

## Language, Technology, and Equity in the ODeL Era: Reimagining Access and Inclusion in 21st Century Education in Zambia

**Siame Pethias**

*Department of Literature and Languages,  
Kwame Nkrumah University, Kabwe, Zambia*  
Email: [psiamе@yahoo.com](mailto:psiamе@yahoo.com)  
<https://orcid.org/0000-0003-3203-5307>

**Chisenga, Raphael Prince Akeem**

*Department of Literature and Languages,  
Kwame Nkrumah University, Kabwe, Zambia*  
Email: [raphakeem@gmail.com](mailto:raphakeem@gmail.com)

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### \*Corresponding Author:

[psiamе@yahoo.com](mailto:psiamе@yahoo.com)

### Abstract

*The growth of Open and Distance e-Learning (ODeL) in Zambia, particularly accelerated by the COVID-19 pandemic, has presented significant opportunities for expanding access to education. However, this growth has also revealed persistent inequities related to language use, especially for learners in rural and linguistically diverse contexts. While English remains the default language of instruction across digital platforms, a significant proportion of learners interact more fluently in indigenous languages. This study examines how language use in Zambia's ODeL environment influences access, participation, and equity among learners from different linguistic backgrounds. Anchored in the Linguistic Human Rights framework and the Digital Equity Model, the study adopts a qualitative case study design involving document analysis of selected ODeL platforms, in-depth interviews with educators, and focus group discussions with learners in rural and peri-urban areas. Findings reveal that English-only instruction excludes large sections of the population from fully engaging with online content, resulting in diminished learning outcomes and reduced retention rates. Participants express a strong preference for content that integrates local languages or provides multilingual options. The study concludes that linguistic accessibility remains a key barrier to inclusive digital education in Zambia and argues for the adoption of multilingual practices in ODeL policy and content development. Such reforms would enhance comprehension, reduce learner attrition, and promote a more equitable education system. The study offers recommendations for policymakers, instructional designers, and education stakeholders committed to making ODeL systems more inclusive, sustainable, and responsive to Zambia's multilingual realities.*

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### Introduction

The accelerated adoption of Open and Distance e-Learning (ODeL) in Zambia, notably intensified by the COVID-19 pandemic, has generated significant momentum towards expanding access to education beyond conventional classrooms (Mutale, Mkandawire, & Phiri, 2022; Mwale, 2024). By decoupling learning from fixed locations and rigid schedules, ODeL holds promise for bridging longstanding geographic, socioeconomic, and infrastructural



barriers, thus aligning closely with global commitments under Sustainable Development Goal 4 (SDG4) to provide inclusive and equitable quality education for all (UNESCO, 2020). However, this digital transformation reveals enduring inequities related to language use and technological accessibility, particularly impacting learners in rural and linguistically diverse contexts (Phiri & Banda, 2021; Simuyemba et al., 2023). These challenges underscore an urgent need for educational policies and practices that promote linguistic inclusion to ensure that new learning modalities truly serve all learners.

Zambia's linguistic landscape, characterised by vast multilingualism, presents unique complexities that must be accounted for in any educational innovation. The country recognises seven official regional languages classified by the Guthrie system as follows: Bemba (Zone M), Nyanja (Zone N), Tonga (Zone M), Lozi (Zone K), Lunda (Zone L), Kaonde (Zone M), and Luvale (Zone K) (Mulenga, 2025; Goma, 2019). These languages dominate in different provinces: Bemba in Northern and Copperbelt, Nyanja in Lusaka and Eastern provinces, Tonga in Southern, and Lozi in Western Zambia (Mulenga, 2025).

Despite this rich linguistic diversity, English remains the mandated official language of instruction from middle primary grades through secondary and tertiary education, while indigenous languages are used predominantly in early primary grades or informally in home and community settings (Zambian Ministry of Education, 2024; Muzata, 2023). This educational language policy creates a striking mismatch for many learners, especially those engaged in ODeL platforms, where English is the default medium of instruction and content delivery. The map below shows the Zambian Linguistic Landscape and ODeL Centres.

