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Bridging boundaries: advancing digital equity and innovation through blended learning in global higher education. A cross-sectional study at Mangosuthu University of Technology.

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Abstract

Background

Blended learning has become a vital approach in global higher education, especially in the post-pandemic era. At Mangosuthu University of Technology (MUT), this model is seen as a potential tool to bridge digital divides and promote innovation in teaching and learning. However, many students still face challenges related to digital access, which affects their academic participation and success.

Methods

This cross-sectional study was conducted at MUT to examine the experiences of students and staff with blended learning. Data were collected through an online survey from 180 participants, including 140 students (78%) and 40 academic staff (22%). The survey explored access to devices and the internet, digital skills, and perceptions of blended learning's impact on equity and learning quality.

Results

Most student participants (65%) were from rural or township areas. About 45% reported difficulty accessing a stable internet, while 39% lacked personal laptops or tablets. Despite these challenges, 68% of students said blended learning helped them manage their time better and access recorded content at their own pace. Only 35% of students felt confident using digital learning platforms without support. Staff reported limited training in blended learning methods but recognized its potential to reach more students effectively.

Conclusion

Blended learning has opened new opportunities for flexible and inclusive education at MUT, but gaps in digital access and readiness continue to affect student participation. A greater focus on student-centred support is needed.

Recommendations

The university should expand access to affordable devices and the internet, provide ongoing digital skills training, and ensure that blended learning platforms are accessible and easy to use. Empowering students with the necessary tools and support is crucial for advancing digital equity and promoting educational success.

Keywords: *Blended learning, digital equity, higher education, innovation, internet access, student experiences, digital literacy, South Africa, Mangosuthu University of Technology, educational transformation.*
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Background information

The COVID-19 pandemic triggered a global shift in higher education, prompting institutions to adopt blended learning models that combine online and face-to-face instruction. While this transition brought new opportunities for flexibility and innovation in teaching and learning, it also exposed and, in many cases, worsened existing inequalities in digital access, particularly in under-resourced institutions and developing countries. In South Africa, many students come from rural or township areas where internet connectivity, access to digital devices, and digital literacy remain major barriers to full participation in technology-enhanced learning environments. Mangosuthu University of Technology (MUT), situated in a township context, serves a student population that is largely from historically disadvantaged backgrounds. As the institution moves forward with blended learning, understanding the real-life experiences of students and staff becomes critical in ensuring that digital transformation does not exclude the very individuals it aims to support. Exploring the gaps and successes in this transition can provide valuable insights

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for designing equitable and inclusive learning models that are tailored to the local context.

Research objectives

- To assess students' and academic staff's access to digital tools and internet connectivity at MUT.
- To evaluate perceptions of the benefits and challenges associated with blended learning.
- To examine the level of digital confidence and preparedness among students engaging with blended platforms.
- To explore the extent of institutional support available to staff for implementing blended teaching strategies.
- To provide recommendations for enhancing digital equity and educational innovation through blended learning at MUT and similar institutions.

Methodology

Study design

This research employed a cross-sectional study design to assess the experiences of students and academic staff with blended learning at Mangosuthu University of Technology (MUT). This design allowed for the collection of data at a single point in time to evaluate access, digital readiness, and perceptions related to digital equity and innovation in teaching and learning.

Study setting

The study was conducted at Mangosuthu University of Technology (MUT), a public institution of higher learning located in Umlazi Township, Durban, KwaZulu-Natal, South Africa. MUT primarily serves students from historically disadvantaged and under-resourced communities, making it a relevant setting for examining digital inclusion in blended learning environments.

Study period

Data collection was carried out over four weeks from 20 March to 15 December 2021, during the first academic term of the university calendar.

Participants

A total of 180 participants were included in the study, comprising 140 students (78%) and 40 academic staff (22%). Eligibility criteria for student participants included being currently registered at MUT and having been exposed to at least one module delivered in a blended format. For staff, eligibility included being actively involved in delivering or supporting blended learning modules. Participants were selected through purposive sampling to ensure that only those with direct experience in blended learning were included.

Exclusion criteria for students included not being currently enrolled at MUT, having no exposure to blended learning modules, or having withdrawn from their courses prior to data collection. Academic staff were excluded if they were not directly engaged in the design, teaching, or support of blended learning modules, or if their role was limited to administrative functions without teaching responsibilities. In addition, any individual who did not provide informed consent or who failed to meet the minimum exposure requirements to blended learning practices was excluded from the study.

