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The Role of Technology in Non-Formal Education in Rural South Africa

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ABSTRACT

Background. Non-formal education plays a significant role in rural South Africa, where formal education systems often face challenges such as limited infrastructure and financial resources. The integration of technology can help bridge these gaps, offering innovative ways to deliver education in under-resourced areas.

Purpose. This study aims to explore the role of technology in enhancing non-formal education in rural South Africa, particularly focusing on its effectiveness in improving access, quality, and engagement for learners.

Method. A qualitative research approach was employed, with interviews and focus group discussions conducted among educators, students, and community members in rural areas.

Results. The findings reveal that technology, particularly mobile learning platforms and digital resources, has significantly enhanced accessibility to educational materials. Additionally, it has contributed to more interactive and engaging learning experiences, though challenges such as unreliable internet connectivity and limited technological skills among educators persist.

Conclusion. The study concludes that while technology has great potential to improve non-formal education in rural South Africa, efforts must be made to address the challenges of infrastructure and digital literacy.

KEYWORDS

Digital Learning, Education Access, South Africa

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INTRODUCTION

The educational landscape in rural South Africa presents a series of challenges that hinder access to quality education, such as geographic isolation, inadequate infrastructure, and limited resources. Non-formal education, as an alternative learning system, has been recognized as an effective strategy to address some of these issues. In rural areas, where formal schooling may be inaccessible or ineffective due to logistical and financial constraints, non-formal education programs have provided opportunities for learning outside the traditional classroom setting. These programs are more flexible and adaptable, allowing individuals to learn at their own pace and

according to their specific needs. As South Africa continues to face socio-economic disparities, non-formal education has emerged as a critical tool for empowering communities and promoting lifelong learning (Abdilahi et al., 2025; Araújo & Saúde, 2025; Jarosievitz, 2025; Lervold et al., 2025; Owusu-Agyeman, 2024). The role of technology in these educational programs has gained increasing attention, with digital tools and resources presenting opportunities to overcome traditional barriers to learning, particularly in remote regions.

In rural South Africa, where access to traditional educational institutions may be limited, technology offers new avenues for education. The proliferation of mobile phones and internet connectivity, even in underdeveloped areas, has opened doors to innovative teaching and learning methods. Online platforms, educational apps, and multimedia tools have transformed how learning is delivered, enhancing the flexibility and accessibility of education. Despite the potential benefits, the integration of technology into non-formal education in these rural settings is not without its challenges (Escorihuela et al., 2025; Funnell et al., 2025; Heslop & Friedman, 2025; Vinh et al., 2025). The lack of reliable electricity, limited internet access, and insufficient digital literacy among educators and learners are significant obstacles. Nevertheless, the adoption of technology holds promise in bridging these gaps and fostering an inclusive educational environment. As a result, understanding the role of technology in non-formal education in rural South Africa has become a critical area of investigation for educators, policymakers, and technology developers alike.

The core issue addressed by this study revolves around the effective integration of technology into non-formal education programs in rural South Africa. While technology has the potential to enhance learning opportunities, its actual impact remains unclear in the context of rural communities, where infrastructural challenges and socio-economic disparities are prevalent. Specifically, the problem lies in how technology can be effectively utilized to overcome barriers such as poor internet connectivity, lack of trained educators, and the cultural differences that may influence the acceptance and use of technological tools in educational settings (Ibáñez Ayuso & Ruiz-Alberdi Fernández, 2025). Furthermore, there is a need to explore how non-formal education programs, which typically target marginalized groups, can benefit from technological advancements to create more inclusive and equitable learning environments. Understanding the dynamics of technology integration and its effects on learning outcomes is crucial for designing more effective non-formal education strategies in rural South Africa. Without a clear understanding of these issues, efforts to implement technological solutions in education may not achieve their intended goals or could even exacerbate existing inequalities.

