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Educational Technology for Sustainable Development in SADC Higher Education: A Systematic Review

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ABSTRACT

Educational technology (EdTech) has emerged as a critical enabler of sustainable development in higher education, particularly within the Southern African Development Community (SADC) region, where innovative strategies are essential to address persistent socio-economic challenges. This study reviews the current practices and challenges associated with the adoption and implementation of EdTech in higher education institutions (HEIs) across the SADC region, with a particular focus on its contribution to achieving the Sustainable Development Goals (SDGs). Guided by the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) methodology, a total of 34 peer-reviewed studies published between 2020 and 2024 were selected from the Scopus and Web of Science databases, based on predefined inclusion criteria. The analysis combined bibliometric mapping using VOSviewer, keyword co-occurrence analysis, and qualitative thematic synthesis. The findings reveal an upward trend in EdTech research output, predominantly driven by South African institutions, with limited representation from other SADC countries. The reviewed studies highlight four current practices adopted by HEIs: strategic and policy-aligned integration of EdTech, blended learning implementation, capacity building among educators and students, and leveraging EdTech to promote inclusive access and sustainable education. However, HEIs continue to face substantial challenges, including infrastructural and financial constraints, limited digital literacy, inadequate institutional policies, and ethical concerns related to assessment integrity. These barriers hinder the sustainable integration of EdTech, particularly in rural-based institutions. The study recommends that policymakers strengthen investment in digital infrastructure, enhance professional development for staff and students, establish robust policy frameworks, and promote equity-driven approaches to EdTech integration.

Keywords: Educational Technology, SADC Region, Higher Education, Sustainable Development, Systematic Review.

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INTRODUCTION

The Southern African Development Community (SADC) has acknowledged the central role of education in advancing sustainable development across its member states, particularly through the strategic integration of educational technology (EdTech). This recognition is articulated in the SADC Education for Sustainable Development (ESD) Strategic Framework, which seeks to expand access to quality and relevant education while equipping citizens with the competencies needed to respond to the

region's developmental challenges.[1] Despite this forward-thinking vision, the region continues to grapple with persistent challenges in fully operationalising EdTech to support sustainable development.[2] Key barriers include inadequate digital infrastructure, disparities in technological proficiency, and limited investment in human and technological resources.[3] In response, SADC has launched various initiatives aimed at promoting digital literacy, expanding access to educational technologies, and encouraging innovation through multi-stakeholder collaboration and public-private partnerships.[4]

These challenges are compounded by entrenched educational disparities, particularly in rural and marginalised communities. Zickafoose et al. highlight that quality education remains unevenly distributed across the region, undermining the attainment of Sustainable Development Goal 4 (SDG 4).[5] EdTech, however, presents a viable mechanism to bridge these gaps by enabling remote access to learning content and supporting inclusive learning environments. The COVID-19 pandemic further underscored this potential, accelerating the digital transformation in many African higher education institutions (HEIs) and revealing both opportunities and shortcomings in existing educational systems.[6] Research suggests that the effective adoption of EdTech can mitigate urban-rural literacy divides,[7] narrow the digital divide, and build educators' digital competence across the SADC region.[8] Furthermore, educational technologies enable flexible learning models tailored to students' financial and contextual needs,[9] and support the delivery of critical subjects such as mathematics and science.[10] The United Nations recognises that in least-developed countries, EdTech is instrumental for broadening access and achieving the equity goals of SDG 4.[11] Given the growing policy support and emerging evidence of EdTech's transformative potential, it is imperative to investigate how SADC countries are leveraging these innovations to drive sustainable development.

Although research on EdTech integration in SADC is on the rise, there remains research gaps that needs to be addressed. For example, Jita and Sintema explored the use of ICT among pre-service teachers in Lesotho, South Africa and Zimbabwe.[12] Their findings revealed a significant difference in ICT competency among pre-service teachers, citing disparity in training and infrastructural development among the select SADC countries. Other researchers highlight the need for SADC nations to improve technological infrastructure, provision of training for educators and updating curriculum to meet the needs of the current digital economy.[13] These findings pinpoint the need for more research to be conducted on the role of EdTech in the SADC region. In light of these developments, this study seeks to address the following research questions:

1. What are the publication trends in the field of educational technology and sustainable development within the SADC region, with respect to publications trend, type, contributing countries and institutions?

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[1] SADC., "SADC Education for Sustainable Development Strategic Framework" (Southern African Development Community. , 2024).

[2] G. N., D. Shava et al., "Achieving Sustainable Development Goal (SDG) 4 on Quality in Education Challenges and Opportunities, Experiences from Southern African (SADC) Universities," *International Journal of Research & Innovation in Social Science (IJRISS)* 5, no. 7 (2021): 559–73.

[3] Martin Muduva et al., "Emerging Technologies in Governance: Insights from SADC Nations," *Information Technologist* 21, no. 2 (2024).

[4] SADC, "SADC Industrialization Strategy and Roadmap 2015–2063" (Gaborone, Botswana: Southern African Development Community, 2015), https://www.sadc.int/sites/default/files/2022-07/Repriting_Final_Strategy_for_translation_051015.pdf.

[5] Alexis Zickafoose et al., "Barriers and Challenges Affecting Quality Education (Sustainable Development Goal #4) in Sub-Saharan Africa by 2030," *Sustainability* 16, no. 7 (March 24, 2024): 2657, https://doi.org/10.3390/su16072657.

[6] Thulani Andrew Chauke, "Lifelong Learning among Students in the Context of COVID-19: A Case Study of the SADC Region," *Journal of Culture and Values in Education* 7, no. 2 (2024): 54–69.

[7] Muduva et al., "Emerging Technologies in Governance: Insights from SADC Nations."

[8] Mackenzie Ishmael Chibambo, "Employability and Open Education Resource Policies Development: Critical Reflections from Selected SADC Higher Education Institutions," *International Journal of Distance Education and E-Learning* 9, no. 2 (2024): 1–15.

[9] Thuthukile Jita and Edgar J Sintema, "Exploring Classroom Use of ICT among Pre-Service Science Teachers in Selected SADC Countries," *African Journal of Research in Mathematics, Science and Technology Education* 26, no. 3 (2022): 218–36.

[10] Jita and Sintema, "Exploring Classroom Use of ICT among Pre-Service Science Teachers in Selected SADC Countries."

[11] United Nations, "The Sustainable Development Goals Report 2023. ," *Https://Unstats.Un.Org/Sdgs/Report/2023/* (New York: United Nations, 2023).

[12] Jita and Sintema, "Exploring Classroom Use of ICT among Pre-Service Science Teachers in Selected SADC Countries."

[13] Lehlohonolo Kurata et al., "Integrating Educational Technology into Lesotho Secondary Religious Studies: A Conceptual Exploration of Practical Challenges and Opportunities," 2024.

2. What are the current practices in the adoption and implementation of educational technology across the SADC region?
3. What challenges do higher education institutions in the SADC region face in integrating educational technology to support sustainable development?

LITERATURE REVIEW

Introduction to Educational Technology and Sustainable Development

EdTech is a combination of computer hardware, software, and educational theory to enhance the teaching and learning process. According to the Association for Educational Communications and Technology (AECT), it involves "the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources."[14] In essence, EdTech includes not only digital tools, such as learning management systems (LMS), educational apps, and virtual classrooms, but also the underlying theoretical frameworks that guide their effective use in educational contexts. EdTech plays a pivotal role in enhancing the quality and accessibility of education, particularly within resource-constrained contexts. One of its core advantages lies in enabling personalised and adaptive learning, where students engage with content at their own pace, supported by real-time feedback and tailored digital tools.[15] This individualised approach supports differentiated instruction and improved learner outcomes. According to Guppy et al., EdTech expands access and flexibility, especially through online platforms and virtual classrooms, which proved essential during the COVID-19 pandemic in sustaining education across disrupted environments.[16]

Beyond educational access, EdTech contribute to learner engagement by integrating interactive features such as multimedia content, personalised learning, and self-assessment tools, advancing more dynamic learning experiences.[17] For educators, platforms such as LMSs and digital grading tools enhance instructional efficiency by streamlining administrative tasks. Moreover, through learning analytics, EdTech offer actionable insights into student performance, facilitating data-informed teaching and timely interventions. EdTech also supports lifelong learning, providing micro-learning and asynchronous opportunities that extend education beyond traditional classroom settings.[18] Within the SADC context, EdTech has the potential to mitigate regional disparities by reaching marginalised populations, strengthening educator capacity, and enhancing the system's resilience to external shocks. Its alignment with SDGs stresses its strategic relevance in promoting inclusive, equitable, and quality education across the region.

The Current Landscape of Educational Technology in SADC Higher Education

The integration of EdTech within higher education is increasingly recognised as a vital pathway for promoting sustainable development, particularly in developing economies. According to Animashaun, Familoni, and Onyebuchi, the implementation of EdTech solutions in emerging markets offers scalable and cost-effective mechanisms to expand access, enhance instructional quality, and foster innovation in higher education.[19] EdTech represents not merely a supplement to traditional pedagogy but a transformative instrument aligned with the broader agenda of sustainable development.[20] In this regard,

[14] AECT Connected Community., "What Is ChatGPT and How Is It Used? ," Southern Regional DLG Community of Practice. , n.d.
[15] Neil Guppy et al., "The Post-COVID-19 Future of Digital Learning in Higher Education: Views from Educators, Students, and Other Professionals in Six Countries," *British Journal of Educational Technology* 53, no. 6 (2022): 1750–65.
[16] Guppy et al., "The Post-COVID-19 Future of Digital Learning in Higher Education: Views from Educators, Students, and Other Professionals in Six Countries."
[17] Oyebola Olusola Ayeni et al., "AI in Education: A Review of Personalized Learning and Educational Technology," *GSC Advanced Research and Reviews* 18, no. 2 (2024): 261–71.
[18] Loso Judijanto, "Exploring the Role of Microlearning in Lifelong Learning: A Bibliometric Review," *The Eastasouth Journal of Learning and Educations* 3, no. 01 (2025): 42–55.
[19] Enitan Shukurat Animashaun, Babajide Tolulope Familoni, and Nneamaka Chisom Onyebuchi, "Implementing Educational Technology Solutions for Sustainable Development in Emerging Markets," *International Journal of Applied Research in Social Sciences* 6, no. 6 (2024): 1158–68.
[20] Animashaun, Familoni, and Onyebuchi, "Implementing Educational Technology Solutions for Sustainable Development in Emerging Markets."

smart learning, characterised by personalised, data-driven, and technology-enhanced instruction, emerges as a critical paradigm for achieving the United Nations SDGs, particularly in education.