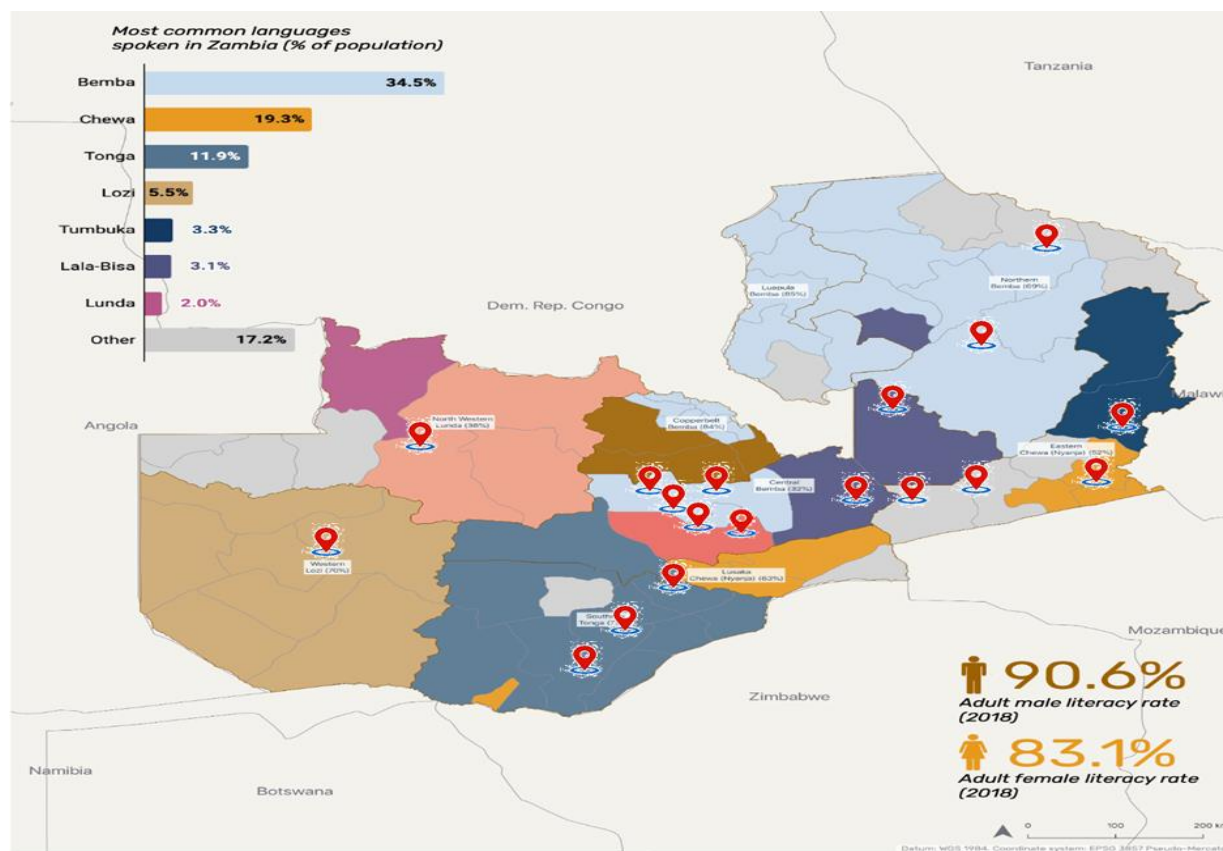


Figure 1: Zambian Linguistic Landscape and ODeL Centres

This linguistic discontinuity at the interface of education and technology creates a serious equity challenge. Although ODeL is lauded for potentially broadening access to education, it risks excluding large segments of learners who are more fluent and comfortable in their indigenous languages (Mwale, 2024; Simuyemba et al., 2023). Learners from rural and peri-urban areas, where digital literacy and internet infrastructure are uneven, face the compounded barrier of engaging with English-only digital content, which limits comprehension, participation, and retention in these programmes (Phiri & Banda, 2021; Chama & Mulenga, 2023). This digital and linguistic exclusion undermines the fundamental equity goals of ODeL and threatens to widen the educational divide between urban and rural, rich and poor, male and female learners (Simuyemba et al., 2023; Mwale, 2024).