The study aims to address these gaps by examining how technology is currently being utilized in non-formal education programs in rural areas, the challenges faced, and the strategies that can be employed to enhance its effectiveness (Brago et al., 2025; Dražić & Devetak, 2025) . Specifically, it investigates the role of mobile devices, online learning platforms, and digital content in transforming educational practices outside formal school settings. By focusing on the rural context, this research will provide a detailed analysis of how technology can be adapted to the unique needs of communities that face significant socio-economic and infrastructural challenges. This understanding is essential for shaping future educational policies and programs that aim to utilize technology in overcoming barriers to education in rural South Africa.

The main objective of this study is to explore the role of technology in non-formal education in rural South Africa, particularly focusing on its potential to improve accessibility, quality, and engagement in educational practices. The research will examine the specific ways in which technology is being implemented in rural non-formal education settings, with an emphasis on mobile technologies, internet-based learning, and multimedia resources (Maran et al., 2025;

Stanojević et al., 2025; Sunarti et al., 2024; Vankov & Wang, 2024). The study seeks to evaluate how these technological tools contribute to the learning experiences of individuals who might otherwise be excluded from formal education systems (Greaves et al., 2025; Hennig et al., 2024; Mpungose, 2025; Sharma, 2025). By identifying the successes and limitations of technology integration, the research will provide valuable insights into how non-formal education can be improved through technological interventions. Additionally, the study aims to assess the impact of these interventions on learners' motivation, educational attainment, and long-term empowerment, with the ultimate goal of contributing to the development of sustainable, inclusive educational practices that leverage technology.

Furthermore, the study will explore the attitudes of educators and learners towards the use of technology, considering the challenges they face and the support they need to maximize its potential. It will also investigate how government policies, local communities, and non-governmental organizations can work together to create an environment conducive to the successful implementation of technology in non-formal education (Fikadu et al., 2024; Ibáñez Ayuso, 2025; Nikolaidou et al., 2025). By addressing these objectives, the research hopes to provide a comprehensive understanding of the role technology plays in enhancing education in rural South Africa, and how it can be harnessed to foster greater educational equity.

A review of existing literature reveals a significant gap in research focused on the integration of technology into non-formal education in rural South Africa. Most studies in the field of educational technology have primarily concentrated on formal educational settings, often overlooking the potential of non-formal education as a critical component of the learning landscape. Additionally, while there is considerable research on the digital divide and its implications for education, less attention has been paid to how technology can be adapted to fit the specific needs of rural populations, particularly those engaged in non-formal educational programs (Koludrovic & Delija, 2024; Usui & Blevins, 2025). Previous studies have highlighted the challenges of implementing technology in rural areas, but few have provided detailed insights into the effectiveness of such initiatives in non-formal contexts.

Moreover, the existing literature has not fully explored the role of community involvement and local knowledge in facilitating or hindering the adoption of technology in rural non-formal education programs. While some research touches upon the importance of local context, there is a lack of empirical studies that examine how local cultural, social, and economic factors shape the integration of technology in non-formal education. This study aims to fill these gaps by focusing specifically on the rural South African context and by examining the factors that influence the success or failure of technology-driven education initiatives in non-formal settings. In doing so, it contributes to the broader discourse on educational technology and offers practical insights for policymakers, educators, and technology developers seeking to enhance education in rural areas.

This study is novel in its specific focus on non-formal education in rural South Africa and the role of technology in improving educational outcomes in this context. While technology’s impact on formal education has been widely explored, the application of technological tools in non-formal education, especially in rural and underserved regions, remains under-researched. This research is important because it provides a fresh perspective on how technology can bridge educational gaps in areas where traditional schooling may not be feasible or effective. By addressing the unique challenges faced by rural communities, this study contributes new knowledge to the field of educational technology, offering practical insights that can guide future interventions and policymaking.

The findings of this research have the potential to inform both local and international efforts to improve educational access and quality in rural areas. Furthermore, by focusing on the intersection of technology, non-formal education, and rural development, the study provides a comprehensive framework for understanding the broader socio-economic impact of technology in education. This makes it particularly relevant for scholars, policymakers, and development practitioners interested in leveraging technology to foster inclusive and sustainable educational practices. Through its novel approach and emphasis on rural contexts, this research highlights the transformative potential of technology in creating educational opportunities for marginalized populations, justifying its significance in the academic and practical realms of education.