Makinde, Ajani, and Abdulrahman contend that smart learning environments enable more effective knowledge acquisition and learner engagement, contributing to long-term development outcomes.[21] Moreover, EdTech plays a significant role in advancing SDG 4, which focuses on inclusive and equitable quality education. Costa et al. highlight that EdTech facilitates access to education, improves learning outcomes, and supports teacher development, all of which are fundamental components of SDG 4.[22] The SADC ESD strategic framework highlights how the COVID-19 pandemic exposed both potential and limitations of EdTech in reaffirming the need for robust digital infrastructure and educator training.[23] The framework notes the essential role of internet-based learning in expanding technology-enabled learning across the region. Furthermore, the framework reinforces SDG 4's principle of "no learner left behind," highlighting the need to support disadvantaged groups to ensure equitable access. Embedding EdTech ensures sustainable development through digital platforms emphasising digital literacy which is directly linked to SDG 4.4 (ICT skills for employment). The ESD framework aligns with the SADC Regional Indicative Strategic Development Plan, underlining a coordinated approach to integrate EdTech into broader development goals. Figure 1 presents the map of SADC member states.

Figure 1: SADC member states[24]

[21] Semiu Olwale Makinde and Yusuf Ayodele Ajani, "Smart Learning as Transformative Impact of Technology: A Paradigm for Accomplishing Sustainable Development Goals (SDGs) in Education," *Indonesian Journal of Educational Research and Technology* 4, no. 3 (2024): 213–24.

[22] Ana Carolina Ferreira Costa et al., "Toward Quality Education: Contributions of EdTech to the Achievement of the Fourth United Nations Sustainable Development Goal," *Sustainable Development* 32, no. 3 (2024): 1634–51.

[23] SADC, "SADC Education for Sustainable Development Strategic Framework."

[24] Southern African Development Community (SADC). 2025. *Member States.*

METHODOLOGY

This study utilised the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) to analyse studies regarding the integration of EdTech among HEIs in the SADC region. The study analysed two databases; namely; Scopus and Web of Science. These databases were chosen for their collection of quality and credible of peer-reviewed studies in the EdTech field. Moreover, these databases were chosen to ensure the review of high-quality studies relevant in this research field. The initial search generated 2 257 studies from the selected databases (see Figure 2 depicting the PRISMA flow diagram). The documents were screened to exclude duplicates and irrelevant records which did not discuss EdTech integration in the SADC higher educational context.

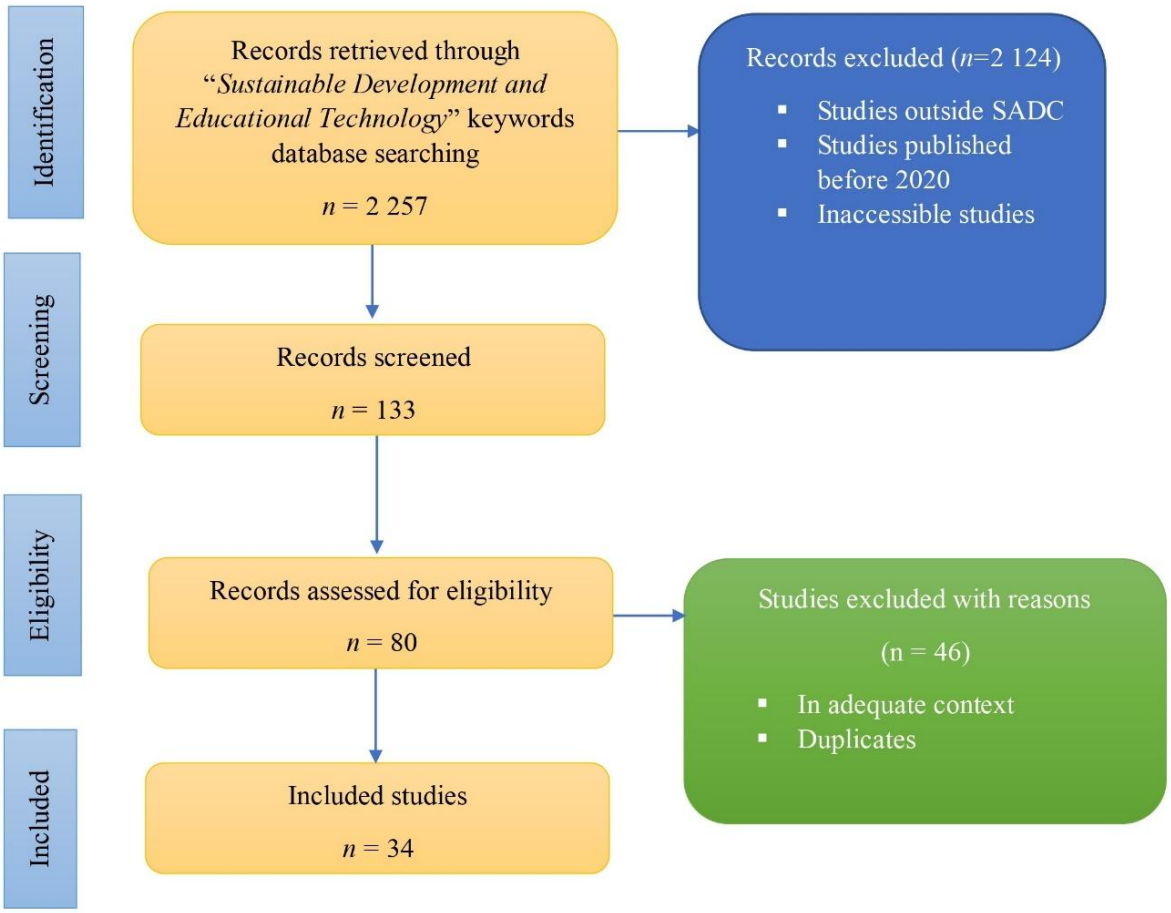

Figure 2: PRISMA diagram illustrating the studies selected for systematic review

The initial database search of the studies under review was carried out on 16 November 2024 and focused on studies published between January 2020 to 16 November 2024. The study used the following search strings to search for the relevant studies for review; *"Educational technology and sustainable development', "Educational technology and education", "Educational technology and higher education", "Educational technology and sustainability", "EdTech and Sustainability", "EdTech and higher education", and 'Educational technology and SADC higher education".* Moreover, studies conducted in Africa but outside the SADC region were excluded. The studies comprised of articles and conference papers. Table 1 shows the search parameters applied in this study.

Table 1: Search parameters

	Scopus	**Web of Science**
Search Strategy	Studies that discussed educational technology adoption in SADC higher education	
Search Period	2020-2024	2020-2024
Publication Types	Articles and conference papers	Articles and conference papers

The dataset comprising the studies under review was downloaded from the two academic databases and imported into Zotero for further processing. Zotero was used to screen articles, identify and remove duplicates, and extract relevant metadata for analysis. To address Research Question 1, Microsoft Excel and R were employed to visualise key bibliometric indicators, including publication trends, document types, and the most prolific authors and institutions. Additionally, VOSviewer was utilised to conduct keyword co-occurrence and strength analysis, providing insights into the thematic focus and emerging trends in EdTech adoption among higher education institutions in the SADC region.

PRESENTATION OF FINDINGS

The findings of this SLR are presented in two phases as follows: First, we present the findings in accordance with the formulated research questions; Second, we present the analysis from the VOSviewer program on keyword occurrence in this research field.

RQ1: What are the publication trends in the field of educational technology and sustainable development within the SADC region, with respect to publication trends, type, contributing countries and institutions?

1. Publication trend

Figure 3 illustrates the publication trend on EdTech integration in higher education within the SADC region from 2020 to 2024. The trend reveals notable fluctuations over the five-year period. In 2020, six publications were recorded, followed by a sharp decline to just two in 2021, likely reflecting disruptions caused by the COVID-19 pandemic and its impact on academic productivity. However, there was a substantial rebound in 2022, with publications rising steeply to eight, indicating a renewed research interest, possibly fuelled by the pandemic-driven shift to digital learning approaches.

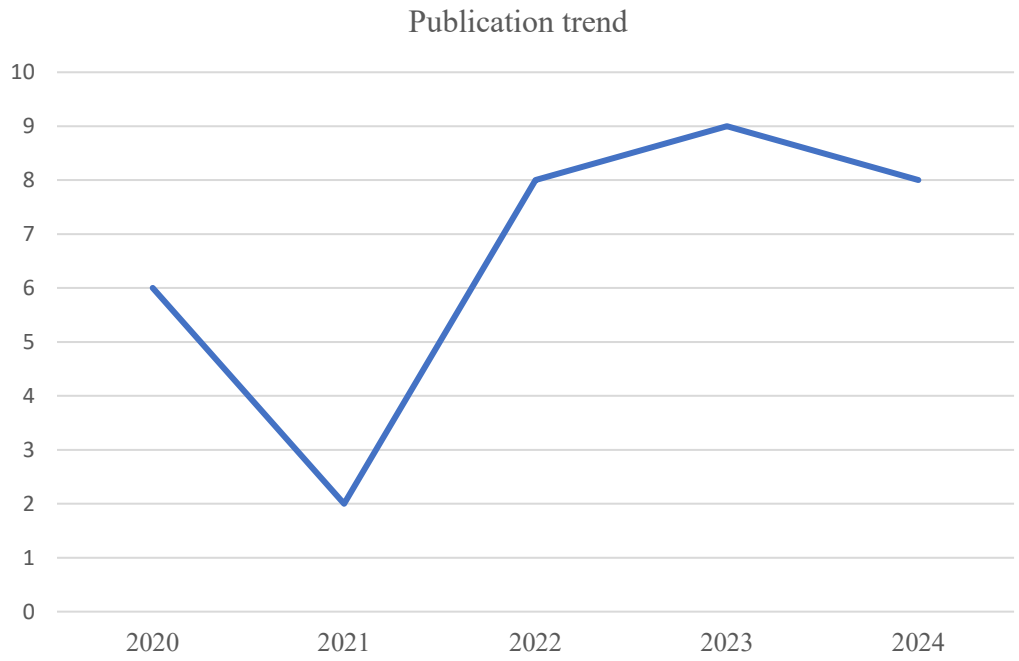

Figure 3: Publication trend (2020-2024)

The upward trajectory continued modestly into 2023, peaking at nine publications. In 2024, there was a slight dip to eight publications, suggesting a stabilisation of research outputs in this domain. Overall, the data indicate a growing scholarly engagement with EdTech in SADC higher education, reflecting the region's increasing prioritisation of digital transformation to support SDGs.

