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Closing the Digital Divide: Strategies for Addressing Inequalities in Technology Access in Higher Education Institutions

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ABSTRACT
Institutions of higher learning in the Eastern Cape face significant challenges in ensuring equitable access to technology among their student population. The digital divide, exacerbated by socioeconomic disparities, poses a barrier to academic success and hinders the realization of educational goals. This paper explores strategies for addressing inequalities in technology access within higher education institutions, drawing insights from empirical research conducted in an institution of higher learning within the Eastern Cape. Semi-structured interviews were employed as the data collection instrument, involving six participants comprising both lecturers and students. The collected data were analysed utilising the thematic approach. The findings revealed that to close the digital divide, the university should invest in infrastructure development, benchmark with other universities, and provide training programs to both lecturers and students. Hence, the study recommended that the university collaborate with government agencies, non-profit organisations, and industry partners, to leverage resources and expertise to address socioeconomic barriers to technology access. The university should also ensure that all initiatives and interventions are designed with a focus on equity and inclusion, considering students' diverse needs and backgrounds.

KEYWORDS
Digital divide; inequalities; technology access; institution of higher learning.

INTRODUCTION

In today's digital era, technology is essential in education, offering numerous opportunities for better learning experiences and enhanced academic results. However, a significant digital divide challenges students' access to technology, subsequently affecting their academic success. This issue is particularly pronounced in universities, where differences in technology access can worsen existing student inequalities. At a university in the Eastern Cape, there is a clear gap in technology accessibility. Some students benefit from modern technology and high-speed internet, while others lack basic resources like computers, laptops, and dependable internet connections. This disparity restricts students' ability to engage in online learning and limits their access to educational resources, research, and academic support. The digital divide refers to the inequality in accessing and using information and communication technologies (ICTs) across individuals, families, businesses, and geographic areas, particularly among different socioeconomic groups (OECD, 2006). A crucial indicator of this divide is the variation in broadband internet access among different income, racial, and geographic demographics. Many disadvantaged individuals remain underserved in areas with limited resources, where digital technology is not prevalent, and availability is uneven (Kajee & Balfour, 2011). Despite not all students having reliable internet access outside campus, universities rapidly transitioned to emergency online learning during the COVID-19 lockdown.

E-learning has highlighted more significant inequalities in Africa compared to other regions worldwide. According to Czerniewicz et al. (2020), South Africa is identified as the most unequal nation globally, a situation further exacerbated by the existing digital divide associated with disparities in income and wealth. Students from rural or marginalised communities faced the greatest challenges during the shift to online learning, as their digital skills lagged those of their peers from wealthier or urban backgrounds who adapted to e-learning more easily. The emergence of e-learning has brought to light factors such as geographic location, socioeconomic status, race, and income level as primary causes of the digital divide among students in South African universities (Dube et al., 2023; Hasan & Bao, 2020; Moloi et al., 2023).

The digital divide encompasses various aspects of ICT access, including physical availability, interest, technological proficiency, and the extent of institutional training in digital technologies. When discussing this divide, the focus remains on the inequalities surrounding access to online technologies (Belay, 2020; Mutongoza & Olawale, 2022). It also highlights the disparity in resources and access that affluent versus underprivileged students encounter regarding online learning platforms (Gamage et al., 2020). As a result, access to online technologies and inequality are crucial elements influencing the success or failure of e-learning initiatives. Azionya and Nhedzi (2021) describe these inequalities as manifesting in three ways: unequal access to technologies (first-level digital divide); unequal development of essential internet navigation and information literacy skills (second-level digital divide); and unequal socioeconomic benefits derived from technology use (third-level digital divide). Challenges contributing to the digital divide, as identified by Hasan and Bao (2020), include inadequate

digital infrastructure, high device costs, frequent rises in internet pricing, and a lack of skills among students. In rural higher education institutions (HEIs) across Africa, the transition to e-learning has been particularly harmful. Students in these regions encounter multiple challenges, such as frequent power outages (load shedding), high data and Wi-Fi costs, poor connectivity, and insufficient training on effectively utilising online learning management systems.