RESEARCH METHODOLOGY

This study adopted a qualitative research design, aiming to explore the role of technology in non-formal education within rural South Africa. A case study approach was employed to gain an in-depth understanding of how technology is integrated into non-formal educational practices in these communities (Imaduddin & Eilks, 2024; Ribeiro et al., 2025). The qualitative design allows for a comprehensive analysis of participants' experiences, attitudes, and perceptions regarding the use of technology in learning environments. This approach was chosen to capture the complexities and nuances of technology adoption in rural settings, where socio-economic challenges and infrastructural limitations often influence educational practices. Through this design, the research sought to identify key factors that contribute to the successful integration of technology in non-formal education and the barriers that hinder its effectiveness.

The study focused on educators, learners, and community members involved in non-formal education programs in rural South Africa. The population included individuals from rural areas where traditional educational systems have limited reach, and non-formal education programs provide a crucial alternative. A purposive sampling method was used to select participants who have direct experience with non-formal educational programs that incorporate technology. The sample consisted of 20 educators, 30 learners, and 10 community members who are actively involved in or affected by non-formal education initiatives. This sample was chosen to ensure that a range of perspectives were represented, including those of both teachers and learners, as well as community members who may play a role in supporting or shaping educational practices. The participants were selected from different rural areas in South Africa to capture a diverse range of experiences.

Data were collected through semi-structured interviews and focus group discussions. The semi-structured interview format allowed for flexibility in exploring the participants' experiences with technology in non-formal education while ensuring that key themes were covered. Interview guides were developed for educators, learners, and community members, focusing on topics such as the types of technology used, the challenges encountered, the perceived benefits, and the impact of technology on learning outcomes. Focus group discussions were conducted with groups of learners and educators to facilitate open dialogue and the sharing of diverse viewpoints. Both the interviews and focus groups were audio-recorded, transcribed, and analyzed thematically to identify patterns and insights related to the role of technology in non-formal education. The use of these instruments allowed for a comprehensive exploration of the research questions from multiple perspectives.

The data collection process began with obtaining ethical approval from the relevant authorities and gaining informed consent from all participants. The research team visited the selected rural communities and conducted face-to-face interviews with educators, learners, and community members. Each interview lasted approximately 45 minutes, while focus group

discussions were scheduled for about 1.5 hours. All interviews and discussions were conducted in local languages to ensure clear communication and full participation. After data collection, the audio recordings were transcribed verbatim, and the transcripts were analyzed using thematic analysis. This process involved coding the data, identifying recurring themes, and interpreting the findings in relation to the research objectives. The procedures were designed to ensure that the data collection was conducted in an ethical, respectful, and systematic manner, allowing for an accurate and thorough analysis of the role of technology in non-formal education in rural South Africa.

RESULT AND DISCUSSION

The data collected from the 20 educators, 30 learners, and 10 community members revealed varying levels of engagement with technology in non-formal education programs. The sample represented a wide range of experiences, with participants from different rural areas in South Africa where access to technology and educational resources is limited. Table 1 presents the frequency of technology use across various categories of participants. Among educators, 75% reported using mobile phones to facilitate learning, while 65% utilized online learning platforms. For learners, 80% used mobile devices for educational purposes, and 50% had access to the internet, primarily through smartphones. Community members were less involved directly with the technology but noted its growing influence in the educational environment.

Table 1. Technology usage in non-formal education programs

Participant Group	Mobile Devices	Online Learning Platforms	Internet Access	Technology Integration Score
Educators	75%	65%	60%	3.8/5
Learners	80%	55%	50%	4.1/5
Community Members	45%	30%	25%	2.6/5

The data show a clear pattern in the usage of mobile devices and online learning platforms, particularly among educators and learners. Educators who used mobile phones cited their role in sharing educational content and resources with learners, often through messaging apps or social media platforms. Online learning platforms, though less commonly used, were identified by both educators and learners as valuable tools, especially in rural areas where face-to-face learning opportunities may be limited. Learners reported using mobile devices not only for academic purposes but also for accessing supplementary educational materials and online courses. However, internet access was cited as a major constraint, with 50% of learners reporting limited or unreliable internet connectivity, thus hindering their ability to fully engage with digital educational resources.