2. Document type

The findings of this SLR highlight a notable distribution of publication types in the domain of EdTech adoption for sustainable development within the SADC region (see Figure 4). The analysis reveals that the majority of publications are articles, comprising 76.4% of the total publications reviewed. This dominance indicates that much of the scholarly focus in this field is on empirical studies and original research, which serve as the foundation for advancing knowledge and providing evidence-based insights.

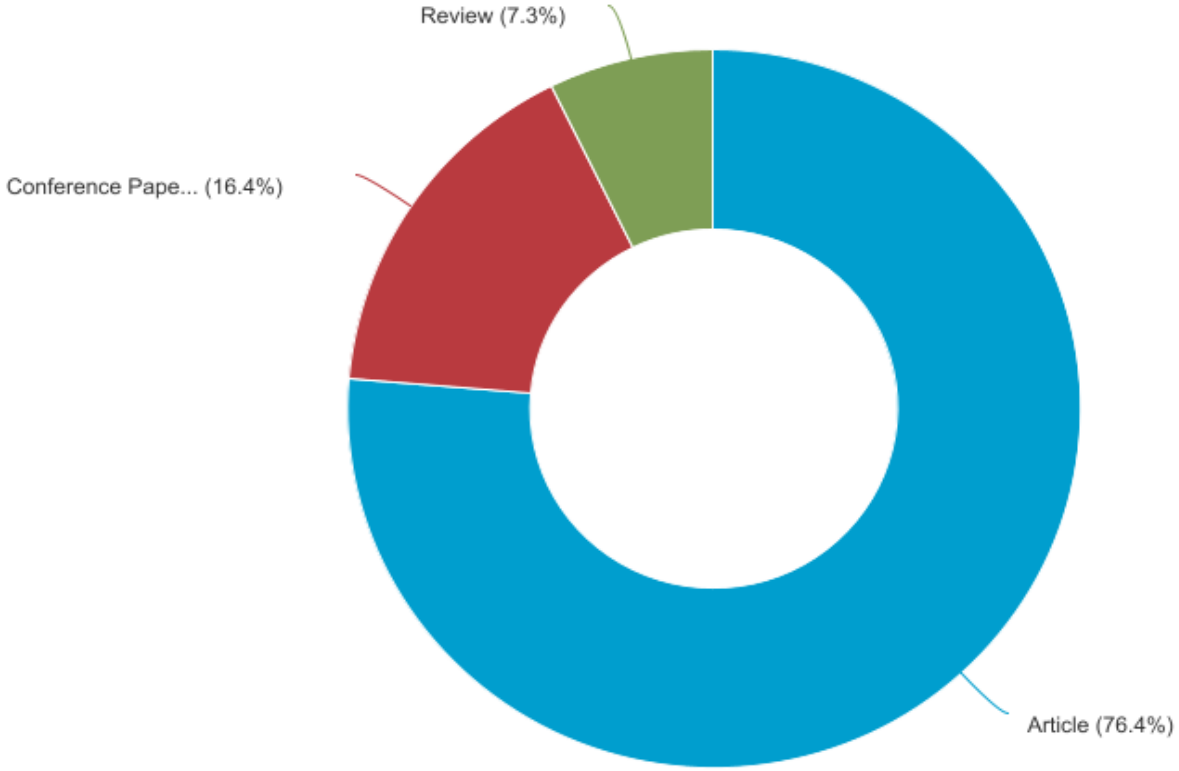

Figure 4: Distribution of publication types

Conference papers represent the second-largest category, accounting for 16.4% of the publications. This indicates the role of academic conferences as platforms for the dissemination of emerging research and technological innovations and promoting critical dialogue and collaboration among researchers and relevant stakeholders. In contrast, review articles constitute the smallest proportion at 7.3%. Although limited in quantity, review articles provide valuable synthesised insights, consolidating existing knowledge and identifying research gaps that could guide future investigations. The publication distribution signifies the importance of promoting diverse publication outputs to balance empirical studies with critical reviews and conference proceedings.

3. Contributing countries and institutions

Table 2 illustrates the top publications by country and institutions of the studies under review. The analysis reveals a notable concentration of scholarly contributions from South African higher education institutions, with the University of Johannesburg leading at 11 publications, followed by the University of South Africa (6) and the University of Pretoria (5). In total, six of the top ten contributing institutions are based in South Africa, highlighting the country's dominant role in shaping research on EdTech and sustainable development in the region. Other contributions come from Tanzania, represented by Mzumbe University and the University of Dar es Salaam and Uganda's Kampala International University, indicating limited but emerging engagement in this field.

Table 2: Publication by affiliation and country

	Institution	Country	Publication count
1	University of Johannesburg	South Africa	11
2	University of South Africa	South Africa	6
3	University of Pretoria	South Africa	5
4	University of KwaZulu-Natal	South Africa	4
5	Mzumbe University	Tanzania	3
6	University of the Free State	South Africa	2
7	University of the Witwatersrand	South Africa	2
8	Rhodes University	South Africa	2
9	University of Dar es Salaam	Tanzania	2
10	Kampala International University	Uganda	2

The lack of representation from the majority of SADC member states, including Angola, Botswana, Malawi, Namibia, and Zimbabwe, signifies a significant research gap, which highlights broader inequalities. This geographic imbalance limits the diversity of insights and may hinder the sustainable development of EdTech strategies in the SADC context. As such, there is a need to promote inclusive knowledge production to strengthen research capacity and collaboration across underrepresented SADC countries through increased funding, institutional support, and regional research partnerships.

RQ 2: What are the current practices in the adoption and implementation of educational technology across the SADC region?

To structure and synthesize the key findings from the reviewed studies, the study employed the PRISMA guidelines as a systematic framework for thematic analysis. Following the identification and selection of full-text articles, the documents were imported into Atlas.ti for qualitative coding. An inductive approach was used to guide the development of themes, beginning with a detailed exploration of current practices in the adoption and implementation of educational technology within SADC higher education institutions. This initial phase yielded five core themes. The second phase focused on identifying the key challenges confronting these institutions in leveraging educational technology to achieve sustainable development, from which four major themes were derived.

The coding process facilitated the efficient identification of recurring concepts across studies, enabling the clustering of similar codes and the use of memoing to support early-stage theme development. These codes were then categorised based on conceptual similarity, allowing for the emergence of broader themes through the identification of recurrent patterns and relationships. To enhance our analysis, Microsoft Excel was employed to map the frequency and distribution of codes and categories across the dataset. A cross-referenced matrix was developed to link individual studies with their respective codes and thematic categories. Excel further supported comparative analysis across studies and enabled the consolidation of overlapping categories into more robust thematic clusters. Ultimately, five themes were established regarding current EdTech adoption practices, while four themes captured the principal challenges facing SADC higher education institutions in their digital integration efforts.

The study examined the themes related to current practices in the adoption of EdTech within HEIs across the SADC region. Table 3 presents these practices, highlighting how HEIs are integrating and adopting EdTech to promote sustainability. The findings from the reviewed studies indicate that EdTech has been implemented through strategic and policy-driven initiatives, the adoption of blended learning approaches, capacity building for both educators and students, the use of online assessments, and the deployment of EdTech to improve access to education and advance progress towards the SDGs.

Table 3: Current practices of EdTech adoption in SADC higher education

Theme	Sample insights	Studies Reviewed
Strategic and policy-driven integration	▪ EdTech is perceived as a key driver of system-wide integration ▪ HEIs embed EdTech into broader digitalisation strategies encompassing tools like the Education Management Information System (EMIS) ▪ EdTech is not only viewed as a teaching tool but as part of institutional governance and quality assurance systems ▪ Scholars identified policy reforms as a significant means of addressing gender imbalances in the STEM field through EdTech ▪ EdTech and ICT skills are important for youth employability, prompting HEIs to implement EdTech to foster learning and prepare graduates	Alo and Brik[25] Anbaroglu et al.[26] Cloete and Ndlovu[27] Lasekan et al.[28] Ncube and Ngulube[29]
Adopting blended learning as a predominant delivery model	▪ Blended learning (an approach that combines face-to-face and digital instruction) has emerged as the most prevalent EdTech implementation among HEIs across SADC ▪ HEIs in SADC have used platforms such as Brightspace, Moodle and Sakai to facilitate blended learning ▪ The integration of blended learning remains superficial, often limited to content dissemination rather than transformative pedagogy ▪ Students from HEIs in Kenya, South Africa and Germany collectively developed four digital teaching and learning resources to enable blended learning in cognitive geomatics ▪ The integration of EdTech among low Human Development Index (HDI) countries such as Zambia, South Africa and Kenya could enhance their participation in the global knowledge economy ▪ EdTech integration could enhance sustainability in the engineering curriculum through blended learning approaches	Ramaila and Mavuru[30] Mosako[31] Schaab, et al.[32] Ramoroka[33]

[25] Abiodun Alao and Roelien Brink, "Strategies for Using ICT Skills in Educational Systems for Sustainable Youth Employability in South Africa," *Sustainability* 14, no. 24 (December 9, 2022): 16513, https://doi.org/10.3390/su142416513.

