results in a significant obstacle to achieving equitable education, as learners in these areas miss out on opportunities to cultivate vital digital skills and tap into the extensive educational resources available online. Dlamini elaborates that rural schools often lack reliable internet connectivity, sufficient computers or other digital devices, and adequate technical support, hindering the digital divide.<sup>19</sup> In the absence of reliable and strong internet access, opportunities for online educational resources, collaborative initiatives, and real-time information sharing are significantly hindered. Mangundu et al highlight that teachers' varying levels of technology competence and lack of professional development hinder the efficient use of ICTs in rural, scarce resources in education, increasing the gap between policy and reality and escalating educational inequality.<sup>20</sup> The lack of teacher readiness, combined with the previously mentioned infrastructural shortcomings, significantly hinders educational inequality, as learners in rural areas lack access to the technological benefits that their urban peers experience.

## THEORETICAL FRAMEWORK

The study utilized two key theories, namely: Social Constructivism and the Technology Acceptance Model (TAM). These theories were chosen to provide a comprehensive framework for understanding both the pedagogical implications of technology use and the factors influencing its adoption by teachers.

Social Constructivism, primarily associated with Vygotsky, posits that learning is an active process where learners construct knowledge through social interaction and collaboration.<sup>21</sup> In the context of this study, it helps analyze how technology facilitates collaborative learning environments among teachers and enhances learner engagement by enabling shared knowledge creation and interaction. Yadav highlights that

<sup>15</sup> HMVE Combrink et al., "Basic Digital Education and the Digital Divide in South Africa: A Free State Perspective 1," *Business Opportunities, Start-Ups, and Digital Transformation in Africa*, 2023, 391.

<sup>16</sup> Ayodele Temidayo Odularu et al., "Exploring COVID-19 Pandemic Impact, Online Engagement, and Digital Divide on Disadvantaged Undergraduate Students in South African Universities," 2023.

<sup>17</sup> Ntombizandile Carol Lesame, "The Digital Divide: Digital Transformation, Employment and Inclusive Growth in South Africa," in *INTED2024*, 2024, 7954–62, <https://doi.org/10.21125/inted.2024.1778>.

<sup>18</sup> Mathukhwana Masutane Modjadji, *Bridging Divides: Tackling Technological Change, Inequality, and Digital Illiteracy in a Fragmented South Africa* (European University Institute, 2025), <https://data.europa.eu/doi/10.2870/6085226>.

<sup>19</sup> Reuben Dlamini, "Implementation of South Africa's Education Policy in ICT: Through an Access and Equity-Oriented Lens," in *Society for Information Technology & Teacher Education International Conference* (Association for the Advancement of Computing in Education (AACE), 2025), 1598–1606.

<sup>20</sup> John Mangundu, Cephas Makwara, and Kgomotlokoa Linda Thaba-Nkadimene, "Barriers to Sustainable Integration of ICT in Pietermaritzburg Public Secondary Schools," *International Journal of Research in Business and Social Science* 14, no. 2 (2025): 342–51.

<sup>21</sup> Joie Claire Mugabekazi et al., "Integrating Collaborative Learning Strategies In The Curriculum: Enhancing Critical Thinking And Communication Skills In Primary Education," *European Journal of Education Studies* 12, no. 3 (February 28, 2025), <https://doi.org/10.46827/ejes.v12i3.5848>.

technology can provide platforms for teachers to co-create lesson plans, share resources, and engage in professional development, thereby fostering a constructivist learning environment.<sup>22</sup> The Technology Acceptance Model (TAM), developed by Fred Davis, focuses on understanding user acceptance of new technologies. Wang and Yu state that TAM proposes that two primary factors, perceived usefulness (PU) and perceived ease of use (PEOU), determine an individual's intention to use a technology, which in turn influences actual technology use. Perceived usefulness refers to the degree to which a person believes that using a particular system would enhance their job performance, while perceived ease of use refers to the degree to which a person believes that using a particular system would be free of effort.<sup>23</sup> In this study,

TAM was employed to assess teachers' perceptions of how beneficial technology is for their teaching practices and how easy it is for them to integrate and use these technologies in their classrooms. This is crucial for understanding the practical barriers and facilitators to technology adoption in rural settings, where resources and technical support might be limited.