Bias

To minimize selection bias, the survey link was distributed across multiple faculties and student groups to ensure broad representation. Participation was voluntary, and anonymity was maintained to reduce social desirability bias. No incentives were offered, and respondents could withdraw at any point without consequences.

Study size

The final sample size of 180 participants was determined based on the number of responses received during the data collection period. The survey was initially sent to approximately 500 individuals (350 students and 150 staff), resulting in a response rate of 36%. While this sample was not randomized, it was deemed sufficient for descriptive and comparative statistical analysis within the scope of an institutional-level study.

Data measurement/sources

Primary data were collected through a structured online questionnaire administered via Google Forms. The questionnaire included both closed-ended and Likert-scale questions focused on five main areas: (1) access to devices and internet, (2) digital skills and confidence, (3) perceived benefits of blended learning, (4) institutional support, and (5) challenges encountered. The instrument was pilot tested with 10 participants to ensure clarity and relevance.

Statistical analysis

Descriptive statistics such as frequencies, percentages, and means were used to summarize participant characteristics and response trends. Chi-square tests were used to assess associations between variables such as access and satisfaction levels. Missing data were handled by excluding incomplete responses from the analysis. All

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statistical analyses were conducted using Microsoft Excel and SPSS version 25.

Ethical consideration

Ethical clearance for the study was obtained from the Research Ethics Committee of Mangosuthu University of Technology on 11 February 2022. All participants provided informed consent electronically before beginning the survey.

Results and findings

Figure 1 reveals that students constituted the majority of participants (78%), while academic staff made up 22% of the total sample. This distribution is appropriate given that students are the primary beneficiaries of blended learning models and are directly affected by issues of digital access and equity. Their larger representation in the study ensures that the findings reflect their experiences and perceptions accurately. The inclusion of academic staff, while smaller in proportion, adds valuable insight into the implementation side of blended learning. This balanced view helps to understand both sides of the teaching and learning process at Mangosuthu University of Technology (MUT).

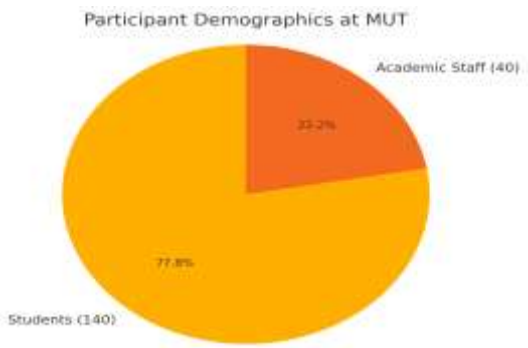

Figure 1: The graph represents the participants' demographics at mut.

Figure 2 highlights some of the key challenges faced by students in adapting to blended learning. The most significant issue is unstable internet access (45%), which is a critical barrier to consistent engagement in online learning environments. Additionally, 39% of students reported lacking personal devices, such as laptops or tablets, which further limits their ability to participate in digital classrooms, access course materials, or complete assessments. Perhaps more concerning is that only 35% of students felt confident using digital platforms independently. This suggests that even when access is available, a lack of digital skills or familiarity with online tools may reduce the effectiveness of blended learning. These findings point to a dual problem: infrastructural inadequacies and gaps in digital literacy, both of which need to be addressed to fully leverage blended learning as a strategy for educational equity and innovation.

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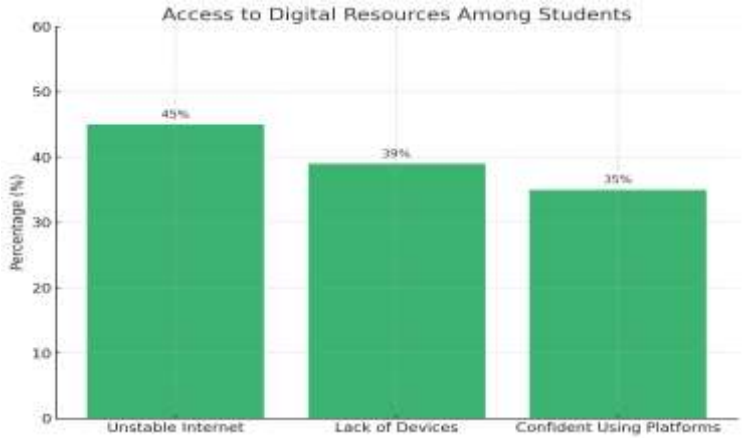

Figure 2: The graph represents access to digital resources among students at mut.