[26] B. Anbaroğlu et al., "Educational Material Development On Mobile Spatial Data Collection Using Open Source Geospatial Technologies," *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences* XLIII-B4-2020 (August 24, 2020): 221–27, https://doi.org/10.5194/isprs-archives-XLIII-B4-2020-221-2020.

[27] Gerald Cloete and Joram Ndlovu, "The Future of Sustainable Tourism Education in the Digital Transformation Age beyond COVID-19 in Namibia," *African Journal of Hospitality, Tourism and Leisure* 12, no. 5SE (2023): 1668–82.

[28] Olusiji Adebola Lasekan et al., "Fostering Sustainable Female Participation in STEM Through Ecological Systems Theory: A Comparative Study in Three African Countries," *Sustainability* 16, no. 21 (November 2, 2024): 9560, https://doi.org/10.3390/su16219560.

[29] Mthokozisi Masumbika Ncube and Patrick Ngulube, "A Systematic Review of Postgraduate Programmes Concerning Ethical Imperatives of Data Privacy in Sustainable Educational Data Analytics," *Sustainability* 16, no. 15 (July 25, 2024): 6377, https://doi.org/10.3390/su16156377.

[30] Sam Ramaila and Lydia Mavuru, "Postgraduate Science Students' Impressions and Experiences of Online Pedagogical Practices: Implications for Technology-Enhanced Pedagogy," *International Journal of Learning, Teaching and Educational Research* 22, no. 1 (January 30, 2022): 112–28, https://doi.org/10.26803/ijlter.22.1.7.

[31] D.R. Mosako, "Implementation of Museum Educational Strategies through Information Communication Technology: Building on the Global Sustainable Development Goal 4," *South African Museums Association Bulletin* 44, no. 1 (2022): 29–37.

[32] Gertrud Schaab et al., "Developing Teaching/Learning Materials on 'Sense of Place' with Students in an International University Cooperation: Overall Approach and First Phase Outcomes at Karlsruhe University of Applied Sciences," *International Journal of Cartography* 9, no. 3 (September 2, 2023): 525–40, https://doi.org/10.1080/23729333.2023.2224487.

[33] Tlou Millicent Ramoroka, "Prospects of Successful Blended Pedagogies in South Africa: Planning, Governance and Infrastructure Considerations," *Development Southern Africa* 38, no. 5 (September 3, 2021): 799–815, https://doi.org/10.1080/0376835X.2021.1929079.

Capacity building and digital competency development	▪ HEIs initiated training programmes to enhance staff digital literacy to foster EdTech integration. ▪ The surge of EdTech adoption among HEIs across the region has enabled capacity development among academic staff. ▪ Numerous HEIs have realised the need for digital training and therefore implemented a professional development framework aligned with curriculum design. ▪ Due to EdTech integration being tied to staff competency, initiatives for professional development are fostered	Dhurumraj et al.[34] Cloete and Ndlovu[35]
Content creation and online assessment adoption	▪ EdTech contributes to the growing momentum on the localization of educational resources and equity focused strategies. ▪ HEIs have adopted Open Educational Resources (OERs) that reflect local cultural and linguistic realities through EdTech initiatives. ▪ The COVID-19 pandemic accelerated the adoption of online exams, automated grading systems and digital tools to create learning resources. ▪ The use of EdTech for online assessments has highlighted areas of improvement to enhance integration.	Maphosa et al.[36] Macheka[37] Nadioo and Reddy[38]
Using EdTech to enhance access to education and SDGs	▪ EdTech directly contributes towards sustainability initiatives ▪ Through the ESD framework, EdTech can be used to develop geotrails and boost sustainability in tourism ▪ Smart-health applications (EdTech initiative) can improve health literacy and align with SDG 3 and 10 ▪ EdTech plays a critical role in advancing sustainability across interconnected domains, including health, education and tourism. ▪ Several studies emphasize the role of EdTech in improving access to quality education (SDG4), especially in underdeveloped countries. ▪ Through EdTech, frameworks such as the Centralised Education Management Information System could address inefficiencies in rural educational settings, and thereby providing access to quality education.	Chigombe[39] Coetzer and Grobbelaar[40] Nadioo and Reddy[41] Mosako[42] Mafenya[43]

[34] Thasmai Dhurumraj et al., "Broadening Educational Pathways To Stem Education Through Online Teaching And Learning During Covid-19: Teachers' Perspectives," *Journal of Baltic Science Education* 19, no. 6A (December 30, 2020): 1055–67, https://doi.org/10.33225/jbse/20.19.1055.

[35] Cloete and Ndlovu, "The Future of Sustainable Tourism Education in the Digital Transformation Age beyond COVID-19 in Namibia."

[36] Vusumuzi Maphosa, Bekithemba Dube, and Thuthukile Jita, "Sustainable Information and Learning Access at a Rural University in Zimbabwe through a Mobile Application," *International Journal of Information and Education Technology* 11, no. 2 (2021): 82–87, https://doi.org/10.18178/ijiet.2021.11.2.1493.

[37] Mavis Thokozile Macheka, "COVID-19 and Social Inequality: Lessons from a Higher and Tertiary Education Institution in Zimbabwe," *Cogent Education* 10, no. 2 (December 11, 2023), https://doi.org/10.1080/2331186X.2023.2272828.

[38] Jayaluxmi Naidoo and Sarasvathie Reddy, "Embedding Sustainable Mathematics Higher Education in the Fourth Industrial Revolution Era Post-COVID-19: Exploring Technology-Based Teaching Methods," *Sustainability* 15, no. 12 (June 16, 2023): 9692, https://doi.org/10.3390/su15129692.

[39] Wisemen Chingombe, "A Framework for Evaluating Geotrails for Education and Geotourism.," 2024.

[40] Jeanne Coetzer and Leon Grobbelaar, "Adopting Smart-Health Care Applications for a Rural Community: A Comparison Between Affective and Anthropomorphic Design Principles," 2024, 195–208, https://doi.org/10.1007/978-3-031-52303-8_15.

[41] Naidoo and Reddy, "Embedding Sustainable Mathematics Higher Education in the Fourth Industrial Revolution Era Post-COVID-19: Exploring Technology-Based Teaching Methods."

[42] Mosako, "Implementation of Museum Educational Strategies through Information Communication Technology: Building on the Global Sustainable Development Goal 4."

[43] Nkhangweleni Patrick Mafenya, "Exploring Technology as Enabler for Sustainable Teaching and Learning during Covid-19 at a University in South Africa," *Perspectives in Education* 40, no. 3 (September 30, 2022): 212–23, https://doi.org/10.18820/2519593X/pie.v40.i3.14.

As indicated in Table 3, institutions of higher learning in the region have implemented EdTech to promote sustainable education in various approaches. These approaches can help bridge the gap in educational access between SADC countries and other developed countries outside Africa.

RQ 3: What challenges do higher education institutions in the SADC region face in integrating educational technology to support sustainable development?

Table 4 presents the thematic analysis of the challenges faced by HEIs in the adoption of EdTech across the SADC region. While EdTech offers considerable opportunities, the studies reviewed highlight persistent infrastructural and financial constraints, particularly affecting HEIs located in rural areas. These institutions often rely heavily on donor funding to support EdTech initiatives, which raises concerns about sustainability. A further significant barrier is the limited digital literacy and training among both educators and students. Without adequate capacity building, the effective integration of EdTech remains limited, thereby diminishing its potential benefits across the higher education sector. Ethical concerns also emerge, particularly regarding academic integrity during digital assessments, as the absence of robust invigilation mechanisms may lead to increased instances of dishonest practices. Additionally, the lack of comprehensive institutional policies and the presence of equity-related barriers hinder inclusive access and reduce the overall effectiveness of EdTech adoption in the region.

Table 4: Challenges related to EdTech adoption in SADC higher education

Theme	Sample insights	Studies Reviewed
Infrastructural and financial constraints	▪ There remains a significant gap in EdTech use among students living in urban areas compared to those in peri-urban and rural areas due to poor access to ICT. ▪ HEIs in the region lack digital infrastructure to accommodate students with disability such as visual impairments. ▪ Scholars highlight the importance of teaching professional ethics when integrating EdTech in the post-digital era. ▪ EdTech adoption in the region is characterised by insufficient institutional funding and support for these tools. ▪ The COVID-19-induced shift to online learning exposed technological exclusion barriers, such as a lack of access to devices and internet connectivity. ▪ EdTech integration is hindered by context-specific infrastructural constraints	Lambani et al.[44] Kisanga and Kisanga[45] Awodiji and Katjiteo[46] Uleanya[47] Noorbhai et al.[48] Hoffmann et al.[49]
Limited digital literacy	▪ HEIs in urban areas are often prioritised and given preference ▪ EdTech implementation strategy remains unsustainable and misaligned with the realities of developing countries.	Lambani et al.[50]

[44] 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.

[45] Sarah E. Kisanga and Dalton H. Kisanga, "The Role of Assistive Technology Devices in Fostering the Participation and Learning of Students with Visual Impairment in Higher Education Institutions in Tanzania," *Disability and Rehabilitation: Assistive Technology* 17, no. 7 (October 3, 2022): 791–800, https://doi.org/10.1080/17483107.2020.1817989.

[46] Omotayo Adewale Awodiji and Ancia Katjiteo, "Sustainable Teaching Professional Ethics in the Post-Digital Era," *OIDA International Journal of Sustainable Development* 16, no. 12 (2023): 33–40.

[47] Chinaza Uleanya, "Reconceptualising Disabilities and Inclusivity for the Postdigital Era: Recommendations to Educational Leaders," *Education Sciences* 13, no. 1 (January 3, 2023): 51, https://doi.org/10.3390/educsci13010051.

[48] Habib Noorbhai, Danica Sims, and Nadia Hartman, "Multi-Disciplinary Staff Perspectives and Consensus on e-Learning and MHealth for Health Sciences Curricula," *Higher Education Research & Development* 43, no. 3 (April 2, 2024): 620–39, https://doi.org/10.1080/07294360.2024.2325149.