The integration of these two theories provides a robust analytical lens. Social Constructivism addresses the why and how technology can be used to improve learning outcomes through collaborative and engaging methods, focusing on the pedagogical benefits. Zhang states that teachers perceive technology as useful (TAM) for facilitating group projects or online discussions (Social Constructivism), and they are more likely to adopt it.<sup>24</sup> TAM addresses the factors influencing the adoption of technologies by teachers, focusing on their individual perceptions and attitudes. Nhleko et al. state that the success of implementing technology for collaborative learning is heavily dependent on teachers' acceptance of technology.<sup>25</sup> Therefore, if teachers find the technology too difficult to use or not beneficial, its potential to foster collaborative learning will not be realized. Therefore, the combined use of these theories allows for a holistic understanding of the complex interplay between technology, pedagogy, and user acceptance in bridging the educational gap in rural South African high schools.

## METHODOLOGY

The research employed a qualitative research approach. Oranga and Matere highlight that qualitative research is a method of inquiry that seeks to understand human behaviour, experiences, and social phenomena through non-numerical data.<sup>26</sup> A descriptive case study research design was selected to provide an in-depth understanding of the phenomenon within a specific context. Out of 162 high schools, 8 educators were purposefully sampled due to their experience of being faced with issues of incorporating technology in their teaching, which happens in rural schools. Four principals with ICT knowledge, and 4 teachers with technology skills and teaching technology as a subject were purposefully selected. Semi-structured interviews were conducted with participants' in-person. McIntosh and Morse explain that interview questions centre on the participants' responses are developed within the context of semi-structured interviews.<sup>27</sup> Ethical considerations, such as ensuring participant anonymity and informed consent, were meticulously addressed

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- <sup>22</sup> Seema Yadav, "Digital Pathways to Excellence for Bridging Gaps and Building Competencies," *Holistic Approaches to Teacher Development: Leadership, Pedagogical Practices, and Cognitive Insights: Leadership, Pedagogical Practices, and Cognitive Insights* 287 (2025).
- <sup>23</sup> Zahir Osman, Tuan Fatma Tuan Sulaiman, and Liana Mohamad, "Shaping the Future: Artificial Intelligence-Enabled Transformation Acceptance in Higher Education Institutions," *International Journal of Academic Research in Economics and Management Sciences* 14, no. 2 (2025).
- <sup>24</sup> Kai Zhang, "Teacher Adoption of Digital Education Management Systems through Combined Information Systems and Social Cognitive Frameworks during Post-COVID Era," *Scientific Reports* 15, no. 1 (May 14, 2025): 16810, <https://doi.org/10.1038/s41598-025-01552-8>.
- <sup>25</sup> Nhlanhla Mzameleni Nhleko, Oluwasegun Julius Aroba, and Colledge Takaingenhamo Chisita, "A Systematic Review of Information and Communication Technologies (ICTs) on Student Motivation: Researchers' Reflections on a Selected Higher Education Institution (HEIs)," *Global Knowledge, Memory and Communication* 74, no. 11 (2025): 77–100.
- <sup>26</sup> Josephine Oranga and Audrey Matere, "Qualitative Research: Essence, Types and Advantages," *OALib* 10, no. 12 (2023): 1–9, <https://doi.org/10.4236/oalib.1111001>.
- <sup>27</sup> Michele J. McIntosh and Janice M. Morse, "Situating and Constructing Diversity in Semi-Structured Interviews," *Global Qualitative Nursing Research* 2 (January 1, 2015), <https://doi.org/10.1177/2333393615597674>.

throughout the research process.<sup>28</sup> Data analysis was performed using a thematic approach, allowing for the identification of recurring patterns, key themes, and significant insights from the collected qualitative data. The themes were drafted through the arrangement of findings into a specific thought phrase, as other researchers do using SPSS. These findings themselves are hereby presented as themes. Das stated that to help with understanding and interpreting what is emerging, qualitative data analysis aims to provide a summary of what was observed or heard using recurring words, phrases, themes, or patterns.<sup>29</sup> The findings' validity and reliability were increased by the thorough validation of data that was made possible by the combination of interviews and document reviews.

## PRESENTATION OF FINDINGS

This study found the following issues as preliminary findings;

1. Rural schools suffer from inadequate infrastructure and poor connectivity
2. Principals complain of the high cost of Data and Devices needed for technology in teaching and learning
3. Limited Digital Literacy and Teacher Training are offered in rural schools
4. Socioeconomic Factors and Geographic Isolation negatively affect rural schools

The following issues came up during the field study. The views of the respondents on these issues are presented below.