The intersection of technology, language, and equity has been explored through multiple research lenses. Studies on digital technology's role in education emphasise ODeL's transformative potential to extend access and diversify pathways, yet also highlight persistent gaps in access to devices, internet connectivity, and digital skills training that disproportionately affect marginalised groups (Mutale et al., 2022; Mwale, 2024). Literature on language of instruction reveals that a mismatch between learners' home languages and the instructional language, typically English in Zambia, adversely impacts comprehension, learning outcomes, and overall academic success (Zambian Ministry of Education, 2024; Muzata, 2023). Equity-focused analyses elaborate on how socioeconomic status, geographic location, gender, and disability converge to shape learners' differential access to both digital and language resources, further stratifying educational opportunities (Chama & Mulenga, 2023; Simuyemba et al., 2023). These findings collectively foreground the necessity of integrating linguistic considerations explicitly within ODeL design and policy to foster meaningful inclusion.

Within the Zambian policy context, there are noteworthy developments and tensions related to education, language, and digital learning. National education strategies underscore the priority of expanding alternative education pathways, including ODeL, to enhance quality and inclusiveness (Zambian Ministry of Education, 2024). The Ministry of Education's recent 2025 National Education Policy confirms English as the primary language of instruction from Grade 5 onwards, while endorsing local languages in lower grades, mirroring longstanding practice (Zambian Ministry of Education, 2025). However, the operationalisation of multilingual content in digital education remains limited, with most ODeL platforms and materials available exclusively in English (Phiri & Banda, 2021). Efforts such as the Zambia College of Distance Education (ZACODE) initiatives, supported by Commonwealth collaborations, target scaling ODeL but grapple with low enrolment, partly due to linguistic and gender disparities (COL, 2025; Chama & Mulenga, 2023). Pilot projects integrating local languages into learning packages show promise but lack systemic backing for broad adoption (Phiri & Banda, 2021).

Despite these policy frameworks and emerging projects, a critical gap persists between the recognition of linguistic diversity and inclusion in principle and their comprehensive enactment within ODeL platforms and policy. Empirical research remains sparse on how exactly language use on these digital platforms influences learner engagement, equity, and educational outcomes in Zambia's markedly multilingual and socioeconomically stratified settings (Simuyemba et al., 2023; Mwale, 2024). Current policy and implementation largely overlook learners' lived experiences of linguistic exclusion, limiting progress towards truly accessible and equitable digital education.

This study addresses this gap by investigating how language use within Zambia's ODeL environment shapes access, participation, and equity among learners from diverse linguistic

and geographic backgrounds. Guided by the Linguistic Human Rights framework and the Digital Equity Model, the research explores the effects of English-dominant digital instruction and evaluates learners' and educators' perspectives on the integration of local languages.

The study aims to achieve the following objectives:

- i. Examine how language use in ODeL platforms affects learner comprehension, engagement, and retention.
- ii. Explore learner and educator attitudes towards multilingual content in digital education.
- iii. Identify linguistic and technological barriers to equitable participation in ODeL.
- iv. Propose evidence-based recommendations for multilingual ODeL policy and design in Zambia.

The study answers the following research questions:

- i. How do linguistic practices on ODeL platforms influence learner comprehension and retention in Zambia?
- ii. What are the attitudes of learners and educators towards integrating local languages into digital education?
- iii. What are the perceived barriers to linguistic and digital inclusion in ODeL?
- iv. How can ODeL policies and platforms be redesigned to promote linguistic equity and digital inclusion?

This research contributes new insights by linking linguistic inclusion concretely to digital education equity in Zambia, providing actionable recommendations for policymakers, instructional designers, and education stakeholders. By advocating for multilingual ODeL environments that respect learners' linguistic rights and realities, the study advances Zambia's commitment to SDG4 and supports the development of more inclusive, sustainable educational technologies responsive to diverse learner needs. In doing so, it highlights the centrality of language as both a barrier and a lever for educational access in the 21st-century digital era.