Figure 3 provides a visual summary of the key findings from the cross-sectional study on blended learning at Mangosuthu University of Technology (MUT). It highlights both the challenges and opportunities experienced by students and staff in engaging with digital education. A significant proportion of students (45%) reported having unstable internet access, while 39% indicated they lacked personal digital devices such as laptops or tablets. These results underscore the persistent infrastructural and socio-economic barriers that limit equitable participation in blended learning environments, particularly for students from disadvantaged backgrounds. Limited access to reliable connectivity and learning tools hampers students' ability to engage consistently with online components of their courses. Despite these challenges, the graph reveals that 68% of students found blended learning to help manage their academic workload. This suggests that the flexibility and accessibility of recorded lectures and online resources are valued, even among students facing technological limitations. However, only 35% of students felt confident using digital learning platforms without assistance. This finding points to the need for targeted digital literacy training to empower students with the necessary skills to navigate blended learning independently. From the staff perspective, approximately 60% acknowledged having limited training in implementing blended learning methodologies. This lack of professional development restricts the potential for innovative teaching and may hinder effective student engagement. The data depicted in the graph reflect a dual reality: while blended learning is recognized as a valuable tool for academic success and innovation, its effectiveness is heavily dependent on addressing the digital divide. Bridging this gap requires institutional support through improved infrastructure, affordable access to technology, and continuous capacity-building for both students and staff.

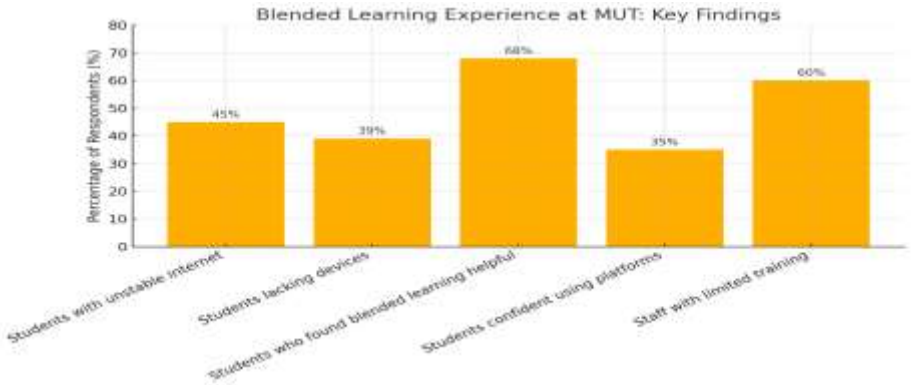

Figure 3: The graph represents the key findings of the blended learning experience at mut.

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Discussion

The findings from the cross-sectional study at Mangosuthu University of Technology (MUT) provide important insights into the current state of blended learning in a South African context, particularly in relation to digital equity and innovation. When compared with findings from other authors and regions, several parallels and differences emerge. At MUT, 45% of students reported unstable internet access, and 39% lacked personal digital devices. These results closely mirror the findings of Tadesse and Muluye (2020), who conducted a similar study in Ethiopian universities and found that over 50% of students struggled with connectivity and lacked devices. Similarly, Dhawan (2020) in India observed that the lack of technological access was a dominant barrier to effective blended learning, especially in rural areas. These comparisons reinforce that infrastructural challenges are a common issue across developing nations, and they continue to hinder the equitable rollout of digital learning. Despite access challenges, 68% of MUT students found blended learning beneficial in managing their studies. This aligns with Maringe and Sing (2021), who found that students at a South African university appreciated the flexibility and self-paced nature of blended learning. Means et al. (2013), in a large U.S.-based meta-analysis, also concluded that blended learning often yields better academic outcomes than either face-to-face or fully online learning alone, provided adequate support is available. The consistency across these studies suggests that blended learning is widely recognized as an effective pedagogical model when it is properly supported. Only 35% of MUT students reported confidence in using digital platforms independently. This figure is similar to the findings of Adarkwah (2021) in Ghana, where many students lacked the digital literacy needed to navigate online learning tools. In contrast, Owston et al. (2013) found that students in Canadian institutions exhibited high confidence levels, largely due to institutional investments in early digital education and training. The stark difference underscores the need for more structured digital literacy programs at institutions like MUT. From the staff perspective, 60% of MUT academic staff indicated limited training in blended learning methods. This is supported by Maphosa and Wadesango (2020), who found that educators in South African rural universities often lacked professional development opportunities in digital pedagogy.