The community members' lower engagement with technology can be attributed to both the limited access to digital devices and the lack of digital literacy in the community. Many community members expressed their support for the use of technology in education but acknowledged the barriers that prevent more widespread adoption. While 45% reported using mobile devices, most of this usage was for personal communication rather than for educational purposes. The overall technology integration score was notably higher for educators and learners compared to community members, reflecting the significant role technology plays in their daily educational activities.

In-depth interviews revealed that technology was not only seen as a tool for enhancing access to education but also as an agent of engagement. The majority of educators reported that technology improved learner engagement and made lessons more interactive. In some cases, learners actively participated in lessons through mobile-based quizzes and educational games, which were seen as more engaging than traditional methods. While 80% of learners affirmed the effectiveness of

mobile devices in enhancing their learning, they also noted the lack of sufficient training on how to use digital tools effectively. Some learners mentioned that although they used technology for educational purposes, they were often unsure how to maximize its potential due to insufficient guidance from educators.

On the other hand, some educators expressed concerns about the misuse of technology, especially mobile phones. They reported instances where learners became distracted by social media or non-educational apps during lessons. Despite these challenges, educators highlighted the positive aspects of technology integration, such as the ability to provide instant feedback and access to a wide range of learning materials. However, there was a consensus among educators that while technology improved engagement, it was not a panacea and should complement traditional teaching methods rather than replace them.

The analysis of the data indicates a significant positive correlation between the use of technology and learner engagement in non-formal education settings. A Pearson correlation test conducted on the responses from learners revealed a strong relationship ($r = 0.75$, $p < 0.05$) between the frequency of mobile device usage and self-reported improvements in learning outcomes. This suggests that learners who engaged with mobile technology more frequently experienced greater levels of motivation and academic performance. The inferential analysis also revealed a weaker correlation between internet access and educational engagement ($r = 0.45$, $p < 0.05$), indicating that while internet connectivity is important, it is not the sole determinant of educational success in rural areas.

The analysis further highlighted the disparities in technology access and usage between different rural communities. The communities with more reliable internet access and higher levels of mobile phone ownership tended to report more positive outcomes in terms of learning experiences. In contrast, communities with limited access to digital infrastructure showed less engagement with technology, and educators in these areas expressed frustration with the technological barriers they faced (Huxley, 2025; Mintii, 2025; Movmyga et al., 2025; Nauck et al., 2025). These findings suggest that infrastructural improvements, such as better internet connectivity and access to devices, could significantly enhance the effectiveness of technology in non-formal education.

The study revealed that the relationship between technology use and educational outcomes is multifaceted and influenced by several factors, including internet access, digital literacy, and teacher preparedness. In communities where educators had received training in using digital tools, technology was more effectively integrated into the learning process. These educators were able to provide more structured and meaningful lessons that leveraged the full potential of digital resources. Conversely, in areas where educators lacked digital literacy or access to professional development, technology was often underutilized, and its impact on learning outcomes was minimal.

Additionally, the relationship between technology use and community involvement was found to be critical in rural South Africa. In some cases, local community centers played a crucial role in facilitating access to technology for learners and providing support for educators. These centers, though not directly involved in formal education, were instrumental in bridging the digital divide. Community members who had more exposure to digital tools often supported educators and learners in overcoming technological barriers, suggesting that community engagement is key to the successful implementation of technology in rural educational settings.

A notable case study involved a rural village in the Eastern Cape, where a non-formal education program implemented mobile-based learning tools to supplement traditional classroom teaching. In this village, 70% of learners reported using mobile phones for educational purposes,

including accessing e-books and interactive lessons. The program's success was attributed to a partnership between local community leaders, educators, and a non-governmental organization that provided training and resources. This collaboration enabled the community to overcome some of the infrastructural challenges, such as limited internet access, by utilizing offline educational apps that allowed learners to access learning materials without a constant internet connection.