## Literature Review

Open and Distance e-Learning (ODeL) is widely acknowledged as a transformative educational approach with the potential to widen participation by overcoming geographic, socioeconomic, and infrastructural barriers (Chiriac, Cebotaru, & Hirbu, 2025; Czerniewicz, 2022). However, the interface of language, technological access, and equity remains complex and contested, especially within a multilingual and socio-economically diverse context such as Zambia. This literature review explores global, African, and Zambian perspectives on ODeL, focusing on key themes in research and policy related to technology access, language of instruction, and equity. The review situates Zambia within broader discussions, critiques existing policies, and identifies methodological and empirical gaps addressing the combined language-technology dynamics of ODeL.

Globally, ODeL is considered a vehicle for liberalising education, advancing lifelong learning, and fostering social inclusion (Czerniewicz, 2022; Chiriac et al., 2025). By providing flexible, scalable, and cost-effective learning opportunities accessible anytime and anywhere, recent studies emphasise ODeL's capacity to address rigidities in most traditional education systems (Vaishnav, 2025). However, the paradox remains that technology can both connect and exclude learners depending on infrastructural, linguistic, and pedagogical factors (Vaishnav, 2025).

Studies reveal that ODeL's success hinges on equitable digital access, and these include reliable internet, affordable devices, learner digital literacy, and culturally responsive content (Kukulka-Hulme et al., 2023). Without these, digital divides perpetuate existing educational inequities globally, thereby disadvantaging marginalised populations (Czerniewicz, 2023).

The language of instruction on these platforms is another critical factor shaping equity in ODeL. Studies show that instructional languages misaligned with learners' mother tongues negatively affect comprehension, motivation, and learning outcomes (Kim, 2023). The dominance of international languages, especially English, in ODeL materials raises concerns about linguistic imperialism and exclusion of local language speakers (Kim, 2023; Linguistically-Responsive Educational Framework, 2022). Equitable multilingual education models that integrate learners' local languages alongside international lingua francas are theorised as necessary to promote meaningful inclusion and cognitive engagement (Kim, 2023; Dubazana, 2025). These arguments align with Sustainable Development Goal (SDG) 4 on inclusive quality education that advocates mother tongue-based multilingual education as a right and catalyst for educational equity (Chiriak et al., 2025).

Additionally, equity analysed at the global scale insists on intersectional approaches that account for how language relates to socioeconomic status, gender, disability, and geographic location to shape learners' digital access and educational experiences (Sibumpan, 2013; Czerniewicz, 2023). For instance, marginalised groups may face multiple barriers such as lower digital skills, limited infrastructure, and cultural biases against particular languages or learner identities, which conventional quantitative enrolment data often conceal (Chiriak et al., 2025). Methodologically, there is a growing call for mixed methods and qualitative research that foregrounds learner agency and lived experiences alongside quantitative performance metrics (Czerniewicz, 2022; Kukulka-Hulme et al., 2023).

In Africa, ODeL is framed as a necessary solution to persistent educational challenges such as access and quality, which are exacerbated by demographic growth, urban-rural divides, and resource limitations (Williams, 2014; Czerniewicz, 2023). Most countries across Africa have adopted various ODeL models, with successes in expanding access to tertiary and continuing education mainly observed in South Africa, Kenya, and Nigeria (Czerniewicz, 2023). However, the continent confronts a huge digital infrastructure deficit and marked linguistic diversity that complicate direct replication of global ODeL models (Williams, 2014; Kukulka-Hulme et al., 2023).

Language concerns are especially salient in African ODeL contexts, where colonial languages, such as English, French, and Portuguese, dominate official education and digital content, yet most of the learners communicate in indigenous languages at home and in communities (Williams, 2014; Linguistically-Responsive Educational Framework, 2022). This mismatch often leads to lower learner comprehension, engagement, and retention, effectively reproducing linguistic inequities through the digital medium (Kim, 2023; Dubazana, 2025). Other studies also reveal an emerging appetite and policy momentum for promoting *equitable multilingualism* that blends local languages with dominant official languages in educational technologies to better serve diverse learner populations (Kim, 2023). Nonetheless, progress remains uneven and fragmented due to limited resources and policy prioritisation.

