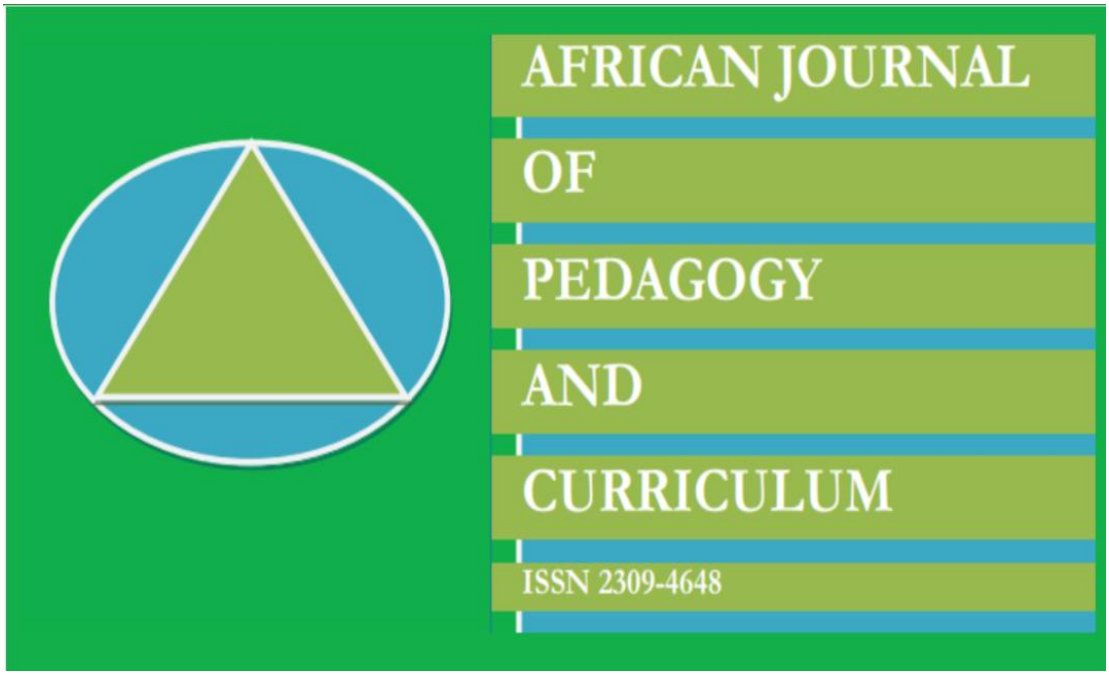

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Editorial Commentary

Advancing socially responsive and contextually relevant pedagogical approaches in curriculum transformation

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This issue of the AJOPAC brings together a rich and thought-provoking collection of scholarly contributions addressing some of the most pressing concerns in contemporary education. Across diverse contexts and methodological approaches, the articles collectively foreground themes of decolonisation, multilingualism, technological transformation, curriculum alignment, inclusive leadership, and sustainability. What emerges is a coherent, contextually grounded dialogue that speaks directly to the evolving realities of education in South Africa and across Sub-Saharan Africa. In view of the latter, advancing socially responsive and contextually relevant pedagogies is fundamental to curriculum transformation, as it enables educational practices to address the diverse socio-cultural realities, lived experiences, and epistemological needs of learners within contemporary society (Ladson-Billings, 2023). In my view, such pedagogical transformation fosters inclusive, equitable, and critically engaged learning environments that promote social justice, epistemic access, and the decolonisation of knowledge production in African and global education systems.

A central thread running through this issue is the imperative to re-centre indigenous knowledge systems and linguistic diversity in teaching and learning (Burgess et al., 2022; Hoppers, 2002). Hare (2012) explores this view, arguing that family literacy practices in rural communities offer a compelling case for embedding indigenous epistemologies in early literacy development. In the first article, ***Magxala and Seleke*** advance the decolonial project by showing how epistemic access can be enhanced when local knowledge systems are recognised as legitimate and valuable. In parallel, this issue engages deeply with the opportunities and challenges posed by technological advances, particularly artificial intelligence (AI) and prompt literacy, in higher education (Plaatjies & Van Wyk, 2025). In article two, ***Ntshangase, Mathebula and Mbatha's*** phenomenological study of AI offers a nuanced account of how students and educators navigate the promises and ethical tensions of emerging technologies. By foregrounding digital inequality and ethical responsibility, the article reminds us that technological innovation must be accompanied by critical reflection and robust governance frameworks. This aligns with broader concerns about ensuring that digital transformation does not reproduce or exacerbate existing inequalities within the education system. With reference to article three, ***Conteh and Camara*** examine issues in Business Law, Ethics, and Chemistry education. These studies reinforce the argument that language is not merely a medium of instruction but a critical resource for meaning-making, critical thinking, and problem-solving. The role of leadership and institutional practice is also brought into sharp focus by Taylor (2005). Article four, ***Mawela's*** study, focuses on instructional leadership in full-service schools and offers valuable insights into how inclusive curriculum delivery can be effectively supported in diverse learning environments. It underscores the importance of leadership practices that are not only administratively sound but also pedagogically responsive and socially just. Environmental sustainability emerges as another important dimension of this issue. A study by ***Tshivhase and Mawela*** reports on an exploratory study of environmental education in the Vhembe District, illustrating how education can play a pivotal role in shaping environmentally responsible behaviours and promoting sustainable living. By situating sustainability within local contexts, the article reinforces the idea that global challenges require locally grounded solutions, informed by community knowledge and participation. Similarly, in the article, ***Mbatha and Chonco*** used a single case study of curriculum alignment in a Community Education and Training (CET) college, highlighting systemic challenges that undermine coherence among policy, curriculum design, and classroom implementation. Together, these contributions underscore the need for stronger alignment among vision, practice, and context to achieve meaningful educational transformation. In article seven, ***Conteh and Camara*** reported on multilingualism and the Culturo-Techno-Contextual Approach (CTCA 2.0), which provides empirical evidence of the cognitive and pedagogical benefits of multilingual instruction. Closely related to these discussions is the strong emphasis on mother-tongue instruction as a driver of improved educational outcomes (Tshotsho, 2013). ***Kipkosgei*** reports on a longitudinal quasi-experimental study of STEM learning and school retention, making a significant empirical contribution by highlighting the transformative potential of sustained mother-tongue-based education. Its findings have important implications for policy and

curriculum reform across the region, particularly in contexts where linguistic marginalisation continues to undermine equitable access to quality education. In article nine, ***Mahlambi*** selected a qualitative study that offers a focused and relevant exploration of instructional leaders' perspectives on assessment to enhance teaching and learning. Grounding the analysis in Hallinger and Murphy's instructional leadership model provides a strong theoretical anchor and enhances its academic contribution. The emphasis on diverse assessment methods is particularly valuable for highlighting responsive, learner-centred practices within school improvement efforts. However, the study would benefit from deeper engagement with the contextual challenges in South African schools and clearer articulation of how these assessment approaches can be implemented sustainably across varied educational settings. With reference to the last article, ***Van Wyk*** reported on recent interest in online team-based learning (TBL) as a collaborative, flipped-pedagogy and student-centred teaching strategy that has increased within open distance e-learning spaces. This strategy enables student teachers to follow a structured process that enhances their active engagement, collective accountability, and team collaboration in the online teaching methodology economics course.

Although the contributions in this issue are diverse, they all aim to promote socially responsive and contextually relevant teaching methods. However, there are key areas that need further development. Improving methodological transparency, especially regarding data collection and analysis, would boost the credibility and reproducibility of certain studies. Additionally, more closely linking theoretical frameworks to empirical findings could deepen the work's scholarly value. Clarifying the policy and practice implications would also increase the research's overall impact.

Overall, this issue makes a significant contribution to ongoing debates in pedagogy and curriculum studies in the age of AI, digital transformation, and volatility, uncertainty, complexity and ambiguity (VUCA). It not only reflects the complexities and challenges of contemporary education but also offers innovative pathways to address them. By foregrounding indigenous knowledge, embracing linguistic diversity, critically engaging with technological change, and promoting inclusive and sustainable practices, the articles in this volume collectively advance a vision of education that is equitable, relevant, and transformative.