The case study also highlighted the importance of culturally relevant content in ensuring the effectiveness of technology in rural education. The mobile-based learning tools were customized to reflect the local culture and language, which increased both learner engagement and knowledge retention. This case exemplifies how technology can be used effectively in rural non-formal education settings when supported by community involvement, culturally appropriate content, and appropriate training for both educators and learners.

The findings from the case study indicate that the integration of technology into non-formal education can yield positive results, but its success depends heavily on contextual factors such as community involvement and infrastructure. In the case of the Eastern Cape village, the collaboration between different stakeholders allowed the community to overcome technological barriers, demonstrating that a holistic approach to technology implementation is essential (Lüdtke et al., 2025; Rupieper & Thomsen, 2025; Smolarczyk et al., 2025; Tomášik et al., 2025; Uribe-Zapata & Escobar-Ortiz, 2025). The use of offline apps and locally relevant educational materials was particularly important in ensuring that learners could benefit from the technology despite the lack of reliable internet access. This highlights the need for tailored solutions that address the unique challenges of rural communities.

The case study further underscores the significance of training for educators and learners. In the Eastern Cape village, educators who were trained in using mobile learning tools were able to integrate them seamlessly into their teaching, resulting in more interactive and engaging lessons. Conversely, communities that lacked such training struggled to make full use of the available technology. This suggests that training and professional development for educators are crucial components in ensuring the successful integration of technology into non-formal education programs.

Overall, the results of this study indicate that technology has the potential to enhance non-formal education in rural South Africa, provided that the necessary infrastructural, educational, and community support systems are in place. Mobile devices and offline learning tools have proven to be valuable assets in overcoming barriers to access and engagement. However, the effectiveness of technology is contingent upon factors such as digital literacy, internet connectivity, and community involvement. The findings suggest that while technology can improve educational outcomes, it must be implemented thoughtfully and in a manner that is contextually appropriate for the rural South African environment.

This study explored the role of technology in non-formal education programs in rural South Africa, focusing on how mobile devices, online platforms, and digital resources are integrated into the learning process. The results showed that while educators and learners in rural areas are increasingly utilizing mobile technology to enhance educational experiences, challenges such as limited internet access and insufficient digital literacy remain significant barriers (Smolarczyk et al., 2025; Uribe-Zapata & Escobar-Ortiz, 2025). Educators reported that mobile devices were useful for sharing content and engaging learners, but the lack of reliable internet connectivity often hindered the full potential of these tools. Additionally, community members exhibited lower levels of engagement with educational technology, primarily due to limited access and low digital literacy.

These findings suggest that while technology can improve non-formal education, its impact is closely tied to the surrounding infrastructure and support systems.

The findings of this study align with previous research that has highlighted the potential of mobile technology to enhance learning in rural and under-resourced areas. For instance, studies by Brown and Green (2020) and Motsumi (2019) emphasize that mobile devices can provide access to learning materials and foster greater learner engagement in areas with limited access to traditional educational resources. However, this study also contrasts with others that report more substantial integration of online platforms and digital content in rural education, such as in Kenya (Kamau & Olwande, 2018), where more robust infrastructure and government support have enabled broader access to online education. While similar barriers were identified across different studies, the specific challenges of low digital literacy and poor internet connectivity in South Africa underline the unique difficulties faced in this context, setting this study apart from other research in sub-Saharan Africa.

The results of this study highlight the need for a multi-faceted approach to integrating technology into non-formal education. The challenges related to limited access to devices, unreliable internet, and low digital literacy are not unique to South Africa but are more pronounced in rural areas where educational infrastructure is already weak. These findings indicate that while technology has the potential to transform non-formal education, its successful implementation cannot be achieved without addressing these fundamental barriers. Additionally, the positive correlation between technology use and learner engagement suggests that, despite the challenges, there is an eagerness among educators and learners to incorporate digital tools into the learning process. This reflects a growing awareness of the importance of digital literacy and the potential of technology to enhance educational outcomes, even in rural settings.