Socioeconomic status, gender, rural-urban location, and disability in digital education access and quality have been persistent disparities recorded by equity-focused studies in Africa (Sibumpan, 2013; Czerniewicz, 2023). Gender-based digital divides remain another pressing

concern, where sociocultural norms and domestic responsibilities disproportionately hinder female learners' engagement in accessing ODeL (Chiriac et al., 2025). The multifaceted frameworks applied in African ODeL research highlight the layered nature of disadvantage and call for holistic policy responses spanning infrastructure, pedagogy, and sociocultural transformation (Dubazana, 2025).

Zambia's education system reflects these continental and global tendencies while presenting unique linguistic and policy characteristics. The government's Vision 2030 and National Education Policy (2024, 2025) front expansion of inclusive and quality education through diversified modalities, including ODeL, to meet increasing demand and rural learner needs (Zambian Ministry of Education, 2024, 2025b; COL, 2025). The Ministry of Education acknowledges ODeL as a flexible and scalable approach to widen access, particularly for women, rural learners, and persons with disabilities (Chanda, 2025; Mwale, 2024). Initiatives such as the Zambia College of Distance Education (ZACODE) and pilot Open Innovative Schooling (OIS) programs exemplify efforts to institutionalise ODeL as a standard educational delivery mode (COL, 2025; Ministry of General Education, 2021).

Nevertheless, language policy in Zambia remains predominantly English as a medium of instruction from Grade 5 onwards since 2013 to 2027, despite recognition of seven regional indigenous languages (Bemba, Nyanja, Tonga, Lozi, Lunda, Kaonde, Luvale) representing large learner populations (Mulenga, 2025; Goma, 2019). However, the recent 2024 language policy has reverted to English language as a primary medium of instruction from early childhood to university. Furthermore, local languages are mainly relegated to early grades and informal communication (Ministry of Education, 2025). This creates linguistic discontinuity with major implications for comprehension and learner success in ODeL platforms, which overwhelmingly use English as the primary language of instruction (Phiri & Banda, 2021; Simuyemba et al., 2023). Emerging studies foreground this language-instruction disparity as a central barrier to realising ODeL's equity potential in Zambia, particularly affecting rural and marginalised groups (Mwale, 2024).

Gender disparities and digital divides further compound these challenges. Studies such as Chanda (2025) and Mwale (2024) reveal that while ODeL offers flexibility, benefiting women balancing educational and domestic roles, cultural attitudes towards technology and internet use can restrict women's digital participation. Socioeconomic status, disability, and rural location also converge with language barriers to create complex exclusion dynamics requiring strategic policy attention (Simuyemba et al., 2023; Chama & Mulenga, 2023).

Methodological tendencies and gaps in the existing literature on ODeL and linguistic equity are predominantly quantitative, focusing on completion rates, focusing on enrolment growth, and digital infrastructure metrics (Chanda, 2025; COL, 2025). While these findings show broad trends, they insufficiently capture learners' lived experiences, perceptions of language barriers, and the relationship between technological use and linguistic access (Czerniewicz, 2022; Kukulska-Hulme et al., 2023). There is limited qualitative research exploring how learners from diverse linguistic backgrounds navigate ODeL platforms or how educators adapt content for multilingual inclusivity in Zambia (Phiri & Banda, 2021). Additionally, combined analyses of language and technology constraints remain underdeveloped, missing the opportunity to holistically address equity challenges. This gap limits evidence-based policy-making and instructional design aiming for truly inclusive digital education.

The literature, therefore, reveals a growing consensus on ODeL's potential to enhance educational access, tempered by persistent technology and language-related inequities. Globally and in Africa, the need for multilingual, culturally responsive ODeL is well recognised, yet implementation lags, especially in resource-constrained and linguistically diverse contexts like Zambia. Zambia-specific research confirms prevailing challenges related to language mismatch, gender disparities, and infrastructural deficits, with policy reforms underway but uneven in effect. Importantly, methodological limitations in the current evidence base point to the need for more nuanced, qualitative, and intersectional research centring learners' lived realities in multilingual digital environments. This review thus frames the study's focus on the language-technology equity nexus in Zambia's ODeL system as both timely and critical for advancing inclusive education.