However, Laurillard (2012) reported that in the United Kingdom, long-term investment in academic staff training had significantly improved blended learning delivery. These comparisons suggest that institutional readiness and capacity-building are critical factors that influence the successful implementation of digital education models. The findings from MUT align with other studies conducted in similar socio-economic contexts, confirming that digital exclusion, due to a lack of internet, devices, and digital skills, is a shared barrier across many developing countries. At the same time, the positive perceptions of blended learning's flexibility and potential for innovation are widely echoed in both developing and developed contexts. However, a clear contrast exists when comparing digital readiness between institutions like MUT and those in countries with more developed digital ecosystems. Bridging this gap will require targeted investments in infrastructure, training, and inclusive policies to ensure that blended learning truly advances digital equity across all levels of higher education.

Generalizability

Given its institutional focus and limited geographic scope, the findings of this study may not be fully generalizable to all South African or global higher education institutions. However, the challenges and opportunities identified, particularly around digital access, infrastructure, and staff capacity, are likely to be relevant to other institutions in similar low-resource or rural contexts. The methodology and outcomes may therefore provide a useful reference point for comparative studies or policy planning in institutions facing similar digital equity challenges.

Conclusion

The study revealed that while blended learning has the potential to enhance educational innovation and flexibility at Mangosuthu University of Technology (MUT), structural barriers such as limited internet access, lack of digital devices, and inadequate digital skills persist among a significant portion of the student population. Despite these challenges, a large number of students expressed positive views on the flexibility of blended learning, and academic staff acknowledged its potential to reach more learners. However, both groups emphasized the need for greater institutional support. These findings underscore the importance of addressing systemic inequalities in digital infrastructure and capacity if the full potential of blended learning is to be realized in higher education institutions serving under-resourced communities.

Limitations

This study is subject to several limitations. Firstly, the research was conducted at a single institution, which may limit the diversity of experiences captured. Secondly, data were self-reported, which may introduce response bias, particularly regarding perceived confidence and satisfaction with blended learning. Thirdly, while the survey included both students and staff, the study did not

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conduct in-depth interviews or focus groups that could have provided deeper qualitative insights into personal experiences and coping strategies. Lastly, the study was conducted during a specific post-pandemic period, which may not reflect long-term patterns in blended learning engagement.

Recommendations

Based on the study findings, it is recommended that MUT prioritize investment in improving digital infrastructure by providing access to affordable or subsidized internet and digital devices for students. Structured digital literacy programs should be introduced for both students and academic staff to build confidence in using digital platforms. Furthermore, regular training workshops on blended learning pedagogy should be made available to staff to enhance teaching innovation. Collaboration with external partners, such as telecommunications providers and technology companies, may also help reduce the digital divide. Finally, blended learning strategies must be co-designed with input from both students and staff to ensure they are inclusive, contextually relevant, and sustainable.

Biography

Dr. Sibonelo Thanda Mbanjwa is a dedicated lecturer in the Department of Nature Conservation at Mangosuthu University of Technology (MUT), South Africa. He holds a Ph.D. in Environmental Science and specializes in biodiversity conservation, sustainable development, and environmental education. Dr. Mbanjwa is deeply committed to community engagement, student mentorship, and the integration of indigenous knowledge systems into conservation practices. His work bridges academia and practical application, empowering students and communities through innovative teaching, research, and outreach initiatives.

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Competing interests

The authors have no relevant financial or non-financial interests to disclose.

Author contributions

I, the author, contributed to the study conception and design. Material preparation, data collection, and research were performed by Mbanjwa S.T. The first draft was written by Mbanjwa S.T.

Data availability

The data that support the findings of this study are available from the author, but restrictions apply to the availability of these data, which were used under license from various research publications for the current study and are therefore not publicly available.

Conflict of interest

The author declares no conflict of interest.

List of abbreviations

MUT – Mangosuthu University of Technology

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