### a. Inadequate Infrastructure and Connectivity

The principal and teachers believed that infrastructure and connectivity are a challenge in the integration of ICT. One of the principals said that:

The principal 1 indicated that:

*Insufficient network infrastructure, characterized by old wiring and a scarcity of Wi-Fi access points, leads to persistent connectivity problems, slow internet speeds, and an inability to sufficiently accommodate the growing number of devices used in the school environment. This significantly hinders the successful implementation of digital learning resources.*

The teacher 1 indicated that:

*Inconsistent internet access in classrooms frequently interrupts lessons that depend on online platforms, educational videos, or other web-based resources, thus impeding teaching effectiveness. These interruptions can result in lost teaching time and reduced learning opportunities for learners.*

Memon and Memon highlight that the lack of reliable internet access and appropriate digital devices creates a significant divide, preventing many learners from participating in online learning opportunities and accessing digital educational resources.<sup>30</sup> This means that learners are unable to fully use modern online learning options due to this technical divide, which causes the gap in education.

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<sup>28</sup> Peter A Newman, Adrian Guta, and Tara Black, "Ethical Considerations for Qualitative Research Methods during the COVID-19 Pandemic and Other Emergency Situations: Navigating the Virtual Field," *International Journal of Qualitative Methods* 20 (2021): 16094069211047824.

<sup>29</sup> Mrigakshi Das, "Qualitative Methodology Techniques and Approaches of Business Research in the Digital Era," in *Evolving Designs, Applications, Technological Advances, and the Future of Qualitative Research* (IGI Global, 2025), 261–92, <https://doi.org/10.4018/979-8-3373-4432-4.ch011>.

<sup>30</sup> Farhat Naureen Memon and Sarwat Naureen Memon, "Digital Divide and Equity in Education: Bridging Gaps to Ensure Inclusive Learning," in *Impact of Digitalization on Education and Social Sustainability* (IGI Global, 2025), 107–30.

### **b. High Cost of Data and Devices**

Principal 2 and Teacher 2 both felt that the high cost of digital devices and internet connectivity presents a major challenge to equitable educational involvement, especially for learners from low-income households.

The principal 2 indicated that:

*The high cost of digital equipment and internet connectivity presents significant obstacles for learners, particularly those from low-income families, in accessing online educational activities and completing homework. This issue is exacerbated by the lack of reliable internet access at home, which makes it difficult for learners who share devices to complete online activities.*

The teacher 2: indicated that:

*Due to the high cost of laptops and internet access, learners from low-income families face challenges in participating in online educational activities and completing homework.*

Ajani and Luthuli state that some learners are digitally excluded due to the high cost of data and devices, which poses a significant challenge towards equal learning opportunities.<sup>31</sup> This indicates that learners from low-income families experience digital exclusion as a result of the high cost of digital technology and internet connectivity.

### **c. Limited Digital Literacy and Teacher Training**

Both principal 3 and teacher 3 believed that addressing the digital literacy gap and providing strong technical assistance are essential for successful technology integration and improved educational results.

The principal 3 indicated that:

*Lack of proficiency in digital tools among teachers hinders the effective integration of technology into the curriculum. This restricted digital literacy hinders teachers from exploring and applying innovative teaching methods that utilize technology, consequently, limiting the opportunities for improved student engagement and learning results.*

The teacher 3: indicated that:

*The absence of technical support when new technologies are implemented results in frustration and disengagement stemming from insufficient digital skills. This disengagement leaves me feeling isolated in difficult situations, lacking immediate access to resources or colleagues to address issues effectively.*

Ahmad et.al. highlight that digital literacy for educators goes beyond the ability to create learning activities that make use of technology, evaluate digital abilities, and promote responsible digital citizenship.<sup>32</sup> This indicates that inadequate training for educators and inadequate levels of digital literacy make it difficult to effectively integrate technology into the curriculum, and a lack of technical assistance causes them to get frustrated and disengaged.

### **d. Socioeconomic Factors and Geographic Isolation**

Both Principal 4 and Teacher 4 agree that socioeconomic factors and geographic isolation present major challenges to effective education in the 21st century, mainly because of their influence on access to and efficient use of technology.

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<sup>31</sup> Oluwatoyin Ayodele Ajani and Cebokazi Luthuli, "Factors Promoting Digital Exclusion of Some Students in Higher Education: A Systematic Review of Digital Divide in Learning Experiences," *Social Sciences and Education Research Review* 12, no. 1 (2025): 200–212.