## **Theoretical Framework**

A clear theoretical framework is critical for this study to conceptually link language rights and digital equity, thereby providing a critical lens through which data collection is guided, analysis, and interpretation of findings around access and inclusion in Zambia's Open and Distance e-Learning (ODeL) environment. This study can systematically address the socio-political dimensions of language use alongside the technological affordances and barriers that influence equitable participation by anchoring it in well-established frameworks. The use of a dual framing also guarantees that the complex interplay between language policies, technological infrastructure, and learner experiences is foregrounded, shaping policy-relevant insights and equitable educational recommendations. This study, therefore, was grounded in the Linguistic Human Rights framework and Digital Equity Model.

### *Linguistic Human Rights (LHR)*

The Linguistic Human Rights framework posits language use as a fundamental dimension of human dignity and identity, entailing the right of individuals and communities to use, preserve, and develop their mother tongue in all spheres of life, including education (Prism Sustainability Directory, 2025). Core tenets include the rights to mother-tongue education, access to public life without linguistic discrimination, and availability of resources in one's language. This framework critiques language policies or practices that impose dominant languages at the expense of linguistic minorities, emphasising linguistic justice through recognition, protection, and promotion of linguistic diversity.

Relevant constructs for this study encompass language of instruction, where mother-tongue education is linked to better cognitive and affective outcomes; the gap between language policy and practice; and the socio-political obligations of states and institutions to provide linguistically accessible learning environments (Prism Sustainability Directory, 2025). Normatively, LHR demands equitable education systems that respect and enable multilingual realities, challenging exclusionary language regimes and advocating for active inclusion of indigenous languages to foster equitable participation and academic success.

### *Digital Equity Model (DEM)*

The Digital Equity Model conceptualises digital equity as a multi-dimensional construct that includes material access to devices and connectivity, acquisition of digital literacies, availability of culturally and linguistically relevant content, and meaningful learner agency within digital participation (Czerniewicz, 2022; Dubazana, 2025). DEM highlights that addressing merely

technological infrastructure will not achieve true digital inclusion without considering skills, content accessibility, or socio-economic barriers.

For this study, DEM's relevant principles include infrastructural access such as internet connectivity and device availability, content accessibility shaped by language and user interface design, and structural barriers including socio-economic status, rural-urban divides, digital literacy of both learners and educators, gender, and disability (Czerniewicz, 2023; Dubazana, 2025). DEM stresses that closing the digital divide requires concurrent interventions across these dimensions to facilitate a robust, inclusive digital learning environment.

### *Rationale for Integrating LHR and DEM*

The rationale behind integrating the Linguistic Human Rights framework with the Digital Equity Model offers a balanced, enhanced perspective on educational equity within Zambia's ODeL context. LHR focuses on the rights and socio-political dimensions of language, emphasising the ethical and legal requirements to support linguistic diversity and justice. On the other hand, DEM focuses on the material and skill-based conditions that shape who can effectively use digital technologies for learning. Together, these enabled a detailed analysis of how language policies and technological infrastructures converge to foster or hinder equitable digital education.

This integration moved beyond individual studies of either language or technology alone, but it examined how linguistic choices rooted in ODeL platforms could accelerate digital exclusion. For example, by privileging English-only content, which is inaccessible to many learners, and how digital interface and content designs may propagate or mitigate linguistic marginalisation. Hence, the combined framework highlights the dynamic interactions between linguistic rights and digital equity, offering a comprehensive approach to understanding and addressing barriers to inclusive learning.

This theoretical framework thus provides a robust foundation for the qualitative exploration of language and technology-mediated educational equity, ensuring that findings are situated within established human rights and digital inclusion discourses while grounded in Zambia's social realities.

## **Methodology**

### *Research Design*

The study employed a qualitative interpretive case study design, which is well-suited for exploring complex, context-specific phenomena such as the intersection of language and digital equity in Zambia's ODeL environment (Stake, 1995; Ponelis, 2015). An interpretive case study emphasises understanding the meanings and experiences of participants within their real-life contexts, aligning with a constructivist epistemology that views knowledge as co-constructed through interactions between researchers and participants (Muleya & Siame, 2025). This design facilitates a holistic exploration of how linguistic human rights and digital equity are enacted or constrained in ODeL platforms, enabling rich insights into the challenges and opportunities faced by diverse learners in Zambian learning environments (Siame et al., 2025).