Professional development programmes should focus on equipping lecturers with the necessary skills to use technology tools and resources effectively, incorporate technology into their teaching, and address the diverse learning needs of their students (Yurtseven Avci et al., 2020). These training initiatives can take many forms, including workshops, seminars, online courses, and peer mentoring opportunities to encourage ongoing learning and collaboration among educators. This training and support are essential for ensuring that technology enhances teaching and learning while promoting equal access to educational opportunities (Haleem et al., 2022). Universities play a critical role in advocating for digital inclusion and addressing disparities in technology access. Establishing policies emphasising digital equity in education can help ensure that all students have equal opportunities.

THEORETICAL FRAMEWORK

The theoretical foundations of this study are grounded in the Knowledge Gap Theory and the Digital Divide Approach (Tichenor, Donohue & Olien, 1970). According to Gaziano (2016), individuals with higher socioeconomic status tend to acquire knowledge or information more rapidly than those with lower socioeconomic status. This suggests that the privileged class has greater access to knowledge compared to the less privileged class. Although information is readily available with just one click, increasing connectivity also brings the potential for a knowledge gap that warrants further investigation. Differences in educational background, socioeconomic status, and digital media awareness mean that the outcomes of using online and social media cannot be generalised. In the context of higher learning institutions in the Eastern Cape, these theoretical perspectives underscore the urgent need to address technology access inequalities. Tsetsi and Rains (2017) examined knowledge gap theories considering various demographic groups, focusing on how users of different socioeconomic backgrounds are impacted by cell phone and internet use, leading to an inequality of “haves” and “have-nots.” This is particularly relevant for students in one higher education institution in the Eastern Cape, where disparities in technology access can significantly impact educational outcomes.

Studies on the digital gap often centre on demographic factors such as socioeconomic status, age, gender, income, and whether individuals live in rural or urban areas (Azubuike et al., 2021). During the COVID-19 pandemic, urban populations faced challenges conducting online activities with inadequate internet connectivity while managing emergency crises. The digital divide posed significant issues for individuals with limited or no internet access (Lai & Widmar, 2021). This is reflective of the situation in the institution under investigation, where many students face similar challenges. Wang et al. (2021) concluded that educational

attainment plays a critical role in defining the knowledge gap, particularly when examining the Covid-19 knowledge gap. Internet use has exacerbated the pre-existing knowledge gap, making the digital divide apparent. Traditional media and interpersonal communication are ineffective at significantly increasing one's knowledge level. Knowledge inequality is not solely caused by lack of access to online resources; in some cases, the quality of use also contributes to the disparate benefits that individuals derive from digital media (Cho & Li, 2021). To effectively address these inequalities in an institution of higher learning in the Eastern Cape, it is crucial to develop and implement strategies aimed at closing the digital divide. Mathrani et al. (2021) utilised factors such as gender, age, family income, and educational attainment to measure the digital gap. Their findings indicate that the digital divide persists, especially among lower socioeconomic groups in developing nations. First-level digital access, which refers to having access to technology and the internet, remains a significant issue (Mathrani et al., 2021; Rotondi et al., 2020).

METHODOLOGY

The study employed a qualitative research methodology rooted in the interpretive paradigm and informed by construct theory (Cherry, 2020). This theory posits that individuals form their own worldviews and utilise them to interpret their observations and experiences. The interpretive paradigm was employed because it emphasises how individuals give meaning to their surroundings and how their perspective influences how they understand it (Maree, 2019). Interpretivists seek to understand the meaning that motivates human behaviour. Henning et al. al. (2004) state that a qualitative research approach cannot frequently manipulate variables, allowing themes that the researcher hopes to uncover in the study to emerge naturally and spontaneously. The qualitative research methodology of this study enabled a deeper examination of the pertinent stakeholders' viewpoints, experiences, and attitudes (Kemparaj & Chavan, 2013). This strategy improves the study findings' relevance and applicability to the stakeholders' actual environments (Pyett, 2003). The best type of research design is participatory research (PR), which encourages active participation from stakeholders. According to Mistry et al. (2015) and Petrova et al. (2016), the study's use of a participatory research design actively incorporates the stakeholders in the research process, allowing them to contribute to producing solutions and suggestions. This is pertinent to the investigation since PR aims to include pertinent parties in the research process (Mistry et al., 2015). In this instance, the parties involved were asked to contribute solutions. They took a proactive role in recognising issues, coming up with fixes, and adjusting. The study produces insights and solutions based on the needs and views of people most impacted by the digital divide since stakeholders are included in the research process. Given the increased likelihood of stakeholder acceptance and implementation of suggested solutions, this method can potentially bring about more lasting and successful reforms within universities. The interpretive paradigm and PR design are more

pertinent as a philosophical basis for the study since they ultimately address inequalities in technology access within the university.