[49] Caitlin Hoffman et al., "Future Directions for Global Clinical Neurosurgical Training: Challenges and Opportunities," *World Neurosurgery* 166 (October 2022): e404–18, https://doi.org/10.1016/j.wneu.2022.07.030.

[50] Lembani et al., "The Same Course, Different Access: The Digital Divide between Urban and Rural Distance Education Students in South Africa."

among academic staff and students	▪ EdTech integration is highly influenced by global paradigms, overlooking contextual challenges pertinent in the SADC region ▪ The effective adoption of online pedagogical strategies by postgraduate science teachers in HEIs in the region is significantly hindered by insufficient professional development ▪ Other scholars highlight ongoing challenges such as user readiness and pedagogical adaptation	Ramoroka[51] Ramaila and Mavuru[52] Rosenberg and Kotschy[53] Naidoo and Reddy[54]
Ethical challenges in assessment and academic integrity	▪ There are ethical imperatives of EdTech adoption for sustainable education ▪ There is a need for an ethical framework in managing EdTech integration in higher education ▪ Privacy and security concerns are highlighted as significant challenges when integrating EdTech	Ncube and Ngulube[55] Awodiji and Katjiteo[56] Masina[57]
Inadequate policies and equity-based barriers	▪ The sustainable integration in HEIs is challenged by weak policy frameworks, insufficient capacity-building efforts, and limited reward structures. ▪ EdTech remains limited to a few countries and institutions, with many of its purported soft-skill benefits predating the paradigm itself. ▪ There remain gender disparities, especially among females, in the STEM field regarding EdTech integration. ▪ Other scholars have identified cross-cultural barriers when implementing EdTech among HEIs in the region.	Landa et al.[58] Chaka[59] Abdullahi and Chimbo[60] Schaab et al.[61]

VOSviewer analysis

Figures 5A and 5B illustrate the keyword co-occurrence and density visualisations generated through VOSviewer (www.vosviewer.com) to identify key themes in the literature on EdTech and sustainable development within SADC higher education. A threshold of a minimum of five occurrences per keyword was applied, resulting in 12 prominent keywords. Figure 4A shows the network visualisation where keywords are grouped into clusters based on their co-occurrence patterns. The most central and strongly connected terms include "sustainable development," "sustainability," "students," and "higher

[51] Ramoroka, "Prospects of Successful Blended Pedagogies in South Africa: Planning, Governance and Infrastructure Considerations."
[52] Ramaila and Mavuru, "Postgraduate Science Students' Impressions and Experiences of Online Pedagogical Practices: Implications for Technology-Enhanced Pedagogy."
[53] Eureta Rosenberg and Karen Kotschy, "Monitoring and Evaluation in a Changing World: A Southern African Perspective on the Skills Needed for a New Approach," *African Evaluation Journal* 8, no. 1 (October 23, 2020), https://doi.org/10.4102/aej.v8i1.472.
[54] Naidoo and Reddy, "Embedding Sustainable Mathematics Higher Education in the Fourth Industrial Revolution Era Post-COVID-19: Exploring Technology-Based Teaching Methods."
[55] Ncube and Ngulube, "A Systematic Review of Postgraduate Programmes Concerning Ethical Imperatives of Data Privacy in Sustainable Educational Data Analytics."
[56] Awodiji and Katjiteo, "Sustainable Teaching Professional Ethics in the Post-Digital Era."
[57] Rumbidzayi Masina, "Integration of Sustainable Development Goals in the Textile Science, Apparel Design, and Technology Programs in Zimbabwean Universities," *Journal of Adult and Continuing Education* 31, no. 1 (March 19, 2025): 265–84, https://doi.org/10.1177/14779714241264972.
[58] Elizabeth Landa et al., "Reinforcement Measures for Sustaining the Integration of Innovative Teaching and Learning Technologies in Selected Tanzanian Universities," *European Conference on E-Learning* 21, no. 1 (October 21, 2022): 208–14, https://doi.org/10.34190/ecel.21.1.530.
[59] Chaka Chaka, "Is Education 4.0 a Sufficient Innovative, and Disruptive Educational Trend to Promote Sustainable Open Education for Higher Education Institutions? A Review of Literature Trends," *Frontiers in Education* 7 (April 28, 2022), https://doi.org/10.3389/feduc.2022.824976.
[60] Aisha M. Abdullahi and Bester Chimbo, "Co-Designing a Framework for a Persuasive Educational Technology Tool for Motivating Female Students for Enrolment into Science, Technology, Engineering and Mathematics Disciplines," *The Journal for Transdisciplinary Research in Southern Africa* 19, no. 1 (July 11, 2023), https://doi.org/10.4102/td.v19i1.1349.
[61] Schaab et al., "Developing Teaching/Learning Materials on 'Sense of Place' with Students in an International University Cooperation: Overall Approach and First Phase Outcomes at Karlsruhe University of Applied Sciences."

education." These connections suggest a central focus on aligning educational technology with sustainability goals, particularly in the context of student learning and institutional practices.