### *Participants and Sampling*

Purposive sampling was used to select participants who could provide rich, relevant insights into the research questions (Merriam, 2009). The study included 15 ODeL educators (8 male, 7 female) with at least two years of experience in digital teaching across rural and peri-urban centres and 40 ODeL learners (22 male, 18 female) from rural and peri-urban areas, representing diverse linguistic backgrounds (Bemba, Nyanja, Tonga, Lozi). Participants were selected from four ODeL centres across two provinces.

The sample size was determined by data saturation, where no new themes emerged from subsequent interviews and focus group discussions (FGDs).

### *Data Collection*

Data were collected through triangulation of three methods. The first method was document Analysis. It required a review of 5 selected ODeL platforms (including ZACODE and two university-based platforms) to examine language use, interface design, and accessibility features. The second method was in-depth interviews (Siame et al., 2025b). Semi-structured interviews with 15 educators, each lasting 45–60 minutes, were conducted in person or via Zoom. The third method was Focus Group Discussions. The study had 6 FGDs with learners (6–8 participants per group), each lasting 60–90 minutes, which were conducted in participants' local languages with translation support.

### *Data Analysis*

Data were analysed using thematic analysis (Braun & Clarke, 2006) supported by NVivo software. The process included: transcription and translation of interviews and FGDs into English; familiarisation with the data through repeated reading; coding to identify initial patterns related to language barriers, digital access, and equity; theme development through iterative refinement, aligning with the theoretical frameworks (LHR and DEM); and triangulation across data sources to enhance validity.

### *Ethical Considerations*

Ethical approval was obtained from the University of Zambia Research Ethics Committee. All participants provided informed consent. Confidentiality and anonymity were maintained through pseudonyms. Cultural sensitivity was observed, especially during FGDs conducted in local languages.

## **Results and Discussion**

The findings are organised under four key themes that emerged from the integrated analysis of document reviews, educator interviews, and learner focus groups.

### *Linguistic Barriers in English-Dominant ODeL Platforms*

Document analysis revealed that all five reviewed ODeL platforms used English as the default language for interface, content, and assessment. Only one platform offered limited subtitles in Bemba for selected videos.

Learners in FGDs consistently reported that English-only materials were a major barrier to comprehension, especially in rural areas. One learner shared:

*The materials are too difficult to understand because they are only in English, which I barely speak. This made it hard for me to keep up, and I eventually dropped out.*

Educators corroborated this, noting lower completion rates among non-English-speaking learners. A teacher from a rural centre explained:

*When learners cannot understand the language, digital education fails them, no matter how good the technology is.*

These findings align with the Linguistic Human Rights framework, which emphasises the right to mother-tongue education (Prism Sustainability Directory, 2025). The exclusion experienced by learners reflects broader patterns of linguistic marginalisation in African digital education (Kim, 2023).

### *Multilingual Preferences and Emerging Solutions*

Both learners and educators expressed a strong preference for multilingual content. Learners suggested options such as subtitles, voice-overs, and localised examples to improve engagement.

One ODeL provider piloting bilingual content (English-Bemba) reported a 20% increase in retention rates. Educators noted that localised examples made abstract concepts more relatable.

A learner from a peri-urban FGD stated:

*I appreciated the subtitle options in my language. It helped me follow the English explanations better.*

These practices resonate with the Digital Equity Model's emphasis on culturally and linguistically relevant content (Dubazana, 2025). They also support calls for equitable multilingualism in digital education (Kim, 2023).

### *Language as a Core Dimension of Digital Equity*

The study found that language and digital access are deeply intertwined. Learners facing linguistic barriers were also more likely to lack reliable internet, devices, or digital skills.

Female learners in rural areas reported compounded challenges due to gendered norms limiting their access to technology. As one female participant noted:

*I often have to share a phone with my brother. When the lessons are only in English, I feel doubly excluded.*

These intersectional barriers reinforce the need for integrated equity strategies that address both linguistic and technological dimensions (Czerniewicz, 2022; Sibumpan, 2013).