Research Site

The study was conducted in one higher education institution in the Eastern Cape. The university's main objective as an academic institution is to give its students access to high-quality instruction and research opportunities while also generating and disseminating knowledge to advance society. The university's location is noteworthy because the Eastern Cape Province is among the poorest areas of South Africa, with high unemployment rates, poverty, and social inequality (South Africa Gateway, Westaway, 2012). It was believed that stakeholders of this institution could assist the university in developing strategies to be implemented to close the digital divide in technology access within the university.

Participants and Selection of Participants

The technique utilised to select research participants was convenient sampling. People who are easily reachable and eager to engage in the study are selected in this type of sampling (Han et al., 2021). Speed and simplicity of usage are the main advantages of this type of sampling. The researchers selected the participants to be visited and the ones that were reachable throughout the study period.

Method of Data Collection

Semi-structured interviews were utilised to collect data from participants. This method is particularly valuable due to its flexible and open-ended nature, which encourages participants to express their experiences, views, and insights in depth (Whiting, 2008). By fostering collaboration between the researcher and participants, this approach supports a more comprehensive and nuanced exploration of the research topic. Furthermore, semi-structured interviews allow for follow-up questions, enabling clarification and deeper elaboration on responses, thereby improving the richness and accuracy of the data (Adams, 2015). Consequently, this method was highly suitable for the study, as it enhanced data quality and validity while providing meaningful insights into participants' experiences and perspectives.

Data Analysis Method

Thematic analysis was employed to analyse the data, making it an integral method for this study as it facilitates the identification of themes from participants' responses. This approach is both flexible and iterative, enabling the researcher to uncover patterns, meanings, and relationships within the data (DeJarnette & González, 2016). The analysis was guided by a single research question, with Braun and Clarke's (2006) six-phase framework ensuring a systematic and rigorous process. These phases include becoming familiar with the data, generating initial codes, identifying potential themes, reviewing and refining themes, defining and naming themes, and producing the final report. Adhering to these steps allowed the researchers to systematically identify and interpret themes rooted in the participants' responses. This method provided a comprehensive and grounded analysis, making thematic analysis particularly suitable for

exploring strategies to address inequalities in technology access within a higher education institution in the Eastern Cape.

Ethical Considerations

Maree (2019) highlights that researchers have an ethical responsibility to adhere to legal guidelines during data collection and to safeguard the rights and well-being of participants when disclosing data. This study received ethical approval under protocol number FEDREC15-06-23-3. Addressing ethical considerations was a critical aspect of this research, ensuring participants' rights and well-being were prioritised throughout the study. Informed consent was obtained from all participants, who were provided with clear information about the study's purpose, procedures, potential risks, and benefits. Participants were also assured of their right to voluntarily participate or withdraw at any time without any adverse consequences. Respecting participants' autonomy helped build trust and upheld the integrity of the research process. To further protect participants, pseudonyms were used to ensure anonymity, making it impossible to trace their responses back to them. Lecturers were coded as L1 to L3, while students were coded as S1 to S3 in the reports. These measures reflect the researchers' commitment to conducting ethical, respectful, and responsible research that benefits all involved.

DISCUSSION OF FINDINGS

Training Programmes

A striking finding emerged from semi-structured interviews, that the university should implement training programs for both students and lecturers to address inequalities in technological access.

S2: *Access to technical skills training would be incredibly beneficial. Many students, including myself, only have smartphones, which are not as effective for completing assignments or conducting research. Workshops would ensure we all have the same opportunities to succeed."*

S3: *"Technical workshops would be a game-changer for many of us. I've often had to rely on friends to help me with basic computer tasks. Learning these skills in a structured environment would make me more independent and improve my academic performance."*

L2: "*Faculties should receive training on how to use various educational technologies effectively to support students better*."