<sup>32</sup> Wasim Ahmad et al., "Digital Literacy Policies," in *Literacy Policies for Equity and Inclusion* (IGI Global, 2025), 79–112, <https://doi.org/10.4018/979-8-3693-8427-5.ch004>.

The principal 4 indicated that:

*Lack of access to essential resources such as up-to-date technology, robust internet connectivity, and a lack of teachers' training in technology are major obstacles to effective education in the 21st century, further widening the digital divide among learners. These shortcomings impede the adoption of blended learning approaches and restrict learners' chances to cultivate essential digital literacy skills required for future achievement.*

The teacher 4 indicated that:

*Socioeconomic factors significantly limit access to technology for both teachers, learners and the school itself. This includes a lack of funding for devices, reliable internet infrastructure, and technical support. Moreover, when technology is accessible, problems related to its implementation and upkeep remain unresolved, resulting in underuse and dissatisfaction among users.*

Buthlezi et.al. state that schools in low-income and isolated areas often lack experienced teachers, adequate facilities, and rich curricula, perpetuating a cycle of disadvantage.<sup>33</sup> This means that the ongoing resource shortages in rural schools primarily impact the ability to provide a high-quality learning environment, leading to a decline in learners' academic performance and restricting their future opportunities.

## **Report on Observations Made by the Researcher**

### **a. School ICT Policies**

In four selected schools ICT policy was available and typed. ICT policies contain rules and procedures governing the use of ICT within the schools. It outlines the roles and responsibilities of various stakeholders regarding ICT use and management. In the policy, there were guidelines for the use of school-owned devices and personal devices, software licensing compliance, cybersecurity measures, and procedures for reporting and addressing ICT-related incidents.

### **b. Teacher Professional Development Records**

There were no teacher professional development records in four selected schools. To keep track of all teachers who attended training and professional development activities, especially those pertaining to their teaching subjects, pedagogical approaches, and the use of technology in the classroom, schools should have teacher professional development records. This must consist of training dates, subjects addressed, training providers, completion certificates, and possibly teacher reflections on how the training has changed the way they teach. In the context of ICT-related professional development, these records would particularly document training in digital literacy, online teaching resources, educational software, and learners' performance data assessment.

### **c. Learners' Assessment Reports**

In the four selected high schools, learners' assessment reports were available and typed. Academic achievements of all subjects taught in schools were documented in learners' assessment reports, which also provide the full records of their achievements. The report includes data analysis demonstrating trends in learners' performance, learning gap identification and the efficiency of various educational strategies for a more thorough perspective.

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<sup>33</sup> Michael Mbongiseni Buthelezi, Lusanda Ncisana, and Mohammed Xolile Ntshangase, "Food Insecurity Versus Learners' Performance in the Classroom: A Case of South African Rural School," *Research in Social Sciences and Technology* 10, no. 2 (May 12, 2025): 130–51, <https://doi.org/10.46303/ressat.2025.30>.

#### **d. Infrastructure Audit Reports**

Infrastructure audit reports were available and typed in four selected schools. It provides a thorough evaluation of the schools' physical and technological infrastructure. This includes a comprehensive inventory of all ICT equipment, such as computers, projectors, network devices, and servers, detailing their condition, age, and location. The report featured a detailed analysis of network connectivity, including bandwidth and Wi-Fi coverage, power supply stability, security of physical assets, and recommendations for upgrades, maintenance, or replacement of equipment. It was also designed to assess the adequacy of facilities like classrooms, laboratories, and administrative spaces.

#### **e. Minutes of School Governing Body (SGB) Meetings**

The SGB minutes of the School Governing Body (SGB) meetings were typed and available in all four selected schools. They provide a formal account of all discussions, decisions, and resolutions made by the governing body of the school. This encompasses attendance logs, agenda topics, summaries of discussions regarding strategic planning, budget distribution, policy approvals, including ICT policies, disciplinary issues, staff hiring, and community involvement initiatives. These minutes serve as an official historical record of the SGB's oversight and governance of the school.

#### **f. Parent-Teacher Association (PTA) Communications**

The four selected schools conducted parent-teacher meetings; however, they lack a documented record of these gatherings. Communications from the Parent-Teacher Association should encompass records of all formal and informal exchanges and information shared between the school and the Parent-Teacher Association. This includes meeting agendas and minutes, newsletters, announcements about school events, fundraising efforts, policy modifications, and any feedback or concerns expressed by parents. These communications demonstrate the level of parental involvement and collaboration in school affairs.