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Weaving Indigenous Knowledge into Early Literacy: Family Literacy Practices in Rural Communities for Decolonial Education and Epistemic Access

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ABSTRACT

This paper critically examines the intersection of language, culture, and indigenous knowledge in shaping family literacy practices within disadvantaged rural communities of South Africa. Drawing on the lived experiences of four isiXhosa-speaking families in the Eastern Cape Province, the study investigates how oral traditions, storytelling, local games, and everyday cultural activities contribute to children's early literacy development within a decolonial and epistemic access framework. The research is theoretically framed by Bronfenbrenner's Ecological Systems Theory and Bourdieu's concept of cultural capital, providing a nuanced analysis of how family and community-based knowledge systems operate as powerful literacy assets, despite historical marginalization in formal education systems. Utilizing a qualitative case study design with purposive sampling, data were collected through semi-structured interviews, participant observations, and cultural artefact analysis. The findings highlight how indigenous knowledge systems embedded in daily cultural practices function as legitimate epistemologies that promote cognitive development, identity formation, and academic readiness. The study advocates for the infusion of culturally responsive pedagogies, policy reforms, and decolonial approaches that affirm African epistemologies, promote epistemic justice, and bridge the gap between home-based literacies and formal schooling. This research contributes to ongoing scholarly debates on decolonisation, indigenous knowledge integration, and equitable literacy development in historically disadvantaged communities.

KEYWORDS: Indigenous Knowledge Systems; Family Literacy; Epistemic Access; Culturally Responsive Pedagogy; Early Literacy Development; African Epistemologies

INTRODUCTION

The legacy of colonial education systems across the African continent continues to marginalise indigenous epistemologies and family-based cultural practices within formal schooling (Abubakre, 2024; Abudu, 2022; Odora Hoppers, 2021). In South Africa, despite policy reforms aimed at addressing educational inequalities, rural communities, particularly those rooted in African knowledge systems, remain disadvantaged in their access

to literacy resources that affirm their linguistic and cultural heritage (Seleke, 2021). The dominant paradigms of literacy instruction continue to privilege Eurocentric, print-based approaches, often overlooking the rich oral traditions, storytelling practices, games, music, and everyday cultural activities that form the bedrock of literacy socialisation in many African homes (Williams & Martinez, 2023). Within this context, family literacy practices in rural communities are not simply informal precursors to formal schooling, but rather complex pedagogical processes rooted in indigenous knowledge systems (IKS), which embody alternative epistemologies that are legitimate and capable of fostering holistic child development (Odora Hoppers, 2021; Sibanda et al., 2025). These cultural practices offer pathways for promoting not only literacy development but also identity formation, critical consciousness, and epistemic access understood as equitable access to the full range of valid bits of knowledge within educational systems (Seleke, 2021; Seleke et al., 2019b).

The Epistemic Crisis in African Literacy Research

The marginalisation of African knowledge systems in mainstream literacy research and practice has resulted in what many decolonial scholars describe as an epistemic crisis, a systematic erasure of African ways of knowing, communicating, and transmitting knowledge (Melo, 2025; Ndimande, 2018; Ndlovu-Gatsheni & Schramm, 2024; Okech, 2020). The crisis is particularly acute in rural areas where schooling remains largely disconnected from children's lived experiences, linguistic resources, and cultural repertoires. Children arrive at school equipped with rich oral literacies acquired through storytelling, singing, communal games, and intergenerational dialogue, all deeply embedded within their socio-cultural ecologies, yet these assets are often rendered invisible in formal classrooms (Binesse et al., 2025; Bryce-Clegg, 2024).
This epistemic gap perpetuates unequal literacy outcomes, reinforces symbolic violence through cultural exclusion, and undermines the educational aspirations of rural African learners (Jackson, 2023; Omodan, 2023). Thus, addressing the epistemic injustice inherent in the literacy field requires serious engagement with indigenous knowledge systems and family literacy as legitimate foundations for early literacy development (Cindi, 2021; Mignolo, 2011; Mignolo, 2007). Against this backdrop, the present study seeks to examine how language, culture, and indigenous knowledge intersect to shape family literacy practices within disadvantaged rural communities of South Africa. In doing so, it contributes to the growing body of scholarship that advocates for the decolonisation of education and epistemic access for historically marginalised learners.

The study is guided by the following primary research question:

How do indigenous knowledge systems and cultural practices shape family literacy practices in disadvantaged rural communities, and how can these be leveraged to promote epistemic access in early literacy development?

Through qualitative engagement with isiXhosa-speaking families in the Eastern Cape Province, this study aims to illuminate the pedagogical value of indigenous family literacy practices, challenge the dominance of Western-centric literacy paradigms, and propose culturally responsive strategies for integrating African epistemologies into early literacy instruction.

Theoretical and Conceptual Framework

In examining how language, culture, and indigenous knowledge shape family literacy practices in rural South African communities, this study draws on a combination of complementary theoretical frameworks: Bronfenbrenner's Ecological Systems Theory, Bourdieu's Theory of Cultural Capital, and Decolonial Theory as applied to epistemic access. These frameworks offer a robust analytical lens for understanding how knowledge is produced, transmitted, and validated across multiple spheres of influence that affect children's early literacy development.

Bronfenbrenner's Ecological Systems Theory

Bronfenbrenner's Ecological Systems Theory posits that human development occurs within a complex, multi-layered system of interconnected environments, ranging from the microsystem (immediate family and home) to the macrosystem (broader cultural and societal forces)(Bronfenbrenner, 2013). In the context of family literacy, the home constitutes the primary microsystem where children are first exposed to linguistic practices, cultural

traditions, and early forms of knowledge transmission (Schwartz, 2024; Wasik & Herrmann, 2004). These experiences are heavily informed by the family's cultural beliefs, practices, and historical heritage, making indigenous knowledge an integral part of children's early literacy socialisation.
In rural South African communities, the microsystem is enriched by oral storytelling, music, traditional games, communal dialogue, and indigenous philosophies such as *Ubuntu* that foreground collective identity and relationality (Nnodim & Okigbo, 2024; Odora Hoppers, 2021; Seleke, 2021). The mesosystem, interactions between home, school, and community, often reveals tensions where formal education systems, grounded in Eurocentric curricula, fail to recognise the cultural capital embedded in indigenous family literacy practices (Bronfenbrenner, 2013; Falcone, 2024). The ecological model, therefore, underscores the need for educational interventions that do not isolate schools from the rich cultural contexts in which learners are embedded.

Bourdieu's Theory of Cultural Capital

Bourdieu's concept of cultural capital (Bourdieu, 2003; Branson & Miller, 2020; Musoba & Baez, 2009) provides critical insights into how particular forms of knowledge, language, and cultural practices are legitimised in formal education systems while others are devalued or excluded. Schools often privilege dominant linguistic codes, academic discourses, and Western-centric literacy norms, thereby marginalising the indigenous knowledge systems that many rural children bring from their homes (Ashrafova, 2025). Family literacy practices rooted in indigenous knowledge constitute a form of "alternative cultural capital"(Beel & Wallace, 2023) that is rarely acknowledged as valuable within formal education systems. These include oral narratives, local proverbs, indigenous languages, agricultural knowledge, ancestral wisdom, and communal learning systems (Hedegard, 2011; Odora Hoppers, 2021). Failure to validate these literacies contributes to epistemic exclusion and reproduces systemic inequalities that disadvantage rural learners from historically marginalised communities (Mathebula, 2019). Bourdieu's framework thus exposes how epistemic hierarchies in education systems perpetuate symbolic violence by delegitimising local knowledges and positioning them as inferior forms of literacy (Mignolo, 2011; Mutongoza, 2025). This study asserts that indigenous family literacy must be actively recognised as valid cultural capital that can enrich and transform early literacy education.

Decolonial Theory and Epistemic Access

Decolonial theory directly confronts the coloniality of knowledge that continues to structure educational systems globally and in South Africa specifically (Mignolo & Walsh, 2018; Ndlovu-Gatsheni & Schramm, 2024; Ndlovu & Woldegiorgis, 2024). The colonial project not only dispossessed African communities of land but also of epistemological authority, rendering African languages, cultural practices, and indigenous epistemologies peripheral to dominant knowledge hierarchies (Amuzu, 2025; Mignolo, 2007; Mutongoza, 2025; Odora Hoppers, 2021). The concept of *epistemic access*, coined by Morrow (2009), extends beyond physical access to schooling, advocating for equitable access to knowledge that recognises, values, and integrates diverse epistemologies. Without epistemic access, many African learners remain alienated within education systems that fail to connect with their cultural identities, linguistic resources, and ontological worldviews (Cross & Atinde, 2015; Lettau & Canyürek, 2025; Maina & Maringe, 2020). Decolonial scholarship calls for reconstituting the curriculum and pedagogy to affirm indigenous knowledge systems, dismantle epistemic hierarchies, and promote cognitive justice (Morreira et al., 2020). In the context of this study, decolonial theory offers a political and ethical imperative to reposition family-based literacy practices not as informal or deficient, but as legitimate expressions of African knowledge-making that deserve full incorporation into literacy education (Abubakre, 2024; Furo, 2018). To synthesise the study's theoretical orientation, Figure 1 illustrates the intersection of Bronfenbrenner's Ecological Systems Theory, Bourdieu's Cultural Capital Theory, and Decolonial Theory, which collectively frame the analysis of indigenous family literacy practices within rural isiXhosa-speaking communities.