L3: "*Providing workshops to develop technical skills is crucial. Many students arrive with limited experience in using essential software and hardware. Workshops can bridge this gap, ensuring all students, regardless of their background, can engage fully with their coursework."*

The sentiments expressed by the participants highlight a significant need for technical skills training among students, particularly those who primarily access educational resources through smartphones. They emphasise the limitations of smartphones for completing assignments and conducting research, underscoring the importance of workshops to level the playing field and provide equal opportunities for academic success. Participants desired to become more independent in handling basic computer tasks, recognising the potential for

improved academic performance through structured skill development. Previous studies confirm that professional development programmes should aim to equip lecturers with the skills needed to use technology tools and resources proficiently, seamlessly integrate technology into their teaching, and cater to the varied learning needs of their students (Yurtseven-Avci et al., 2020). These training initiatives can take various forms, such as workshops, seminars, online courses, and peer mentoring opportunities, designed to foster continuous learning and collaboration among educators. Providing such training and support is crucial to ensuring that technology enhances teaching and learning effectively and promotes equitable access to educational opportunities (Haleem et al., 2022). As echoed by the participants, the call for technical skills training among students and lecturers aligns with the broader goals outlined in Agenda 2063, which emphasises the transformation of education systems to meet the demands of the digital age and ensure inclusive and equitable access to quality education. By aligning with the principles of Agenda 2063, initiatives aimed at providing technical skills training to students contribute to realising a continent where education is a crucial driver of sustainable development and prosperity for future generations (Arikan & Zorba, 2024: Zorba, 2023).

Infrastructure Development

To address inequalities in technology access in higher education institutions, universities should invest in infrastructure development. This investment is crucial for creating an equitable learning environment where all students, regardless of their socioeconomic background, can access the technology necessary for academic success.

L1: *"Infrastructure development should indeed be a priority for our university to tackle technology access inequalities. As lecturers, we witness firsthand how students from disadvantaged backgrounds struggle with outdated or inadequate facilities. By upgrading infrastructure, the university can create a level playing field, enabling all students to engage with digital learning resources and tools fully. This proactive approach is essential for fostering inclusivity and ensuring that every student has the opportunity to succeed academically."*

S3: *"It is crucial for our university to improve infrastructure to address technology access disparities. Many students face barriers due to outdated facilities or insufficient resources. By investing in infrastructure, the university can ensure all students have equal opportunities to access and utilize technology for their studies. This not only promotes fairness but also enhances the overall learning experience."*

The findings accentuate the critical need for universities to prioritise infrastructure development to address disparities in technology access among students. They highlight the significant challenges faced by students from disadvantaged backgrounds due to outdated or insufficient facilities. Upgrading infrastructure is essential to creating a level playing field, enabling all students to fully engage with digital learning tools and resources. Participants emphasised that this proactive approach fosters inclusivity, ensuring equal academic opportunities for all students, regardless of their socioeconomic background. These findings align with prior research that has emphasised the necessity of resource allocation to enhance

technology infrastructure and professional development programs in schools (Kilag et al., 2023). According to Soomro et al. (2020), implementing robust ICT infrastructure and digital facilities in higher education has far-reaching impacts on access, equity, management, efficiency, pedagogy, and online teaching and learning. However, despite progress in ICT infrastructure across several South African universities, digital pedagogy often remains underutilised. Radovanović et al. (2020) advocate for policies and initiatives that promote digital literacy, internet access, and affordability for all students and their families. These efforts align with broader developmental goals, such as Agenda 2063's vision of an integrated, prosperous, and peaceful Africa, and Sustainable Development Goals (SDGs) 4 (Quality Education) and 9 (Industry, Innovation, and Infrastructure). By addressing disparities in technology access through infrastructure upgrades and digital literacy initiatives, universities not only promote equitable education but also contribute to advancing Agenda 2063 and the SDGs, fostering a more inclusive and prosperous future.

Benchmarking

To address inequalities in technology access within higher education institutions, universities should consider benchmarking against other universities. This process involves examining the strategies and practices of peer institutions that have successfully mitigated socioeconomic barriers to technology access.

L2: "*As lecturers, we must stay informed about what other universities are doing to close the digital divide. Benchmarking allows us to assess our progress and identify areas for improvement. By sharing insights and experiences with our counterparts, we can collectively work towards enhancing technology access for all students in the Eastern Cape."*

S1: *"Our university should benchmark with others to address the digital divide for improving technology access."*

These findings revealed the significance of benchmarking as a strategic tool for universities to learn from each other's experiences and initiatives in tackling the digital divide, aiming for improved technology access and equity in education. Benchmarking aligns with the Higher Education Council (HEC) mandate to ensure that higher education institutions provide education that meets both the country's demands and international higher education trends (Nasikiliza, 2015). Additionally, it would enhance the self-assessment initiatives already carried out by educational institutions. Benchmarking allows universities to adopt and tailor proven methods to their context, ensuring a more equitable distribution of technology resources and support. It promotes a culture of continuous improvement and innovation, helping institutions to stay at the forefront of educational technology and to serve their diverse student populations better.