#### **g. Donor Reports or Project Documentation**

All four chosen schools provided a report of Donor Reports or Project Documentation. The documentation was typed, containing detailed accounts of the funds received from donors, the utilization of these funds, and the outcomes or impacts of the projects they supported. This encompasses financial statements, project proposals, progress reports, evidence of project implementation (such as photos and completion certificates), and evaluations of project success in relation to the stated objectives. For donations related to ICT, this documentation specifically illustrates how the donated equipment or funds for technology initiatives have been utilized and their effects on teaching and learning. All documents in the four selected schools are available and typed, except for the parent-teacher association (PTA) communications document. The principals reported that they did not know how to draft it.

### **DISCUSSION**

The integration of technology holds significant promise for bridging the educational gap in rural South African high schools, a challenge exacerbated by historical inequalities and geographical isolation. Mwansa et al. highlight that technology integration has great potential to decrease the educational gap in South African high schools in rural areas, which is made worse by geographic remoteness and historical injustices.<sup>34</sup> Interviews with principals possessing ICT knowledge and technology teachers reveal a nuanced understanding of both the potential and the persistent obstacles. Mulaudzi states that principals act as catalysts for change, emphasize the critical role of reliable infrastructure, including consistent electricity and

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<sup>34</sup> Gardner Mwansa, Matipa Ricky Ngandu, and Zolisa Mkwambi, "Bridging the Digital Divide: Exploring the Challenges and Solutions for Digital Exclusion in Rural South Africa," *Discover Global Society* 3, no. 1 (June 9, 2025): 54, <https://doi.org/10.1007/s44282-025-00189-2>.

internet access, as foundational to any technological intervention.<sup>35</sup> He stated that the current state of technological infrastructure and access in rural high schools in South Africa remains a significant challenge, characterized by limited connectivity, insufficient hardware, and unreliable power sources.<sup>36</sup> Sithole states that rural schools struggle with a shortage of functional computers, projectors, and other essential technological tools, with frequent power outages. His study revealed that teachers often express enthusiasm for integrating technology but are hindered by a lack of training, technical support, and the aforementioned infrastructural deficiencies.<sup>37</sup> Ramaila et al. elaborate that lack of training, technical support, and the aforementioned infrastructural deficiencies often lead to a disconnect between teachers' enthusiasm for using technology and their ability to effectively implement it in the classroom.<sup>38</sup> Furthermore, these leaders stress the importance of ongoing professional development for teachers, moving beyond basic computer literacy to pedagogical integration of technology. They note that many teachers, despite having access to devices, lack the confidence and skills to effectively incorporate them into their daily lessons, often reverting to traditional methods.

Discussions with four technology teachers corroborate these points, adding further depth to the challenges and opportunities. These teachers are often at the forefront of technological implementation, reporting that while learners are generally enthusiastic about using digital tools, the lack of sufficient devices per learner remains a significant barrier. Omari states that a single tablet or computer is shared among multiple learners, hindering individualized learning and the practical application of skills.<sup>39</sup> Moreover, the teachers point out that there is a scarcity of relevant, localized digital content and educational software that aligns with the South African curriculum. They often resort to creating their own digital resources, a time-consuming endeavor, or using generic international content that may not resonate with their learners' contexts. Wakkary and Oogjes elaborate that the issue of technical support and maintenance for devices with breakdowns often leads to prolonged periods of non-functionality.<sup>40</sup> Teachers express frustration over the lack of readily available IT support, forcing them to improvise or wait for external assistance, which can take weeks or even months. Furthermore, there is a fear among some teachers of being replaced by technology or a lack of confidence in their own digital literacy skills. Finally, learners have a high level of interest in using technology; the primary challenges include limited access to devices, expensive data, and a lack of digital literacy skills.

Document reviews further illuminate these discussions, providing a broader context for the challenges faced. Omojemite highlight that reports from the Department of Basic Education and various NGOs consistently identify inadequate funding as a primary impediment to widespread technological adoption in rural schools.<sup>41</sup> These documents often detail the disparity in resource allocation between urban and rural areas, with rural schools receiving significantly less investment in ICT infrastructure and training. Makda states that policy documents emphasize the need for a comprehensive national strategy for digital learning that addresses connectivity, device provision, content development, and teacher training holistically.<sup>42</sup> Omweri elaborates that document review in schools involves examining various internal and external records

<sup>35</sup> Rofhiwa Mulaudzi, "Investigation of the Adoption and Implementation of the E-Education Policy in the Gauteng Provincial Government" (University of the Witwatersrand, Johannesburg (South Africa), 2023).