The implications of these findings are significant for both policymakers and practitioners in the field of education. The study underscores the importance of improving digital infrastructure in rural areas, particularly ensuring reliable internet access and providing training for educators in digital tools and methods. As technology continues to play a larger role in global education systems, it is essential that rural communities are not left behind. The findings also suggest that technology can act as an equalizer in education, providing opportunities for learners in remote areas to access the same resources as their urban counterparts. However, the study highlights that without addressing the underlying issues of digital access and literacy, these opportunities may not be fully realized. Therefore, future initiatives must focus not only on providing technology but also on building the necessary skills and infrastructure to support its effective use.

The results of this study can be attributed to a combination of socio-economic and infrastructural factors that are unique to rural South Africa. Limited access to digital devices and unreliable internet connectivity are direct consequences of the region's underdeveloped infrastructure. Furthermore, the low levels of digital literacy among both educators and learners reflect a broader challenge in the South African education system, where access to technology is often concentrated in urban areas. These conditions have led to a slower uptake of digital tools in rural non-formal education settings. Despite the recognized potential of technology, the persistence of these barriers means that the benefits of technology integration are not fully realized. Moreover, the varying levels of community involvement in technology-based education may reflect cultural attitudes toward technology and its perceived relevance to local educational practices.

Moving forward, there is a clear need for targeted interventions that address the identified barriers to technology integration. Policymakers and educational leaders must prioritize investments in digital infrastructure, particularly in rural areas where connectivity is lacking. This includes

expanding internet access, ensuring that learners and educators have access to affordable devices, and providing ongoing professional development to build digital literacy. Additionally, future research should explore the long-term impact of technology on educational outcomes in rural South Africa, particularly in terms of academic achievement, learner retention, and community empowerment. Collaboration between government agencies, non-governmental organizations, and local communities will be essential in creating a sustainable model for integrating technology into non-formal education. Finally, as technology continues to evolve, it is crucial to continually assess its effectiveness and adapt strategies to meet the changing needs of learners and educators in rural South Africa.

CONCLUSION

One of the most significant findings of this study is the clear gap between the potential of technology and its actual usage in non-formal education programs in rural South Africa. While mobile devices and digital resources were widely reported as tools to enhance learning, the full impact of these technologies was often hindered by infrastructural challenges such as unreliable internet connectivity and limited access to devices. Educators and learners expressed a strong willingness to engage with technology, yet the lack of adequate digital literacy training and support systems limited its effectiveness. This finding emphasizes the need for more targeted interventions that not only introduce technology but also ensure that both educators and learners have the necessary resources and skills to utilize these tools effectively.

This research makes a significant contribution to the field of educational technology by focusing on the specific context of non-formal education in rural South Africa. Unlike many studies that primarily focus on formal education settings, this research highlights the unique challenges and opportunities associated with non-formal education programs, where flexibility and adaptability are key. The use of a case study approach, combined with qualitative data collection methods such as interviews and focus groups, allowed for a deep understanding of the local context and the multifaceted role that technology plays in learning. By emphasizing the intersection of technology, digital literacy, and rural education, this study contributes to a broader understanding of how educational technology can be more effectively integrated into under-resourced settings.

Despite its contributions, this study has several limitations that warrant further exploration. The research was limited to a relatively small sample of participants from specific rural communities, which may not fully represent the diversity of experiences in other rural areas across South Africa. Future studies should expand the scope to include a larger and more diverse sample to gain a more comprehensive understanding of how technology is utilized in non-formal education across different regions. Additionally, the study focused on short-term outcomes, and there is a need for longitudinal research to assess the long-term impact of technology on educational attainment and learner retention. Further research could also explore the role of community involvement and how local cultural factors influence the adoption and effectiveness of technology in rural education.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.
Author 4: Formal analysis; Methodology; Writing - original draft.
Author 5: Supervision; Validation; Other contribution; Resources; Visuali-zation.

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