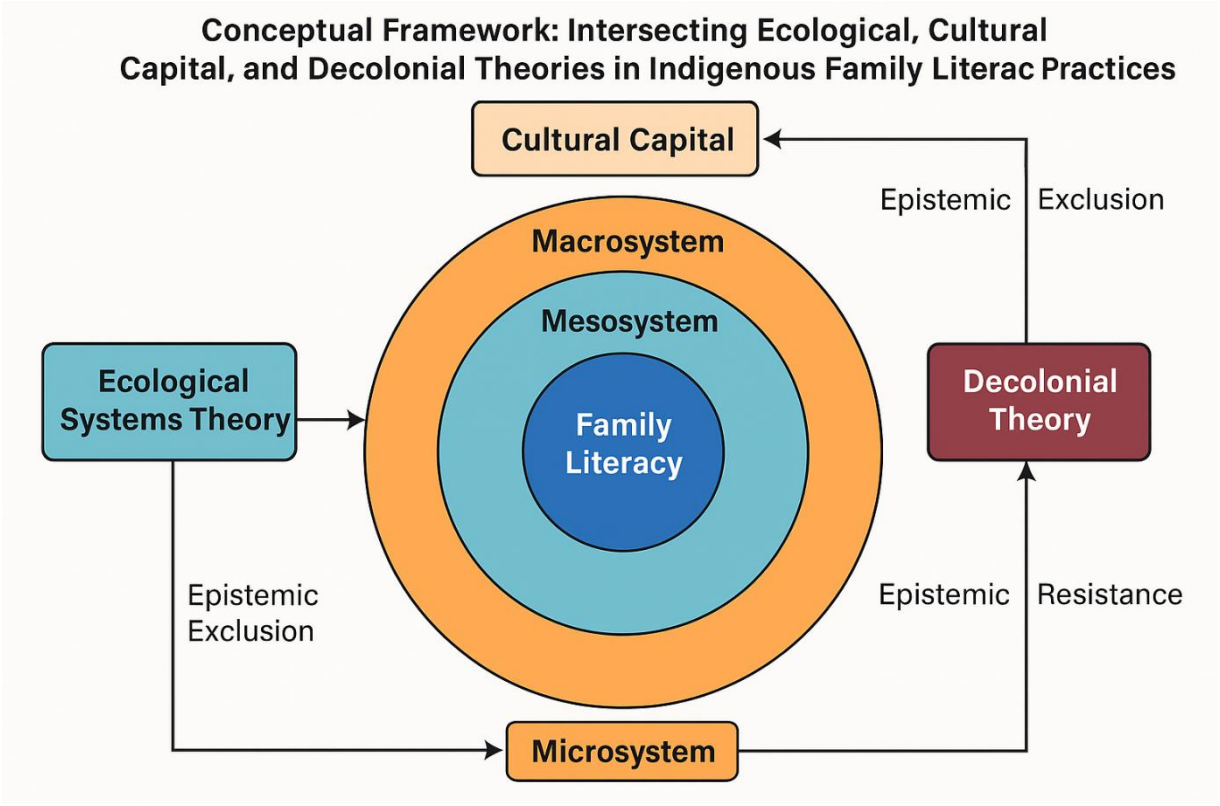

Figure 1: Conceptual Framework: Intersecting Ecological, Cultural Capital, and Decolonial Theories in Indigenous Family Literacy Practices (Magxala & Seleke, 2026)

As reflected in Figure 1, the conceptual framework positions family literacy as a culturally saturated process shaped by micro- and macro-level ecological influences, historical patterns of epistemic exclusion, and ongoing acts of epistemic resistance that challenge dominant Western-centric literacy paradigms.

LITERATURE REVIEW

Family Literacy Practices and Indigenous Knowledge

Family literacy has traditionally been defined as the informal ways in which families support children's emergent literacy development through home-based reading, storytelling, and other early language practices (Wasik & Herrmann, 2004; Williams & Martinez, 2023). In African contexts, however, family literacy must be understood more expansively, as it encompasses a wide range of indigenous cultural practices that function as rich forms of literacy socialisation outside of Western conventions of print-based reading and writing(Pindi, 2021; Sibanda et al., 2025). In many rural South African communities, storytelling (*intsomi*), oral history, ancestral knowledge, praise poetry (*izibongo*), idiomatic expressions, communal dialogues, and ritual performances play a central role in transmitting cultural values, language skills, historical consciousness, and cognitive development (Ndimande, 2018; Omodan, 2023). These practices are not simply peripheral or "supplementary" but constitute the very foundation of children's early literacy experiences and identity formation (Lettau & Canyürek, 2025; Mncube & Hadebe-Ndlovu). Indigenous knowledge systems offer alternative epistemologies that center collective knowledge, relationality, spirituality, ecological stewardship, and the wisdom of elders as vital sources of learning (Blose & Gumbo, 2024; Cindi, 2021; Odora Hoppers, 2021). As such, family literacy practices rooted in IKS are multidimensional, they promote not only language proficiency but also moral reasoning, cultural identity, and critical thinking(Seleke et al., 2025).

Oral Traditions as Literacy Resources

Oral traditions serve as critical pedagogical tools that transmit knowledge across generations. Storytelling, in particular, involves highly sophisticated cognitive processes such as narrative sequencing, moral reasoning, vocabulary acquisition, and audience engagement(Vygotsky, 1978). Through the telling of folktales, proverbs, and moral narratives, children in rural communities internalise cultural norms, linguistic structures, and ethical frameworks that shape their social behaviour and intellectual growth(Sibanda et al., 2025; Sihela & April, 2025). Additionally, traditional games such as *amagenda* (clapping games), *skip-rope chants*, or seasonal songs serve as embodied literacies where rhythm, memory, language, coordination, and social skills are simultaneously developed (Seleke et al., 2019a; Shive, 2025; Sianturi et al., 2025). These forms of "playful learning" function as epistemic tools that build foundational literacy competencies well before children encounter formal schooling (Peters & Mongeon-Ferré, 2025). Yet, such indigenous forms of literacy are often rendered invisible or undervalued in dominant educational discourses that equate literacy with Western, print-based competence alone (Kurniati & Mwariko, 2025; Wasik & Herrmann, 2004). This epistemic exclusion contributes to the marginalisation of African learners whose home literacies are positioned as deficient rather than as culturally rich and educationally valuable (Cross & Atinde, 2015; Omodan, 2023; Seleke, 2021).

Decolonial Perspectives on Early Literacy in African Contexts

Decolonial scholars argue that the crisis in African literacy research is fundamentally an epistemic one, rooted in colonial histories that continue to structure what counts as legitimate knowledge within education systems(Chilisa, 2024; Ndlovu-Gatsheni & Schramm, 2024; Ndlovu & Woldegiorgis, 2024). The continued dominance of Western-centric literacy models reinforces symbolic violence (Bourdieu, 2003) and perpetuates educational inequalities by erasing indigenous epistemologies from curricula, pedagogy, and assessment practices (Mignolo, 2011).
In response, African scholars advocate for decolonising literacy education by:

- Validating indigenous knowledge systems as credible epistemologies(Odora Hoppers, 2021; Semali, 2024).
- Promoting *epistemic access* by recognising learners' home languages, cultural practices, and lived realities as starting points for formal education (Morrow, 2009).
- Redesigning curricula that foster *cognitive justice* , the equitable coexistence of multiple knowledge systems within formal schooling (Shizha, 2025).
- Training teachers to adopt culturally responsive pedagogies that leverage learners' linguistic repertoires and cultural capital (Seleke et al., 2019b; Seleke et al., 2025).

As Uzuegbunam (2025) asserts, require not merely additive inclusion of indigenous content but a structural rethinking of knowledge production and pedagogical authority within educational institutions. Within the South African policy context, curriculum frameworks such as CAPS (Curriculum and Assessment Policy Statement) have made limited progress in meaningfully integrating IKS into literacy education (Cindi, 2021). Without intentional decolonial reform, these policy frameworks risk reproducing epistemic inequalities under the guise of multiculturalism or surface-level inclusivity (Jansen, 2019, 2023).