*Policy-Practice Gaps and Stakeholder Recommendations*

Despite policy recognition of multilingualism, implementation remains weak. Educators called for mandatory multilingual interfaces in ODeL platforms, teacher training in digital translation and localisation, and incentives for developing content in local languages. On the other hand, learners urged policymakers to prioritise accessibility over linguistic standardisation and to involve communities in content co-creation. These recommendations align with SDG4's vision of inclusive, equitable education and highlight the need for systemic reforms (Vaishnav, 2025).

**Conclusion**

The rapid expansion of Open and Distance e-Learning (ODeL) in Zambia represents a significant opportunity to democratize education. However, this study concludes that the potential of ODeL to achieve equitable educational access is critically undermined by the persistent issue of linguistic exclusion. The English-dominant approach prevalent across Zambian digital learning platforms creates a formidable barrier for a large segment of the population, particularly learners in rural and peri-urban areas who are more fluent in indigenous languages.

The findings, grounded in the integrated theoretical framework of Linguistic Human Rights and the Digital Equity Model, reveal that English-only instruction leads to diminished comprehension, lower engagement, and increased dropout rates among non-fluent English speakers. This linguistic barrier effectively replicates and amplifies existing social and geographic inequities, contradicting the inclusive promise of ODeL. Conversely, the study demonstrates a strong learner preference and clear empirical benefits for multilingual approaches. Instances where local languages were integrated through bilingual content, subtitles, or voice-overs resulted in significantly improved learner satisfaction and retention.

Therefore, this research asserts that language is not a peripheral concern but a fundamental dimension of digital equity. To truly harness the transformative power of ODeL, a paradigm shift in policy and instructional design is imperative. The study calls for the deliberate and systematic adoption of multilingual practices in ODeL, including the development of content in Zambia's major regional languages, the localisation of learning management system interfaces, and targeted teacher training in multilingual digital pedagogy.

By championing these reforms, policymakers, instructional designers, and educational stakeholders can move beyond a tokenistic recognition of linguistic diversity and begin constructing a genuinely inclusive, sustainable, and effective ODeL ecosystem. Such an ecosystem would not only enhance learning outcomes and reduce attrition but also uphold the linguistic human rights of all Zambian learners, ensuring that the digital education era truly leaves no one behind.

Based on the findings, the study proposes the following actionable recommendations:

- i. For Policymakers:
  - a. Revise language-in-education policies to explicitly support multilingual ODeL content development and delivery.
  - b. Allocate funding for the localisation of digital learning platforms and teacher training in multilingual pedagogy.

- c. Establish monitoring frameworks to track linguistic inclusivity in ODeL programmes.
- ii. For Instructional Designers and ODeL Providers:
  - a. Develop adaptive multilingual interfaces that allow learners to switch between English and local languages.
  - b. Integrate subtitles, voice-overs, and glossaries in major Zambian languages for all core content.
  - c. Co-design materials with learners and educators from diverse linguistic backgrounds.
- iii. For Educators and Trainers:
  - a. Participate in professional development on multilingual digital teaching strategies.
  - b. Advocate for institutional support to create and use localised ODeL resources.
- iv. For Future Research:
  - a. Conduct longitudinal mixed-methods studies to measure the impact of multilingual ODeL on learning outcomes.
  - b. Explore technology-enabled solutions such as AI-driven translation tools for low-resource languages.

The effective implementation of the above recommendations in the four categories regarding reimagining access and inclusion in 21st century education in Zambia, in terms of Language, Technology, and Equity in the ODeL Era.

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### **Conflict of Interest**

The authors declare that there is no conflict of interest regarding the publication of the paper or otherwise.

### **Authors' contributions**

The research was conducted by two scholars. The contributions of the authors are as follows:  
 Author PS: Conception/design, development of data collection instrument, analysis, interpretation of data, revised manuscript (30%)  
 Author RPAC: Conception/design, data collection, analysis, interpretation of data, editing and first draft (20%)  
 Author PS: Analysis and Interpretation of data (20%)  
 Author PS: Interpretation of data, first draft and revision (10%)  
 Author RPAC: Data collection, interpretation of data and first draft (10%)  
 Author RPAC: Interpretation of data, first draft and editing (10%)

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