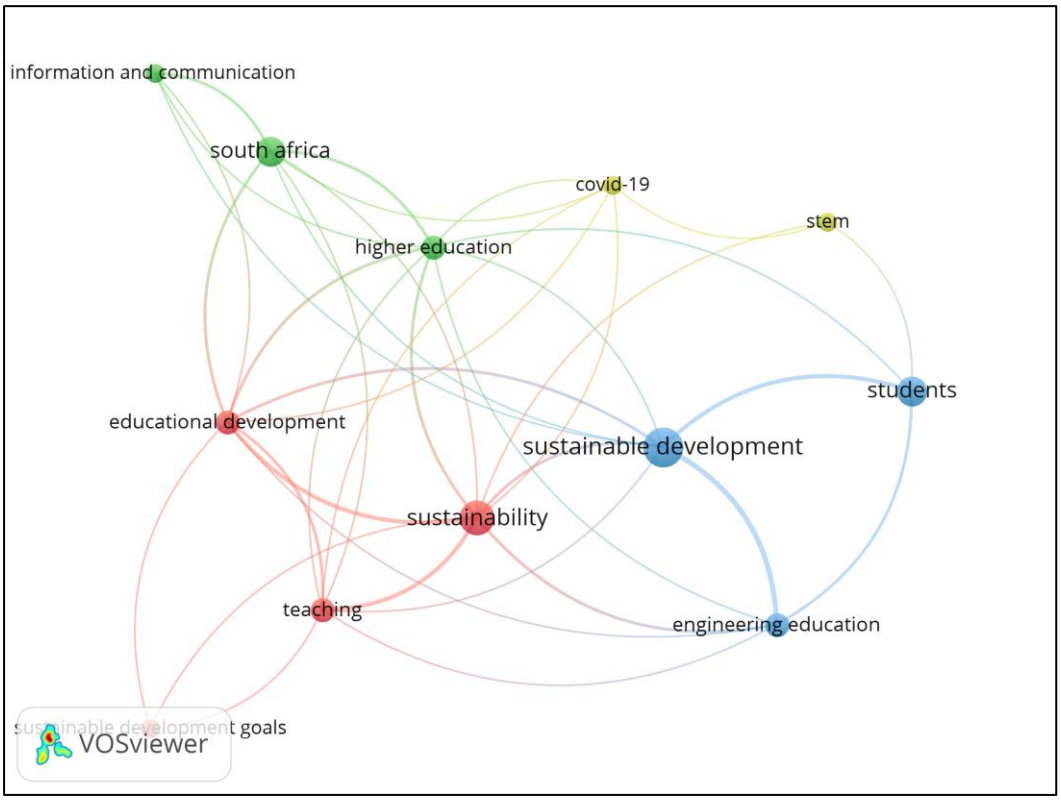

Figure 5A: Keyword Co-occurrence Network Map

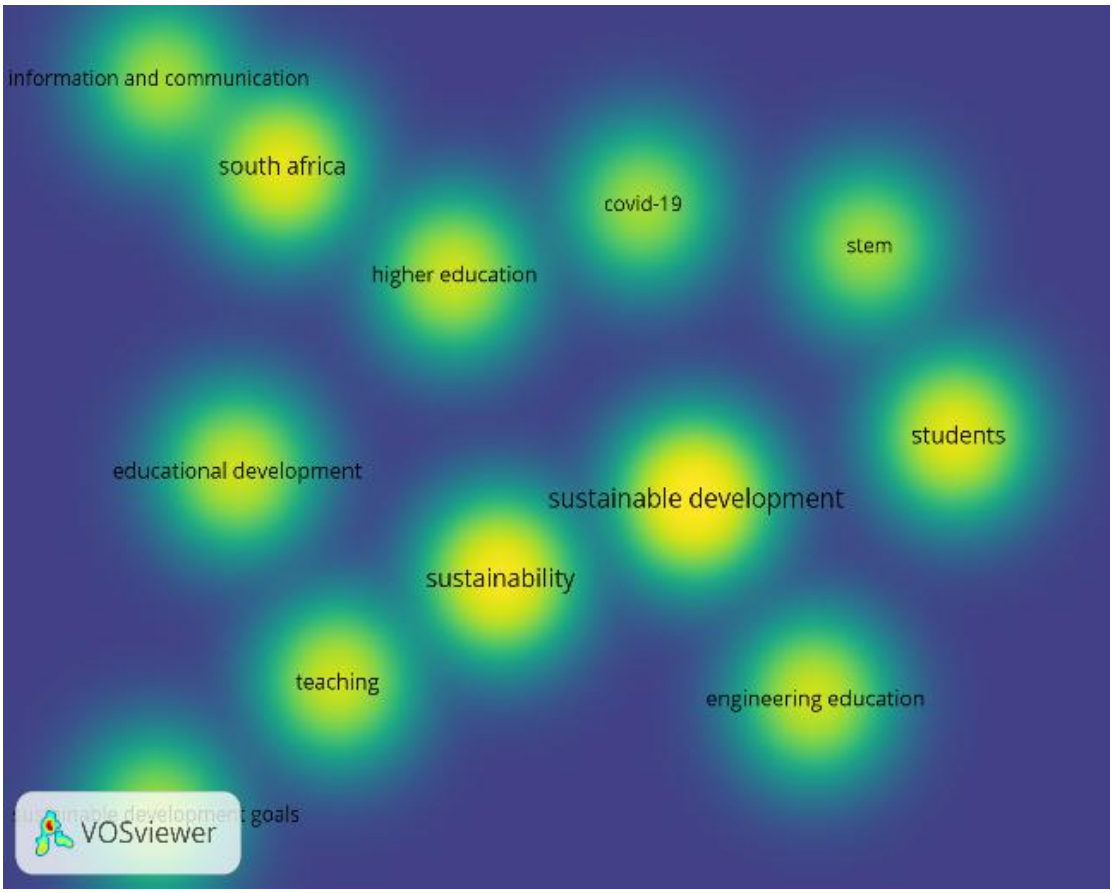

Figure 5B: Keyword Density Map

The visualisation further reveals meaningful associations between "educational development," "teaching," and "information and communication," suggesting that EdTech is often conceptualised within the broader goals of pedagogy and digital communication infrastructures. The term "South Africa" also emerges as a highly frequent keyword, reflecting the country's leading role in the region's research output on EdTech and sustainability. Additionally, clusters involving "STEM," "engineering education," and "COVID-19" highlight contextual factors shaping EdTech integration. The presence of "COVID-19" in the network indicates the pandemic's significant role in accelerating the adoption of EdTech as a necessity rather than a luxury.

Figure 5B displays the density visualisation, which provides a heat map indicating the intensity of keyword occurrences. Brighter yellow areas represent higher keyword frequency and stronger research attention. "Sustainable development," "sustainability," and "students" appear as the most saturated regions, confirming their dominance in the current scholarly discourse. The surrounding terms such as "higher education," "educational development," and "South Africa" appear with moderate density, suggesting they are also important but slightly less prominent. Overall, the keyword mapping reflects a research landscape where EdTech is increasingly linked to sustainability, with a strong emphasis on pedagogy, contextual relevance, and the transformative potential of technology in the SADC higher education system.

DISCUSSION

The analysis of publication trends from 2020 to 2024 demonstrates a dynamic yet gradually growing body of literature focused on EdTech integration in higher education within the SADC region. The observed dip in publications in 2021 is likely attributed to the academic disruptions caused by the COVID-19 pandemic, a trend echoed globally, where scholarly productivity was adversely impacted.[62] However, the sharp rebound in 2022 and peak in 2023 reflect a renewed academic interest, likely driven by the accelerated shift to online learning and the urgent need to explore digital teaching tools under crisis conditions. This growth trajectory, despite a modest dip in 2024, signals a stabilisation of research output in this field and a sustained prioritisation of EdTech as a critical driver of educational transformation and resilience in the SADC region. The predominance of journal articles among publication types indicates a strong emphasis on empirical and evidence-based inquiry into EdTech adoption, reflecting a commitment by scholars in the region to contribute original research to the academic discourse. This aligns with broader trends in EdTech research, where empirical studies provide vital insights into localised implementation practices and educational outcomes.[63]

Additionally, the role of conference proceedings highlights the importance of academic forums as incubators for innovation and scholarly exchange of research findings. Geographically, the distribution of scholarly output in this field reveals a significant imbalance. South African institutions dominate, with the University of Johannesburg contributing the highest number of publications, followed by several other South African universities. This is consistent with existing literature that identifies South Africa as a regional research hub with comparatively greater research infrastructure, funding mechanisms, and academic networks.[64] While Tanzania and Uganda feature among the contributors, the limited presence of other SADC countries such as Angola, Namibia, and Zimbabwe expose an uneven research publication trend. This underrepresentation reflects structural inequalities in research capacity, technological infrastructure, and funding availability across the region.[65] Such

[62] de Almeida Renan Moritz Varnier, "How Did the Scientific Publication System Respond to the Covid-19 Pandemic?," *Iberoamerican Journal of Science Measurement and Communication* 2, no. 3 (December 20, 2022), https://doi.org/10.47909/ijsmc.160.

[63] Musawer Hakimi, Shairagha Katebzadah, and Abdul Wajid Fazil, "Comprehensive Insights Into E-Learning in Contemporary Education: Analyzing Trends, Challenges, and Best Practices," *Journal Of Education And Teaching Learning (JETL)* 6, no. 1 (February 17, 2024): 86–105, https://doi.org/10.51178/jetl.v6i1.1720.

[64] Catherine M. Jones et al., "The Roles of Regional Organisations in Strengthening Health Research Systems in Africa: Activities, Gaps, and Future Perspectives," *International Journal of Health Policy and Management*, March 8, 2022, https://doi.org/10.34172/ijhpm.2022.6426.

[65] Johan Maritz, Alize Le Roux, and Elsona van Huyssteen, "SADC's Settlement Hierarchy and Networks in Support of Cross-Border Regional Development," in *Regional Policy in the Southern African Development Community* (London: Routledge, 2024), 99–122, https://doi.org/10.4324/9781003379379-8.

disparities have critical implications for the sustainable development of inclusive and contextually relevant EdTech strategies in the region.

Based on the analysis of findings presented in RQ2, the current practices in the adoption and implementation of EdTech within SADC HEIs reveal a multi-faceted and evolving landscape demonstrating regional development priorities, particularly towards promoting SDGs. The review uncovered five dominant themes: strategic and policy-driven integration, the adoption of blended learning, capacity building and digital competency development, content creation and online assessment, and leveraging EdTech to promote access to education and the SDGs. Firstly, the integration of EdTech into institutional strategies and policies signifies a system-wide recognition of technology as central to higher education reform in SADC. The findings highlight that HEIs are implementing EdTech to promote institutional governance and quality assurance mechanisms. This is complemented by reforms addressing gender imbalances in STEM and promoting youth employability through ICT-driven programmes[66].

Secondly, blended learning has emerged as a predominant delivery model in the region. This highlights the importance of the shift away from traditional face-to-face pedagogical mechanisms, which pose several challenges, particularly in underdeveloped communities. However, while the adoption of blended learning is widespread, several studies, including Muhuro et al., caution that its application remains superficial, often limited to content transmission rather than facilitating transformative pedagogy.[67] Thirdly, the emphasis on capacity building highlights how HEIs are equipping educators and students with the necessary digital competencies to integrate technology effectively. This finding echoes the work of Mwila et al., who argue that ongoing professional development is critical to building EdTech readiness among academic staff in the region.[68] The COVID-19 pandemic has further accelerated these efforts, prompting institutions to invest in professional training and curriculum-aligned digital upskilling. Moreover, EdTech is being used to promote the development of localised content and online assessments, including the creation of culturally relevant OERs. A study by Azmi and Khoshaim shows how the pandemic expedited the use of automated grading systems and digital content development, reinforcing the potential of EdTech to support scalable and equitable learning environments.[69] In addition, assessments are not only tools for evaluation but also present opportunities to improve pedagogical delivery. Lastly, EdTech is being strategically employed to expand access to education and align with the broader SDG agenda, particularly SDG 4 (quality education) and SDG 3 (health). The findings from studies reviewed reveal that EdTech applications such as EMIS and smart-health tools are enhancing education delivery and health literacy, especially in rural or under-resourced contexts. These applications demonstrate EdTech's potential to serve as a cross-sectoral enabler of sustainable development.

The findings of this systematic review highlight several persistent challenges confronting HEIs across the SADC region in their efforts to integrate EdTech to support sustainable development. While EdTech presents transformative opportunities for teaching, learning, and institutional development, its adoption remains uneven and hindered by infrastructural, human, ethical, and policy-related constraints. A primary and recurrent theme is infrastructural and financial limitations, particularly affecting HEIs in peri-urban and rural areas. These institutions often lack the necessary ICT infrastructure, such as reliable internet access, digital devices, and inclusive technologies for students with disabilities. This digital divide exacerbates inequalities in access to quality education and impedes the potential of EdTech to

[66] Lasekan et al., "Fostering Sustainable Female Participation in STEM Through Ecological Systems Theory: A Comparative Study in Three African Countries."

[67] Lasekan et al., "Fostering Sustainable Female Participation in STEM Through Ecological Systems Theory: A Comparative Study in Three African Countries."

[68] Kennedy Mwila et al., "Teachers' Continuous Professional Development (CPD) in Southern African Development Community (SADC): A Review of Policies, Approaches and Implementation Strategies in Enhancing Teacher Competences," *International Journal of Education Humanities and Social Science* 05, no. 01 (2022): 104–24, https://doi.org/10.54922/IJEHSS.2022.0349.

[69] Fatima M Azmi and Heba Bakr Khoshaim, "The COVID-19 Pandemic and the Challenges of E-Assessment of Calculus Courses in Higher Education: A Case Study in Saudi Arabia," *International Journal of Learning, Teaching and Educational Research* 20, no. 3 (March 30, 2021): 265–81, https://doi.org/10.26803/ijlter.20.3.16.

serve as a tool for inclusion and equity.[70] Furthermore, the overreliance on donor funding in several institutions raises critical concerns about the long-term sustainability of EdTech initiatives in the region. These findings resonate with global research that emphasizes the importance of context-specific infrastructure planning to support equitable digital transformation in higher education.[71]

Limited digital literacy and professional capacity among both academic staff and students present a formidable barrier. The rapid switch to digital learning platforms exposed considerable gaps in user readiness and pedagogical adaptation across the region. Studies indicate that HEIs in urban centres are often prioritised for training and investment, leaving rural institutions behind. Additionally, existing implementation strategies often reflect globalised paradigms that are misaligned with the socio-economic and technological realities of SADC countries. This finding affirms similar conclusions by O'Hara and Naicker, who argue that capacity-building initiatives must be rooted in local educational cultures and resource constraints.[72] Moreover, ethical challenges in assessment and academic integrity further complicate the integration of EdTech in HEIs. With the rise of online and remote learning modalities, concerns related to cheating, data privacy, and surveillance have intensified. The absence of robust invigilation systems in digital assessment environments increased the risk of dishonest academic practices. As noted by Afuro and Mutanga, the development and implementation of ethical frameworks are urgently needed to guide fair and secure EdTech practices in the region.[73] Furthermore, inadequate institutional policies and equity-based barriers hinder the strategic and sustainable adoption of EdTech. Moreover, gender disparities in STEM education and cross-cultural misalignments pose additional layers of exclusion, suggesting the need for refined policies that promote inclusive, locally relevant EdTech strategies.