Locating This Study

This study is situated within this decolonial scholarly agenda, advocating for a reconceptualisation of family literacy not as a pre-formal or preparatory practice but as a fully fledged educational space where indigenous knowledge, language acquisition, cultural identity, and moral formation are actively constructed. In doing so, it challenges the epistemic hegemony of dominant literacy paradigms and contributes to ongoing debates about epistemic access, decolonial justice, and transformative literacy education for historically marginalised communities in South Africa.

METHODOLOGY

This study employed a qualitative, interpretive research design rooted in decolonial and indigenous research paradigms to explore how language, culture, and indigenous knowledge systems inform family literacy practices within disadvantaged rural communities of South Africa (Hatch, 2023). Recognising the historical

marginalisation of African knowledge systems in mainstream educational research, the study adopted an ontological position that privileges participants' lived experiences, cultural epistemologies, and linguistic resources as valid and authoritative sources of knowledge (Abidogun & Falola, 2020). Drawing on interpretivist assumptions that reality is socially constructed and deeply situated in cultural and historical contexts, this approach allowed for an in-depth, context-sensitive investigation of how indigenous literacy practices operate in natural family settings (Osei-Tutu, 2023). The study specifically utilised a qualitative case study design, focusing on four isiXhosa-speaking families in the Eastern Cape Province, chosen purposively to capture the diversity, richness, and complexity of family literacy practices in rural environments. Rather than treating these participants as objects of study, they were engaged as co-constructors of knowledge, with the research process intentionally structured to reflect relational ethics, communal accountability, and cultural sensitivity. Data collection combined semi-structured interviews, participant observations, and audio-visual documentation of storytelling sessions, music performances, and traditional games. This multi-method approach generated rich, textured narratives that illuminated how family literacy practices are intertwined with cultural identity formation, intergenerational knowledge transmission, and early literacy acquisition. Throughout the process, the researcher maintained reflexive journals to interrogate positionality and power dynamics inherent in conducting research with historically marginalised communities.

The collected data were subjected to thematic analysis, following a recursive process of coding, categorisation, and interpretation that sought to capture both explicit themes and latent cultural meanings embedded within participants' narratives and observed practices (Braun & Clarke, 2019). The analysis was conducted with deep sensitivity to the cultural integrity of indigenous knowledge systems, drawing on theoretical frameworks that recognise how home-based literacies function as legitimate epistemologies often excluded from formal education systems. Bronfenbrenner's ecological systems theory offered an organising lens for interpreting the multilayered social environments in which literacy is developed, while Bourdieu's concept of cultural capital illuminated how dominant schooling practices often devalue indigenous literacy assets(Nolan & Owen, 2024). Simultaneously, decolonial theory foregrounded the epistemic injustices inherent in educational structures that privilege Eurocentric literacy models while marginalising African epistemologies(Mutongoza, 2025; Ngulube, 2025). Ethical considerations throughout the study adhered to indigenous research protocols that prioritise respect, non-maleficence, informed consent, anonymity, and relational accountability(DeHass et al., 2025). Participants were engaged in culturally appropriate ways, with consent processes conducted in isiXhosa to ensure full understanding, and with careful attention paid to sustaining trust, reciprocity, and respect for community values. This decolonially-informed methodological approach thus enabled the study to capture not only the descriptive dimensions of family literacy but also its deeper epistemic significance within the broader struggle for cognitive justice and decolonial educational transformation(Maile, 2024; Shizha, 2025).

FINDINGS

The findings of this study present a deeply textured account of how indigenous knowledge systems (IKS), cultural practices, and language converge to structure early literacy development in rural isiXhosa-speaking families. Contrary to dominant Western-centric definitions of literacy that narrowly frame it as the ability to decode written texts, the families in this study enacted complex and multi-dimensional literacy practices grounded in oral traditions, embodied cultural activities, and intergenerational knowledge transmission. These practices collectively served as legitimate epistemic spaces where young children acquired not only foundational literacy skills but also identity, moral reasoning, and social belonging(Seleke et al., 2019b; Seleke et al., 2025). The richness of these indigenous literacy ecologies demonstrates that family literacy in rural African contexts is not a peripheral or compensatory activity, but rather a robust, culturally embedded process that sustains intellectual, cultural, and cognitive development(Seleke et al., 2019b). Figure 2 presents a synthesis of the empirical findings, illustrating the interconnected family literacy ecology in which storytelling, games, music, and oral traditions interact to foster linguistic development, cultural identity, cognitive growth, and moral reasoning among children.

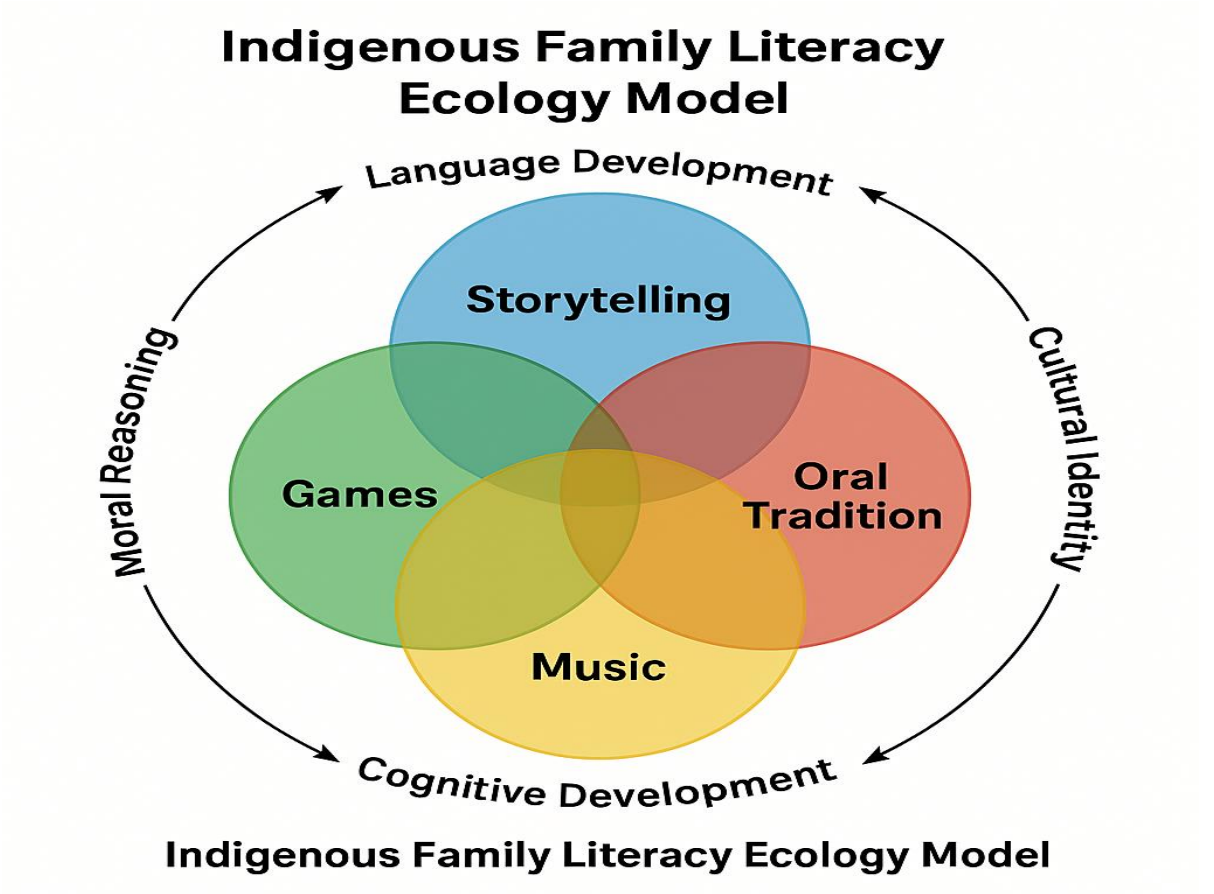

Figure 2: Indigenous Family Literacy Ecology Model (Magxala & Seleke, 2026)

As depicted in Figure 2, indigenous family literacy practices function as holistic and dynamic systems that transcend narrow Western-centric definitions of literacy, simultaneously cultivating multiple developmental domains within culturally embedded learning environments.