Addressing Socioeconomic barriers

To effectively address inequalities in technology access within higher education institutions, universities must tackle the underlying socioeconomic barriers. By focusing on

these barriers, institutions can ensure that all students can benefit from the technological resources necessary for academic success.

S1: *"The institution should provide grants or scholarships for purchasing necessary technology, such as laptops and tablets. Many students cannot afford these on their own."*

L1: *"Providing stipends for technology to students from disadvantaged backgrounds can level the playing field*."

The findings highlight a pressing need for financial support to address inequalities in technology access. By introducing targeted financial aid initiatives such as grants, scholarships, and stipends, the institution can effectively reduce the socioeconomic barriers that impede students' academic progress. These measures not only promote equity and inclusion but also enhance the overall quality of education by ensuring all students have access to the necessary technological tools for success. This approach fosters an inclusive learning environment where every student, regardless of financial background, can thrive. Previous research supports this perspective by emphasising the crucial role universities play in advocating for digital inclusion and bridging technology access gaps. Kelly and Zakrajsek (2023) argue that implementing policies centred on digital equity in education is vital to ensuring equal access to technology resources and facilitating meaningful participation in digital learning. Such policies may include allocating funding and incentives for upgrading technology infrastructure, establishing standards for digital access and literacy, and supporting affordable internet access programs for low-income households.

Recommendations

This paper recommends that the university under investigation develop and implement structured technical skills training programmes for students and lecturers to address digital inequalities. The university should ensure that training programs cover essential software, hardware, and digital literacy skills to effectively empower students and lecturers to utilise technology for teaching and learning. Furthermore, the university could invest in modern technological infrastructure that supports digital learning environments and enhances access to educational resources for all students. The university should also collaborate with stakeholders to identify and address infrastructure gaps, particularly in underserved areas or disadvantaged student populations. Establishing formal mechanisms for benchmarking against peer institutions to identify best practices and effective strategies for addressing technology access disparities is also recommended, as well as fostering partnerships and knowledge-sharing networks with other universities, both locally and internationally, to exchange insights and experiences in closing the digital divide. Higher Education Institutions (HEI) should develop targeted financial aid programs, such as grants, scholarships, and stipends, to support students from disadvantaged backgrounds in acquiring necessary technology devices. There is need for collaborating with government agencies, non-profit organisations, and industry partners to leverage resources and expertise in addressing socioeconomic barriers to technology access.

The last recommendation is ensuring that all initiatives and interventions are designed to focus on equity and inclusion, considering students' diverse needs and backgrounds.

CONCLUSION

Closing the digital divide within the studied institution of higher learning in the Eastern Cape demands a multifaceted strategy that tackles socioeconomic, infrastructural, and educational hurdles. The research underscores the pivotal role of implementing comprehensive measures to ensure fair access to technology resources and support for students and lecturers. By embracing a holistic approach, blending infrastructure enhancement, training initiatives, benchmarking practices, and socioeconomic interventions, higher education institutions in the Eastern Cape can effectively bridge the digital gap and foster an environment of inclusivity and fairness for all stakeholders. With collaborative efforts and strategic partnerships, we can progress toward realising the vision of a digitally empowered and flourishing academic community.

Limitations

The study faced several limitations that may impact the generalizability and comprehensiveness of its findings. Firstly, the research was conducted at a single higher education institution in the Eastern Cape, which may limit the applicability of the results to other contexts or regions with differing socio-economic conditions and technological challenges. Additionally, the use of convenient sampling to select participants introduced bias, as it did not represent the broader stakeholder perspectives within the university. The reliance on semi-structured interviews, while beneficial for depth, has also resulted in variability in responses based on individual participants' willingness and ability to articulate their experiences. Furthermore, the interpretive nature of the methodology has led to researchers' subjectivity in data analysis, potentially influencing the findings. The dynamic nature of technology access issues means that the insights gathered may quickly become outdated in the face of rapid advancements in digital tools and educational practices.

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