RECOMMENDATIONS

The findings have several critical implications for the successful integration of EdTech among HEIs in the SADC region. The recommendation can help stakeholders in the higher education sector within SADC reshape their pedagogical strategies to ensure sustainability.

- **Policy and Infrastructure Development:** Governments and institutions in the SADC region must prioritise investments in ICT infrastructure, including affordable internet and digital devices, to bridge the digital divide and enhance access to quality education.
- **Capacity Building:** There is a need for robust training programmes to build digital literacy among educators, students, and administrators, ensuring effective integration of EdTech in the higher education sector.
- **Ethical Frameworks:** Higher education institutions must adopt privacy-preserving data frameworks to ensure ethical use of educational data analytics.
- **Collaboration and Innovation:** Regional and interdisciplinary collaborations should be adopted to develop and share ideas on innovative teaching and learning tools that address regional challenges.
- **Focus on Equity and Access:** Policymakers must implement targeted interventions to ensure digital inclusion for marginalised countries, particularly HEIs in rural communities and female students.

CONCLUSION

The study aimed to explore how HEIs in the SADC region are integrating EdTech to promote sustainability through a systematic literature review approach. The findings indicate a steady increase in publications in this field, with the majority originating from South Africa, followed by Tanzania and

[70] Farhat Naureen Memon and Sarwat Naureen Memon, "Digital Divide and Equity in Education," in *Impact of Digitalization on Education and Social Sustainability* (IGI Global, 2024), 107–30, https://doi.org/10.4018/979-8-3693-1854-6.ch004.

[71] Nizar Bitar and Nitza Davidovich, "Transforming Pedagogy: The Digital Revolution in Higher Education," *Education Sciences* 14, no. 8 (July 25, 2024): 811, https://doi.org/10.3390/educsci14080811.

[72] Sabine O'Hara and Sigamoney Naicker, "Local Commitment and Global Reach: Advancing Sustainable Capacity Building in Higher Education," *World* 3, no. 4 (October 1, 2022): 783–801, https://doi.org/10.3390/world3040044.

[73] Dominic Afuro Egbe, Bethel Murimo Mutanga, and Tarirai Chani, "Combating Digital Academic Dishonesty: A Scoping Review of Approaches," *International Journal of Engineering and Advanced Technology* 9, no. 6 (August 30, 2020): 82–88, https://doi.org/10.35940/ijeat.F1268.089620.

Uganda. This trend highlights the relative advancement of EdTech adoption in these countries and underscores the need for other SADC member states to close the gap and actively engage in the discourse on the sustainable integration of EdTech. HEIs in the region have implemented various practices to enhance pedagogy and promote sustainable educational development. Aligned with the region's ESD framework and the SDGs, these practices are expected to improve higher education curricula, expand access to quality education, and contribute to regional development priorities. However, the integration of EdTech is not without challenges. Key challenges include infrastructural and financial constraints, inadequate policy frameworks, limited training and capacity-building for academic staff and students, and integrity concerns associated with online assessments. It is also essential that stakeholders ensure HEIs in rural communities are not excluded from these advancements. Ultimately, HEIs must build the capacity of administrators, researchers, and students to engage with EdTech in ways that are both effective and sustainable, thereby advancing the goals of the SDGs and ESD. This study holds particular relevance for curriculum designers, academic managers, teaching staff, and policymakers in the higher education sector, as it provides a comprehensive overview of the strategies and considerations necessary for the successful integration of EdTech in the SADC higher education context.

BIBLIOGRAPHY

Abdullahi, Aisha M., and Bester Chimbo. "Co-Designing a Framework for a Persuasive Educational Technology Tool for Motivating Female Students for Enrolment into Science, Technology, Engineering and Mathematics Disciplines." *The Journal for Transdisciplinary Research in Southern Africa* 19, no. 1 (July 11, 2023). https://doi.org/10.4102/td.v19i1.1349.

AECT Connected Community. "What Is ChatGPT and How Is It Used? ." Southern Regional DLG Community of Practice. , n.d.

Alao, Abiodun, and Roelien Brink. "Strategies for Using ICT Skills in Educational Systems for Sustainable Youth Employability in South Africa." *Sustainability* 14, no. 24 (December 9, 2022): 16513. https://doi.org/10.3390/su142416513.

Anbaroğlu, B., İ. B. Coşkun, M. A. Brovelli, T. Obukhov, and S. Coetzee. "Educational Material Development on Mobile Spatial Data Collection Using Open Source Geospatial Technologies." *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences* XLIII-B4-2020 (August 24, 2020): 221–27. https://doi.org/10.5194/isprs-archives-XLIII-B4-2020-221-2020.

Animashaun, Enitan Shukurat, Babajide Tolulope Familoni, and Nneamaka Chisom Onyebuchi. "Implementing Educational Technology Solutions for Sustainable Development in Emerging Markets." *International Journal of Applied Research in Social Sciences* 6, no. 6 (2024): 1158–68.

Awodiji, Omotayo Adewale, and Ancia Katjiteo. "Sustainable Teaching Professional Ethics in the Post-Digital Era." *OIDA International Journal of Sustainable Development* 16, no. 12 (2023): 33–40.

Ayeni, Oyebola Olusola, Nancy Mohd Al Hamad, Onyebuchi Nneamaka Chisom, Blessing Osawaru, and Ololade Elizabeth Adewusi. "AI in Education: A Review of Personalized Learning and Educational Technology." *GSC Advanced Research and Reviews* 18, no. 2 (2024): 261–71.

Azmi, Fatima M, and Heba Bakr Khoshaim. "The COVID-19 Pandemic and the Challenges of E-Assessment of Calculus Courses in Higher Education: A Case Study in Saudi Arabia." *International Journal of Learning, Teaching and Educational Research* 20, no. 3 (March 30, 2021): 265–81. https://doi.org/10.26803/ijlter.20.3.16.

Bitar, Nizar, and Nitza Davidovich. "Transforming Pedagogy: The Digital Revolution in Higher Education." *Education Sciences* 14, no. 8 (July 25, 2024): 811. https://doi.org/10.3390/educsci14080811.

Chaka, Chaka. "Is Education 4.0 a Sufficient Innovative, and Disruptive Educational Trend to Promote Sustainable Open Education for Higher Education Institutions? A Review of Literature Trends." *Frontiers in Education* 7 (April 28, 2022). https://doi.org/10.3389/feduc.2022.824976.

Chauke, Thulani Andrew. "Lifelong Learning among Students in the Context of COVID-19: A Case Study of the SADC Region." *Journal of Culture and Values in Education* 7, no. 2 (2024): 54–69.

Chibambo, Mackenzie Ishmael. "Employability and Open Education Resource Policies Development: Critical Reflections from Selected SADC Higher Education Institutions." *International Journal of Distance Education and E-Learning* 9, no. 2 (2024): 1–15.

Chingombe, Wisemen. "A Framework for Evaluating Geotrails for Education and Geotourism.," 2024.

Cloete, Gerald, and Joram Ndlovu. "The Future of Sustainable Tourism Education in the Digital Transformation Age beyond COVID-19 in Namibia." *African Journal of Hospitality, Tourism and Leisure* 12, no. 5SE (2023): 1668–82.

Coetzer, Jeanne, and Leon Grobbelaar. "Adopting Smart-Health Care Applications for a Rural Community: A Comparison Between Affective and Anthropomorphic Design Principles," 195–208, 2024. https://doi.org/10.1007/978-3-031-52303-8_15.

Costa, Ana Carolina Ferreira, Andresa Monique de Brito Silva, Maximilian Espuny, Aglaé Baptista Torres Rocha, and Otávio José de Oliveira. "Toward Quality Education: Contributions of EdTech to the Achievement of the Fourth United Nations Sustainable Development Goal." *Sustainable Development* 32, no. 3 (2024): 1634–51.

Dhurumraj, Thasmai, Sam Ramaila, Ferhana Raban, and Ahmed Ashruf. "Broadening Educational Pathways to Stem Education through Online Teaching and Learning During Covid-19: Teachers' Perspectives." *Journal of Baltic Science Education* 19, no. 6A (December 30, 2020): 1055–67. https://doi.org/10.33225/jbse/20.19.1055.

Egbe, Dominic Afuro, Bethel Murimo Mutanga, and Tarirai Chani. "Combating Digital Academic Dishonesty: A Scoping Review of Approaches." *International Journal of Engineering and Advanced Technology* 9, no. 6 (August 30, 2020): 82–88. https://doi.org/10.35940/ijeat.F1268.089620.

Guppy, Neil, Dominique Verpoorten, David Boud, Lin Lin, Joanna Tai, and Silvia Bartolic. "The Post-COVID-19 Future of Digital Learning in Higher Education: Views from Educators, Students, and Other Professionals in Six Countries." *British Journal of Educational Technology* 53, no. 6 (2022): 1750–65.

Hakimi, Musawer, Shairagha Katebzadah, and Abdul Wajid Fazil. "Comprehensive Insights Into E-Learning in Contemporary Education: Analyzing Trends, Challenges, and Best Practices." *Journal Of Education And Teaching Learning (JETL)* 6, no. 1 (February 17, 2024): 86–105. https://doi.org/10.51178/jetl.v6i1.1720.

Hoffman, Caitlin, Roger Härtl, Nathan A. Shlobin, Tshibambe N. Tshimbombu, Samer K. Elbabaa, Michael M. Haglund, Andrés M. Rubiano, et al. "Future Directions for Global Clinical Neurosurgical Training: Challenges and Opportunities." *World Neurosurgery* 166 (October 2022): e404–18. https://doi.org/10.1016/j.wneu.2022.07.030.