Central to these family literacy practices was storytelling (*intsomi*), which functioned as the primary pedagogical vehicle for transmitting language, culture, and epistemology(Mncube & Hadebe-Ndlovu; Ndlovu & Gumbo, 2024). The storytelling sessions, often held in the evenings around the hearth or during communal gatherings, involved elaborate performances that included song, rhythm, gesture, and audience participation(Mojapelo, 2020).

As explained by one grandmother, MaNdlovu:
"Every evening, when the work is done, I sit with the children and tell them stories from my mother and her mother before her. They listen, they ask questions, and they learn about who we are."

These narratives were infused with indigenous moral lessons, historical memory, social values, and spiritual wisdom, effectively blending cognitive, ethical, and linguistic development(Osei-Tutu, 2023). The children were not passive recipients but active participants who engaged in asking clarifying questions, interpreting characters' motives, and sometimes contributing alternative endings, thus fostering higher-order thinking skills. Vygotsky's (1978) theory of the social construction of knowledge is visible here, as language development unfolded within the zone of proximal development through guided interaction with more knowledgeable elders.

In addition to storytelling, traditional games played a vital role in promoting literacy competencies, particularly in developing children's phonological awareness, sequencing abilities, memory, and cognitive flexibility(Madima, 2021). During one observation, a group of children engaged in a skipping rope game, synchronizing their movements while reciting the months of the year in English: *"January, February, March..."* The rhythmic structure of the game required not only linguistic recall but also precise timing, coordination, and

peer collaboration. These embodied literacies demonstrate how play, far from being peripheral, serves as an epistemic tool for cognitive scaffolding. As one parent, Mama Zanele, reflected:
"They are learning even when they play. Their tongues know the words, their feet know the rhythm. They teach each other without a teacher."
This observation echoes Asea (2022) and Martinez-Vargas et al. (2025)'s notion of " Epistemic decoloniality," where the community's collective intellectual resources serve as organic learning platforms.
The integration of music and oral performance into family literacy practices emerged as another powerful site of knowledge production and identity formation. The children's creative engagement with rap music, often blending isiXhosa and English, showcased linguistic hybridity, narrative fluency, and cultural innovation.

One child, Likho, performed his self-composed lyrics:
"Igama lam nguPaul, ndihlala eBhofolo, imin'imqaba-qaba, ndidl'umnqgosho everyday uDud' uswelekile sisifo seswekile."

In this brief yet sophisticated verse, Likho embedded elements of personal identity ("my name is Paul"), geographical affiliation ("I live in Bhofolo"), and social commentary ("diabetes took Dud'"). This creative linguistic practice demonstrated the child's ability to negotiate multiple cultural and linguistic registers, embodying Tyler (2023)'s concept of "translanguaging as epistemic access." Furthermore, the use of music as a literacy tool reflects the flexibility and adaptability of indigenous knowledge systems, where ancient oral traditions seamlessly converge with contemporary global influences, while still retaining their epistemic function in literacy development(Siziba & Maseko, 2023).

Crucially, these findings reveal that such indigenous literacy practices are not only mechanisms for language acquisition but also for cultural identity formation and epistemological grounding. The children internalised not only linguistic structures but also collective histories, ethical frameworks, and ontological orientations rooted in Ubuntu philosophy, which emphasises relationality, reciprocity, and communal responsibility (Seleke, 2021) .

As one elder, Tata Sipho, explained:
"When we tell stories, we remind the children that they belong to the community, not just to themselves. Our words give them life and wisdom."
Thus, literacy development in this context cannot be separated from the child's moral, social, and cultural becoming, a process that extends far beyond the narrow metrics typically used to assess reading proficiency in Western schooling systems.

However, despite the strength and depth of these indigenous family literacy ecologies, the study also uncovered significant epistemic tensions as children transition into formal schooling environments that remain deeply entrenched in colonial linguistic hierarchies and Eurocentric literacy norms. Schools privileged English as the sole language of literacy and assessed reading competencies almost exclusively through decontextualised, print-based texts.

As Tata Mthetho lamented:
"At school, they want only books, only English. They do not ask what the child knows from home."
This systemic disregard for home-based literacies constitutes a form of epistemic violence (Cross & Atinde, 2015), whereby indigenous ways of knowing are rendered invisible, illegitimate, or irrelevant within formal schooling spaces. Children are thus positioned as linguistically and academically deficient despite possessing rich cultural and cognitive literacies cultivated through home practices.

The persistent privileging of print-based, monolingual, and Western literacy frameworks reflects the coloniality of knowledge that still shapes South Africa's education system(Asea, 2022; Melo, 2024; Mignolo, 2011). This epistemic exclusion not only undermines children's confidence and sense of belonging in the classroom but also reproduces historical inequalities by denying them access to pedagogies that build on their lived experiences and cultural capital(Mignolo & Walsh, 2018; Ndlovu & Woldegiorgis, 2024; Temin, 2024). Yet, the resilience demonstrated by these families in preserving and innovating their indigenous literacy practices constitutes a powerful act of epistemic resistance. They sustain intellectual sovereignty in the face of epistemic erasure, reaffirming the viability of indigenous knowledge systems as legitimate sites of early literacy development. The findings from this study confirm that indigenous family literacy practices offer sophisticated and legitimate pathways for early cognitive and linguistic development, moral formation, and identity construction(Seleke et al., 2025). They also expose the epistemic injustices perpetuated by formal education systems that refuse to

engage with these knowledge systems on equal footing(Ndlovu-Gatsheni & Schramm, 2024). The data strongly suggest that addressing literacy challenges in historically marginalised communities requires more than simply providing access to books or formal schooling; it demands a fundamental epistemological shift towards educational models that value, integrate, and sustain the cultural and linguistic capital that children bring from their homes. Such a shift is necessary for achieving epistemic access, cognitive justice, and truly decolonised literacy education in South Africa(Cross & Atinde, 2015; Odora Hoppers, 2021; Shizha, 2025).

DISCUSSION

The findings of this study illuminate the profound disjuncture between the lived literacy experiences of rural isiXhosa-speaking families and the dominant literacy models institutionalised within South African formal schooling. At the heart of this disjuncture lies an ongoing epistemic conflict: on one hand, the rich, multi-layered indigenous knowledge systems that continue to flourish within families and communities; on the other, an education system still heavily structured by colonial legacies that continue to privilege Western epistemologies, monolingualism, and decontextualised print literacy as the only valid forms of knowledge transmission. This conflict is neither accidental nor neutral, but a direct consequence of what Feldman (2019) has termed *epistemicide*, the systematic erasure and delegitimisation of non-Western ways of knowing through the historical violence of colonialism. To further conceptualise the epistemic conflict at the heart of South African literacy education, Figure 3 illustrates the tensions between formal school literacies and indigenous family literacies, while highlighting epistemic access as the bridge toward cognitive justice.

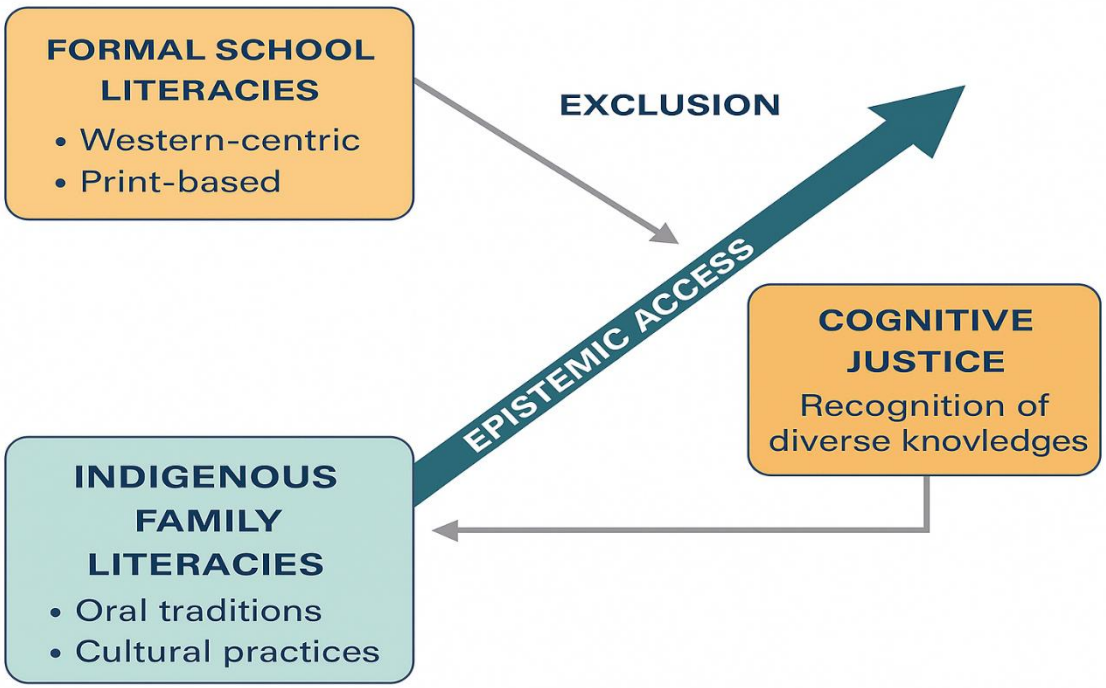

Figure 3: Epistemic Tension and Epistemic Access Model (Magxala & Seleke, 2026)

As illustrated in Figure 3, achieving epistemic access requires transforming the educational interface where school systems move beyond exclusionary paradigms to recognise and integrate indigenous knowledge systems into literacy instruction and assessment.