<sup>36</sup> Mulaudzi, "Investigation of the Adoption and Implementation of the E-Education Policy in the Gauteng Provincial Government."

<sup>37</sup> Nosihle Veronica Sithole, "Social Issues That Negatively Impact Information and Communication Technology Integration in South African Township Schools," *Artha Journal of Social Sciences* 24, no. 2 (2025): 37.

<sup>38</sup> Sam Ramaila, Syamthanda Mpiwenhle Zondi, and Lydia Mavuru, "Pedagogical Strategies Employed by Teachers in Township Schools for Teaching Meiosis and Genetics with Improvised Resources," *Journal of Teaching and Learning* 19, no. 1 (2025): 236–60.

<sup>39</sup> Laila Omari, "Teachers' Pedagogical Competencies on the Use of ICT for Enhancing Learner-Centred Learning in Secondary Schools in Tanzania: The Case of Bagamoyo District" (University of Dodoma (Tanzania), 2021).

<sup>40</sup> Ron Wakkary and Doenja Oogjes, *The Importance of Speculation in Design Research* (Springer, 2025).

<sup>41</sup> Matthew Damilola Omojemite, "Teacher Preparedness for Transformative Education in the Intermediate Phase: Insights from Eastern Cape, South Africa," *Interdisciplinary Journal of Education Research* 7, no. 1 (2025): a22–a22.

<sup>42</sup> Fatima Makda, "Digital Education: Mapping the Landscape of Virtual Teaching in Higher Education – a Bibliometric Review," *Education and Information Technologies* 30, no. 2 (February 27, 2025): 2547–75, <https://doi.org/10.1007/s10639-024-12899-2>.

to understand the current state of technology integration and its impact on bridging educational gaps.<sup>43</sup> Document review helps to identify existing resources, policies, and challenges. The following are documents reviewed in four selected schools, namely: school ICT policies, teacher professional development records, learners' assessment reports, infrastructure audit reports, minutes of school governing body (SGB) meetings, parent-teacher association (PTA) communications and donor reports or project documentation.

## RECOMMENDATIONS

- The Department of Basic Education and the Department of Communications and Digital Technologies (DCDT) must collaborate to expand the reach of broadband infrastructure in rural areas. This includes exploring various technologies such as fiber optics, satellite internet, and TV white spaces to provide cost-effective connectivity.
- The DBE should invest in training initiatives that empower teachers to become facilitators of digital learning, capable of leveraging technology to create engaging and interactive lessons.
- The DBE should develop policies that mandate minimum standards for digital resources in schools, allocate funding specifically for technology integration, and address issues of digital safety and responsible online behaviour.
- DBE must implement strong policy frameworks which require collaboration among various stakeholders, namely provincial Departments of Education, school Governing Bodies and Parent Teacher Associations.

## CONCLUSION

The role of technology in bridging the educational gap in rural South African high schools is undeniably significant, yet it is currently limited by profound challenges related to infrastructure, affordability, and human capacity. While technology has the potential to enhance access to educational materials, foster engaging learning experiences, and improve overall educational outcomes, its impact is severely curtailed by the digital divide. To truly leverage technology for equitable education, a concerted and multi-pronged effort is required from the government, private sectors, and communities. This effort must prioritize robust infrastructure development, implement targeted affordability measures, and invest heavily in comprehensive digital literacy and pedagogical training for teachers. Without addressing these foundational issues, the promise of technology in transforming rural education in South Africa will remain largely unfulfilled, perpetuating existing inequalities. The success of technology integration hinges on creating an enabling environment where access is universal, affordable, and accompanied by the necessary skills and support for meaningful engagement. Although there are challenges with the use of ICT in Limpopo, South Africa, it remains for further studies to compare this study with other studies made elsewhere about the same matter.

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<sup>43</sup> F S Omweri, "A Systematic Literature Review of E-Government Implementation in Developing Countries: Examining Urban-Rural Disparities, Institutional Capacity, and Socio-Cultural Factors in the Context of Local Governance and Progress towards SDG 16.6," *International Journal of Research and Innovation in Social Science* 8, no. 8 (2024): 1173–99.

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