Jita, Thuthukile, and Edgar J Sintema. "Exploring Classroom Use of ICT among Pre-Service Science Teachers in Selected SADC Countries." *African Journal of Research in Mathematics, Science and Technology Education* 26, no. 3 (2022): 218–36.

Jones, Catherine M., Joëlle Sobngwi-Tambekou, Rhona M. Mijumbi, Aaron Hedquist, Clare Wenham, and Justin Parkhurst. "The Roles of Regional Organisations in Strengthening Health Research Systems in Africa: Activities, Gaps, and Future Perspectives." *International Journal of Health Policy and Management*, March 8, 2022. https://doi.org/10.34172/ijhpm.2022.6426.

Judijanto, Loso. "Exploring the Role of Microlearning in Lifelong Learning: A Bibliometric Review." *The Eastasouth Journal of Learning and Educations* 3, no. 01 (2025): 42–55.

Kisanga, Sarah E., and Dalton H. Kisanga. "The Role of Assistive Technology Devices in Fostering the Participation and Learning of Students with Visual Impairment in Higher Education Institutions in Tanzania." *Disability and Rehabilitation: Assistive Technology* 17, no. 7 (October 3, 2022): 791–800. https://doi.org/10.1080/17483107.2020.1817989.

Kurata, Lehlohonolo, Mampota Selialia, Rethabile Rosemary Molefi, and Senoni Francinah Rateronko. "Integrating Educational Technology into Lesotho Secondary Religious Studies: A Conceptual Exploration of Practical Challenges and Opportunities," 2024.

Landa, Elizabeth, Chang Zhu, Jennifer Sesabo, and Mustapha Almasi. "Reinforcement Measures for Sustaining the Integration of Innovative Teaching and Learning Technologies in Selected

Tanzanian Universities." *European Conference on E-Learning* 21, no. 1 (October 21, 2022): 208–14. https://doi.org/10.34190/ecel.21.1.530.

Lasekan, Olusiji Adebola, Margot Teresa Godoy Pena, Adeyinka John Odebode, Alfredo Pedro Mabica, Raul Abílio Mabasso, and Oluwatosin Mogbadunade. "Fostering Sustainable Female Participation in STEM Through Ecological Systems Theory: A Comparative Study in Three African Countries." *Sustainability* 16, no. 21 (November 2, 2024): 9560. https://doi.org/10.3390/su16219560.

Lembani, Reuben, Ashley Gunter, Markus Breines, and Mwazvita Tapiwa Beatrice Dalu. "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.

Macheka, Mavis Thokozile. "COVID-19 and Social Inequality: Lessons from a Higher and Tertiary Education Institution in Zimbabwe." *Cogent Education* 10, no. 2 (December 11, 2023). https://doi.org/10.1080/2331186X.2023.2272828.

Mafenya, Nkhangweleni Patrick. "Exploring Technology as Enabler for Sustainable Teaching and Learning during Covid-19 at a University in South Africa." *Perspectives in Education* 40, no. 3 (September 30, 2022): 212–23. https://doi.org/10.18820/2519593X/pie.v40.i3.14.

Makinde, Semiu Olwale, and Yusuf Ayodele Ajani. "Smart Learning as Transformative Impact of Technology: A Paradigm for Accomplishing Sustainable Development Goals (SDGs) in Education." *Indonesian Journal of Educational Research and Technology* 4, no. 3 (2024): 213–24.

Maphosa, Vusumuzi, Bekithemba Dube, and Thuthukile Jita. "Sustainable Information and Learning Access at a Rural University in Zimbabwe through a Mobile Application." *International Journal of Information and Education Technology* 11, no. 2 (2021): 82–87. https://doi.org/10.18178/ijiet.2021.11.2.1493.

Maritz, Johan, Alize Le Roux, and Elsona van Huyssteen. "SADC's Settlement Hierarchy and Networks in Support of Cross-Border Regional Development." In *Regional Policy in the Southern African Development Community*, 99–122. London: Routledge, 2024. https://doi.org/10.4324/9781003379379-8.

Masina, Rumbidzayi. "Integration of Sustainable Development Goals in the Textile Science, Apparel Design, and Technology Programs in Zimbabwean Universities." *Journal of Adult and Continuing Education* 31, no. 1 (March 19, 2025): 265–84. https://doi.org/10.1177/14779714241264972.

Memon, Farhat Naureen, and Sarwat Naureen Memon. "Digital Divide and Equity in Education." In *Impact of Digitalization on Education and Social Sustainability*, 107–30. IGI Global, 2024. https://doi.org/10.4018/979-8-3693-1854-6.ch004.

Mosako, D.R. "Implementation of Museum Educational Strategies through Information Communication Technology: Building on the Global Sustainable Development Goal 4." *South African Museums Association Bulletin* 44, no. 1 (2022): 29–37.

Muduva, Martin, Gideon Mazambani, Tavengwa Masamha, and Sibusisiwe Dube. "Emerging Technologies in Governance: Insights from SADC Nations." *Information Technologist* 21, no. 2 (2024).

Mwila, Kennedy, Maimbolwa Namuchana, Enala Sharon Lufungulo, Onwubuya Gift Chinemerem, Steward Mudenda, Darius Mangwatu, Christabel Nangandu, and Hikaambo. "Teachers' Continuous Professional Development (CPD) in Southern African Development Community (SADC): A Review of Policies, Approaches and Implementation Strategies in Enhancing Teacher Competences." *International Journal of Education Humanities and Social Science* 05, no. 01 (2022): 104–24. https://doi.org/10.54922/IJEHSS.2022.0349.

Naidoo, Jayaluxmi, and Sarasvathie Reddy. "Embedding Sustainable Mathematics Higher Education in the Fourth Industrial Revolution Era Post-COVID-19: Exploring Technology-Based Teaching Methods." *Sustainability* 15, no. 12 (June 16, 2023): 9692. https://doi.org/10.3390/su15129692.

Ncube, Mthokozisi Masumbika, and Patrick Ngulube. "A Systematic Review of Postgraduate

Programmes Concerning Ethical Imperatives of Data Privacy in Sustainable Educational Data Analytics." *Sustainability* 16, no. 15 (July 25, 2024): 6377. https://doi.org/10.3390/su16156377.

Noorbhai, Habib, Danica Sims, and Nadia Hartman. "Multi-Disciplinary Staff Perspectives and Consensus on e-Learning and MHealth for Health Sciences Curricula." *Higher Education Research & Development* 43, no. 3 (April 2, 2024): 620–39. https://doi.org/10.1080/07294360.2024.2325149.

O'Hara, Sabine, and Sigamoney Naicker. "Local Commitment and Global Reach: Advancing Sustainable Capacity Building in Higher Education." *World* 3, no. 4 (October 1, 2022): 783–801. https://doi.org/10.3390/world3040044.

Ramaila, Sam, and Lydia Mavuru. "Postgraduate Science Students' Impressions and Experiences of Online Pedagogical Practices: Implications for Technology-Enhanced Pedagogy." *International Journal of Learning, Teaching and Educational Research* 22, no. 1 (January 30, 2022): 112–28. https://doi.org/10.26803/ijlter.22.1.7.

Ramoroka, Tlou Millicent. "Prospects of Successful Blended Pedagogies in South Africa: Planning, Governance and Infrastructure Considerations." *Development Southern Africa* 38, no. 5 (September 3, 2021): 799–815. https://doi.org/10.1080/0376835X.2021.1929079.

Renan Moritz Varnier, de Almeida. "How Did the Scientific Publication System Respond to the Covid-19 Pandemic?" *Iberoamerican Journal of Science Measurement and Communication* 2, no. 3 (December 20, 2022). https://doi.org/10.47909/ijsmc.160.

Rosenberg, Eureta, and Karen Kotschy. "Monitoring and Evaluation in a Changing World: A Southern African Perspective on the Skills Needed for a New Approach." *African Evaluation Journal* 8, no. 1 (October 23, 2020). https://doi.org/10.4102/aej.v8i1.472.

SADC. "SADC Education for Sustainable Development Strategic Framework." Southern African Development Community. , 2024.

SADC. "SADC Industrialization Strategy and Roadmap 2015–2063." Gaborone, Botswana: Southern African Development Community, 2015. https://www.sadc.int/sites/default/files/2022-07/Repriting_Final_Strategy_for_translation_051015.pdf.

Schaab, Gertrud, Serena Coetzee, Nerhene Davis, and Faith N. Karanja. "Developing Teaching/Learning Materials on 'Sense of Place' with Students in an International University Cooperation: Overall Approach and First Phase Outcomes at Karlsruhe University of Applied Sciences." *International Journal of Cartography* 9, no. 3 (September 2, 2023): 525–40. https://doi.org/10.1080/23729333.2023.2224487.

Shava, G. N., D., N. Nkengebeza, K. D. Phuthi, Mpuang, and J. Alava. "Achieving Sustainable Development Goal (SDG) 4 on Quality in Education Challenges and Opportunities, Experiences from Southern African (SADC) Universities." *International Journal of Research & Innovation in Social Science (IJRISS)* 5, no. 7 (2021): 559–73.

Uleanya, Chinaza. "Reconceptualising Disabilities and Inclusivity for the Postdigital Era: Recommendations to Educational Leaders." *Education Sciences* 13, no. 1 (January 3, 2023): 51. https://doi.org/10.3390/educsci13010051.

United Nations. "The Sustainable Development Goals Report 2023. ." *Https://Unstats.Un.Org/Sdgs/Report/2023/*. New York: United Nations, 2023.

Zickafoose, Alexis, Olawunmi Ilesanmi, Miguel Diaz-Manrique, Anjorin E. Adeyemi, Benard Walumbe, Robert Strong, Gary Wingenbach, Mary T. Rodriguez, and Kim Dooley. "Barriers and Challenges Affecting Quality Education (Sustainable Development Goal #4) in Sub-Saharan Africa by 2030." *Sustainability* 16, no. 7 (March 24, 2024): 2657. https://doi.org/10.3390/su16072657.

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