The children's rich oral repertoires, the sophisticated narrative and moral reasoning observed in storytelling, the linguistic hybridity demonstrated in musical expressions, and the embodied literacy competencies embedded in traditional games, all point to the existence of alternative literacy ecologies that challenge dominant conceptions of what literacy entails. As highlighted by Bourdieu (2003)'s theory of cultural capital, formal schooling institutions valorise particular forms of linguistic and cultural capital, predominantly white, middle-class, and Eurocentric, while dismissing the cultural assets brought by rural African children as irrelevant or inferior. This exclusion creates what Babu et al. (2025)describes as *epistemic injustice*, wherein learners are denied full

participation in knowledge production simply because their home literacies are not formally recognised as legitimate within school-based epistemic structures. The implications of these findings reinforce the urgent call for the decolonisation of literacy education. Decolonisation, as argued by Ndlovu-Gatsheni and Schramm (2024), demands more than the surface inclusion of African cultural artefacts into curricula; it requires a fundamental restructuring of the epistemic frameworks that govern what counts as knowledge, whose knowledge is valued, and whose knowledge is taught. In the South African context, the continued hegemony of English and the marginalisation of indigenous African languages such as isiXhosa in early literacy instruction reflects an enduring coloniality of power and knowledge that directly undermines the constitutional vision of equity and inclusion (Seleke et al., 2025).

Moreover, the findings resonate strongly with Morrow (2009)'s concept of epistemological access, which posits that true access to education cannot be achieved through physical enrolment alone, but must include access to knowledge that is intelligible, meaningful, and affirming to learners lived realities. The cultural knowledge, linguistic resources, and epistemic frameworks that rural children acquire at home constitute the foundations upon which epistemological access should be constructed(Mignolo, 2007). Instead, current schooling models often force children to navigate alien literacy terrains that disconnect them from their home identities, leading to educational alienation, early literacy failure, and ultimately systemic underachievement (Odora Hoppers, 2021). The result is a form of structural epistemic exclusion that perpetuates not only inequality in literacy outcomes but also broader patterns of social and cognitive marginalisation. However, the resilience of the families studied, their determination to preserve, innovate, and transmit their cultural knowledge to the next generation , represents a powerful act of epistemic resistance. These families demonstrate that, even in the absence of institutional support, indigenous literacy practices remain vibrant, adaptable, and pedagogically effective(Omodan, 2023). Their literacy practices are not static relics of tradition but dynamic, living knowledge systems capable of responding to contemporary linguistic and cultural shifts while remaining deeply anchored in African worldviews (Seleke et al., 2019b).

Critically, these findings challenge educators, curriculum designers, and policymakers to move beyond tokenistic multiculturalism towards culturally sustaining pedagogies (Seleke, 2021; Seleke et al., 2025), which do not simply include indigenous knowledge as peripheral enrichment but position it as a central organising principle in the development of early literacy curricula. Such approaches require deliberate teacher training programs that prepare educators to recognise, value, and work with the full linguistic repertoires and cultural capital that learners bring to school. This also requires radical shifts in assessment practices to account for multiple literacies, oral, performative, embodied, and written, rather than narrowly assessing reading and writing in isolation from their broader cultural contexts. Ultimately, the discussion presented here aligns with broader cognitive justice discourses, which assert that all knowledge systems deserve equal recognition and protection(Shizha, 2025). Indigenous family literacy practices embody not only valid educational pathways for children's linguistic and cognitive development but also represent a form of cultural sovereignty and epistemic dignity that must be protected if South African education is to truly transform(Maile, 2024). The persistence of these indigenous literacy ecologies offers a blueprint for more inclusive, contextually relevant, and epistemically just educational systems that advance the goals of both social equity and decolonial educational transformation.

Implications for Policy and Practice

The findings of this study offer urgent and far-reaching implications for educational policy, curriculum design, teacher preparation, and systemic reform in South Africa and other postcolonial contexts facing similar epistemic inequalities. At its core, this study challenges prevailing literacy policies that continue to reproduce colonial hierarchies of knowledge by privileging Eurocentric, print-based, monolingual conceptions of literacy while rendering indigenous knowledge systems (IKS) invisible in both curriculum and pedagogy. If education systems are to become vehicles of genuine epistemic access, cognitive justice, and decolonial transformation, they must undergo fundamental structural and epistemological reorientation to meaningfully integrate and legitimise indigenous family literacy practices as valid and generative sources of knowledge. Figure 4 below presents a decolonial literacy transformation model that synthesises the study's key recommendations for policy, teacher education, curriculum reform, community engagement, and systemic epistemological restructuring.

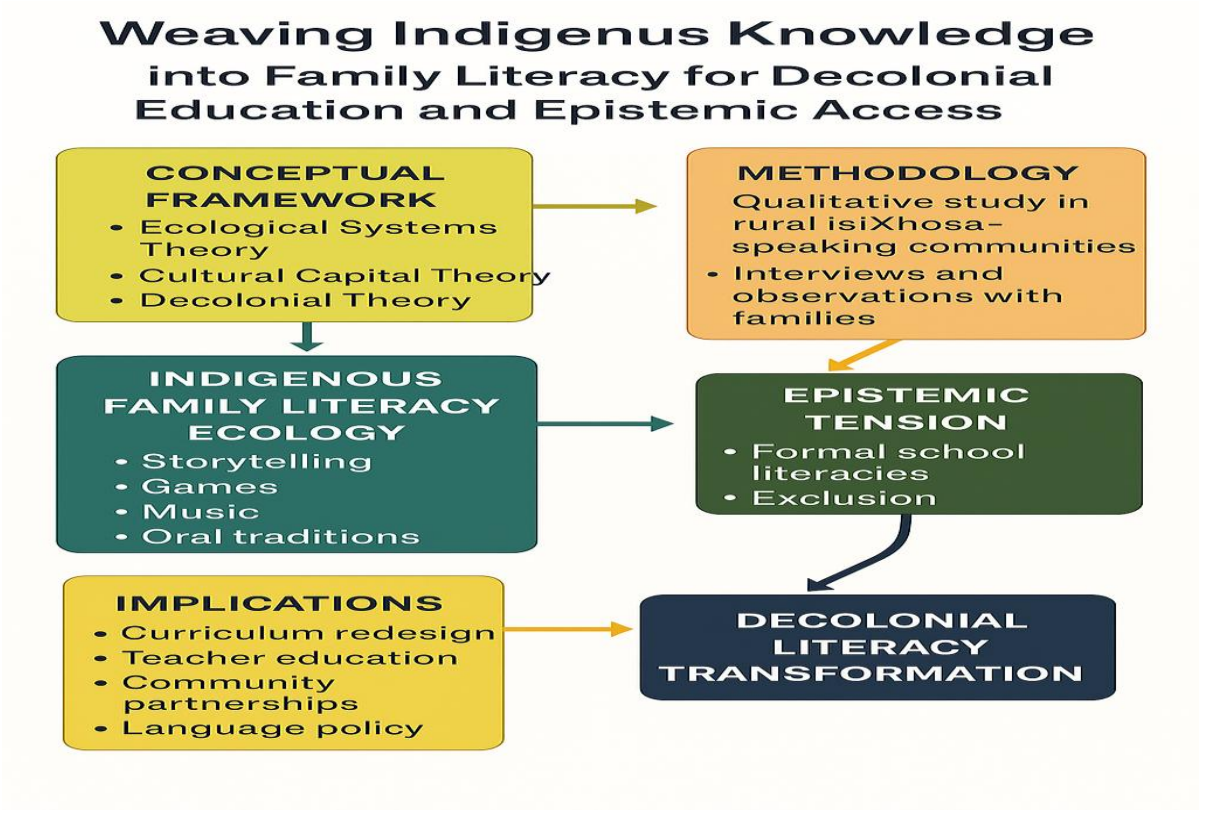

Figure 4: Decolonial Literacy Transformation Model (Magxala & Seleke, 2026)

As illustrated in Figure 4 above, achieving meaningful transformation in literacy education demands simultaneous reform across multiple systemic levels, guided by the principles of cognitive justice, epistemic access, and the integration of indigenous knowledge systems.

Firstly, curriculum policy must be fundamentally reimagined to embed indigenous knowledge systems not as marginal or supplemental content but as foundational epistemic frameworks that inform the entire literacy development process. The existing Curriculum and Assessment Policy Statement (CAPS) offers some rhetorical space for cultural inclusion; however, its practical application remains largely superficial, offering minimal engagement with indigenous ontologies and epistemologies(Cindi, 2021). Literacy curricula must move beyond merely inserting African proverbs or folktales into textbooks, towards structurally recognising storytelling, oral traditions, communal learning, and indigenous moral reasoning as core components of early literacy pedagogy. The privileging of English as the primary language of instruction and assessment must also be interrogated, as it continues to marginalise the mother tongues through which children first acquire cognitive and linguistic competencies in the home (Seleke et al., 2025). Policies that strengthen mother tongue-based bilingual education would not only enhance literacy outcomes but would also affirm the linguistic dignity of African learners.

Secondly, teacher education programs must urgently incorporate culturally responsive and decolonial pedagogies that equip teachers to work competently and respectfully with the diverse linguistic, cultural, and epistemic resources that children bring to the classroom. Most current teacher preparation models remain locked within Western pedagogical paradigms that leave many educators ill-equipped to recognise and integrate indigenous family literacy practices into their classrooms (Selepe, 2021). Pre-service and in-service teacher training must foreground indigenous research methodologies, epistemic humility, linguistic pluralism, and culturally sustaining pedagogies (Odora Hoppers, 2021). Teachers should be trained to observe, listen to, and draw upon the family literacy ecologies of their learners, using these as the foundation for classroom literacy instruction rather than dismissing them as irrelevant or non-academic. Such training would not only enhance classroom inclusivity but also contribute to building epistemic bridges between home and school that support holistic learner development(Seleke, 2021).

Thirdly, educational leadership and institutional governance structures must foster systemic shifts that enable the recognition of indigenous knowledge as a living and evolving body of educational resources. This includes

revisiting textbook development processes, language-in-education policies, teacher appraisal systems, and assessment frameworks to ensure they are aligned with the broader goals of decolonisation and cognitive justice(Odora Hoppers, 2021). Assessment regimes, for example, must evolve beyond rigid standardised tests towards multi-modal, context-sensitive assessments that capture children's oral proficiency, narrative competence, performative literacies, and culturally embedded reasoning processes (Hlengwa-Selepe, 2024). Without reformed assessment systems, even the most progressive curriculum reforms may fall short, as learners will continue to be judged through deficit-oriented lenses that ignore their cultural assets.
Furthermore, community partnerships and parental involvement should be institutionalised as critical sites for co-constructing literacy education. The families participating in this study demonstrated that indigenous knowledge is not owned by formal institutions but lives within communities, elders, and intergenerational interactions. Policymakers and school leaders should create structured spaces for meaningful engagement with parents, elders, cultural knowledge holders, and traditional storytellers, ensuring their voices inform curriculum development and classroom practice (Chilisa, 2024). Such partnerships would not only foster more culturally relevant literacy environments but would also challenge the historical boundary that has long separated home literacy practices from formal schooling.

Finally, this study reinforces the need for ongoing decolonial scholarship and indigenous knowledge research to inform education policy, practice, and theory(Madima & Makananise, 2025). South Africa's education system, like many in the Global South, remains embedded in historical legacies that systematically delegitimise African ways of knowing. Sustained investment in indigenous research centres, policy think tanks, and academic programs focused on IKS can play a critical role in ensuring that decolonial literacy models move beyond isolated interventions towards becoming normative practice within national education systems(Manyike & Shava, 2018). Realising the transformative potential of indigenous family literacy practices requires dismantling the epistemological and structural barriers that continue to confine African learners within educational systems that neither reflect their lived realities nor affirm their cultural capital. Only through deliberate, sustained, and system-wide reform can South Africa meaningfully pursue a literacy agenda that delivers epistemic access, cognitive justice, and decolonised educational futures for all its children(Omodan, 2024).

CONCLUSION

This study has critically examined the intersection of language, culture, and indigenous knowledge systems in shaping family literacy practices within rural isiXhosa-speaking communities of South Africa. The evidence presented here profoundly challenges conventional, Western-centric definitions of literacy that dominate formal education systems, demonstrating instead that African rural families engage in rich, sophisticated, and culturally embedded literacy practices that serve as legitimate sites of knowledge transmission and cognitive development. Through storytelling, traditional games, oral performance, music, and intergenerational dialogue, families enact multi-dimensional literacy ecologies that simultaneously promote linguistic proficiency, narrative competence, cultural identity formation, moral reasoning, and social belonging. The study's findings expose the persistent epistemic injustice embedded within formal schooling structures that continue to privilege Eurocentric, print-dominant, and monolingual literacy models while systematically excluding the linguistic and cultural capital rural African children bring from their homes. These exclusions, deeply rooted in the coloniality of knowledge, not only undermine children's early literacy trajectories but also reproduce broader educational inequalities that obstruct meaningful epistemic access. The resilience of the families documented here stands as a powerful form of epistemic resistance, evidence that indigenous literacy practices remain vibrant, generative, and pedagogically potent even in the face of institutional marginalisation. Situated within the broader decolonial turn in education, this study contributes to the growing body of scholarship that calls for an urgent epistemological restructuring of literacy education in South Africa and other postcolonial societies. True transformation will not be realised through surface-level inclusion of cultural artefacts but through the full recognition of indigenous knowledge systems as co-equal and co-constitutive epistemologies that deserve central placement within curriculum design, teacher training, assessment practices, and educational policy. Only through such fundamental reforms can education systems advance the goals of epistemic justice, cognitive sovereignty, and inclusive educational futures that are truly responsive to the complex linguistic and cultural realities of African learners. This study reaffirms that family literacy is not peripheral to the formal schooling project but is instead a central, dynamic, and indispensable epistemic resource. For South Africa to fulfil its constitutional commitment to educational equity and social justice, literacy development must be reimagined as a space where multiple knowledge systems, languages, and cultural worldviews are not only recognised but celebrated and sustained. This is the ethical and intellectual challenge that decolonial literacy scholarship presents to both researchers and

practitioners, and one that this study humbly seeks to advance.

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Artificial intelligence in education: A phenomenological study of opportunities, ethical tensions, and digital inequality in South African universities

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ABSTRACT
The integration of artificial intelligence (AI) into education is reshaping teaching, learning, and institutional administration worldwide. AI technologies offer significant opportunities for personalised learning, improved efficiency, and enhanced academic support. However, their adoption also raises important ethical, pedagogical, and structural concerns, particularly in contexts characterised by digital inequality. The purpose of this qualitative study is to explore stakeholder experiences and perceptions of artificial intelligence integration within South African higher education institutions. Using a phenomenological research design, data were collected through semi-structured interviews with 24 participants, including educators, students, and educational technology specialists from three universities. Thematic analysis revealed four key themes: (1) AI as a catalyst for personalised and flexible learning, (2) AI-driven efficiency in teaching and administrative tasks, (3) ethical concerns relating to privacy, surveillance, and algorithmic bias, and (4) structural challenges associated with digital inequality and institutional readiness. The findings indicate that while AI has considerable potential to enhance learning outcomes and institutional efficiency, its successful implementation depends on contextual factors such as infrastructure, digital literacy, and institutional policy frameworks. By combining Technological Pedagogical Content Knowledge (TPACK) and Critical Digital Pedagogy (CDP), the study contributes a Global South perspective on the socio-technical dynamics of AI integration in higher education. The paper concludes with recommendations for ethical governance, educator capacity development, and inclusive digital infrastructure to support responsible AI adoption in universities.

Keywords: Artificial intelligence in education; Higher education; Digital inequality; Technological Pedagogical Content Knowledge (TPACK); Critical Digital Pedagogy

INTRODUCTION

Artificial intelligence (AI) has emerged as one of the most transformative technological developments influencing contemporary education systems. AI-enabled tools such as adaptive learning platforms, automated feedback systems, and learning analytics are increasingly being integrated into higher education institutions worldwide. These technologies have the potential to reshape teaching practices, enhance student learning experiences, and improve institutional decision-making processes. Scholars have highlighted the potential of AI to support personalised learning, provide real-time feedback, and assist educators in managing large and diverse student populations (Holmes et al., 2022; Zawacki-Richter et al., 2021).

In higher education, AI applications extend beyond instructional support to include administrative processes such as grading, plagiarism detection, student advising, and performance monitoring (Van Wyk, 2025). By automating routine tasks and generating insights from large datasets, AI systems may enable educators to focus more on higher-order pedagogical activities such as mentoring, conceptual explanation, and curriculum development (Luckin, 2021). Consequently, AI is increasingly positioned as a key driver of innovation within digital learning environments (Bernacki et al, 2021).

However, the integration of AI in education also raises important ethical, pedagogical, and institutional concerns, such as the risk of copying and plagiarism. Scholars have pointed to issues such as algorithmic bias, data privacy, and the potential for increased surveillance within digital learning environments (Benjamin, 2019; Williamson & Eynon, 2020; Van Wyk, 2024; Plaatjies et al, 2025). These concerns are particularly relevant in contexts where educational institutions operate within unequal socio-economic conditions. In such settings, technological innovations may inadvertently reproduce or intensify existing disparities in access to resources, digital literacy, and educational opportunities.

Scholars like Van Wyk (2024) have examined the opportunities and potential threats associated with the use of AI, such as ChatGPT, in academia. Although AI technologies have the potential to enhance educational access and learning outcomes, their implementation occurs in contexts where many students face limitations in access to devices, internet connectivity, and technological support (Van Wyk, 2025). As a result, the integration of AI in higher education may simultaneously create opportunities for innovation while also raising concerns regarding digital exclusion and institutional preparedness (Bernacki et al, 2021).

Despite the growing global interest in AI-supported education, empirical research, such as that by Tang et al. (2023), exploring the lived experiences of stakeholders in developing and unequal contexts remains limited. Much of the existing literature, like that cited in this study, focuses on technological capabilities or quantitative evaluations of AI-based systems, with fewer studies examining how educators, students, and educational technology specialists interpret and experience AI adoption within their institutional environments. Understanding these perspectives is essential for developing context-sensitive strategies for responsible AI implementation in higher education.

Research Problem

Although artificial intelligence is increasingly being integrated into higher education systems worldwide, limited qualitative research has examined how key stakeholders experience and interpret AI adoption within contexts characterised by digital inequality and institutional diversity. In South Africa, where higher education institutions differ significantly in technological infrastructure and socio-economic contexts, the integration of AI may both enhance educational opportunities and reproduce existing disparities. However, little empirical evidence exists regarding how educators, students, and educational technology specialists perceive the opportunities, ethical implications, and institutional challenges associated with AI integration in these contexts.

Research Objective

The objective of this study is to explore stakeholders' experiences and perceptions of the integration of artificial intelligence in South African universities.

Research Question

The study was guided by the following research question: How do educators, students, and educational technology specialists experience and interpret the opportunities, ethical concerns, and institutional challenges associated with the integration of artificial intelligence in three South African higher education institutions?

Contribution of the Study

This study contributes to the growing literature on artificial intelligence in education in three important ways. First, it provides empirical insight from the Global South, where technological adoption occurs within contexts characterised by digital inequality and resource disparities. Second, by integrating the Technological Pedagogical Content Knowledge (TPACK) framework with Critical Digital Pedagogy (CDP), the study offers a theoretically informed perspective that connects technological innovation with pedagogical practice and ethical considerations. Third, the findings provide practical insights for policymakers and higher education institutions seeking to implement AI technologies in ways that are pedagogically meaningful, ethically responsible, and socially inclusive.

LITERATURE REVIEW

The integration of artificial intelligence (AI) into education has generated significant scholarly interest over the past decade. Rapid advances in machine learning, natural language processing, and data analytics have expanded the possibilities for automated educational systems that support teaching, learning, and institutional decision-making. As a result, researchers increasingly explore how AI technologies influence pedagogical practices, student learning experiences, and governance structures within higher education. While much of the early scholarship focused on the technological capabilities of AI systems, more recent studies emphasise the socio-technical implications of AI adoption, including ethical concerns, institutional readiness, and digital inequalities. This literature review synthesises key debates within the field and examines four central areas: AI-supported personalised learning, AI-driven efficiency in educational systems, ethical and governance concerns, and the implications of digital inequality for AI adoption in higher education.

Artificial Intelligence and Personalised Learning

One of the most widely discussed benefits of AI in education is its potential to enable personalised learning. Personalised learning refers to instructional approaches that adapt learning pathways, content, and feedback to the needs, abilities, and preferences of individual learners (Bernacki et al, 202; Donevvska-Todorova et al, 2022). AI systems such as intelligent tutoring systems, adaptive learning platforms, and automated feedback mechanisms can analyse large volumes of learner data to identify patterns in student engagement, comprehension, and performance (Holmes et al., 2022). By processing such information in real time, AI technologies can tailor learning materials and activities to individual student needs, thereby supporting differentiated instruction within diverse classrooms.

Empirical research by scholars like Tang et al (2023); Cheng et al (2023), and Van Wyk (2024) suggest that adaptive learning technologies can improve student engagement and academic performance by providing immediate feedback and targeted support. For instance, AI-powered tutoring systems can identify misconceptions in student responses and generate corrective explanations, allowing learners to progress at their own pace. Such systems are particularly valuable in higher education contexts characterised by large class sizes, where individualised feedback from instructors may be limited (Bond et al., 2023).

However, the effectiveness of personalised learning technologies depends not only on the sophistication of the AI algorithms but also on how educators interpret and integrate these tools within their pedagogical practices. From the perspective of the Technological Pedagogical Content Knowledge (TPACK) framework, technology alone does not guarantee improved learning outcomes. Instead, meaningful technology integration requires educators to combine technological knowledge with pedagogical strategies and disciplinary expertise (Mishra & Koehler, 2006). AI-driven learning systems, therefore function most effectively when instructors actively interpret algorithmic insights and incorporate them into pedagogically sound teaching approaches.

Moreover, scholars such as Cheng et al. (2023) have cautioned against overly technocentric interpretations of personalised learning. Williamson and Eynon (2020) argue that algorithmic personalisation may inadvertently reduce complex learning processes to data-driven metrics, thereby overlooking the relational and socio-emotional dimensions of education. In this sense, while AI technologies can enhance instructional responsiveness, they may also introduce new tensions between automated decision-making and educators' professional judgement. These tensions highlight the importance of examining how AI-supported learning systems are experienced and negotiated by educators and students in specific institutional contexts.

Artificial Intelligence and Educational Efficiency

Beyond personalised learning, AI technologies are increasingly being deployed to streamline administrative and instructional processes in higher education institutions. AI-supported systems can automate tasks such as grading assignments, detecting plagiarism, managing course scheduling, and analysing student performance data (Zawacki-Richter et al., 2021; Ogwueleka, 2025; Deepshikha, 2026). By automating routine and time-consuming tasks, AI technologies may allow educators to devote more attention to higher-order pedagogical activities such as mentoring, curriculum design, and critical discussion with students.

Learning analytics systems provide a particularly significant example of AI-driven efficiency in education. These systems analyse large datasets derived from student interactions with digital learning environments to identify behavioural patterns and predict academic outcomes (Ifenthaler & Yau, 2022). Institutions can use these insights to identify students at risk of academic failure and implement early-intervention strategies to improve retention and completion rates.

Despite these potential benefits, researchers caution that the efficiency gains associated with AI technologies may also produce unintended consequences. Perrotta and Selwyn (2020) note that the increasing reliance on algorithmic systems for educational decision-making may gradually reshape professional roles within higher education. For instance, if instructors become dependent on automated analytics to evaluate student performance, there is a risk that professional expertise may be subordinated to algorithmic recommendations. This dynamic raises questions about the long-term implications of AI integration for academic autonomy and professional identity within educational institutions.

Furthermore, the promise of efficiency often masks underlying assumptions about productivity and performance within contemporary higher education systems. From a critical perspective, the automation of educational processes may reflect broader institutional pressures to optimise efficiency, sometimes at the expense of reflective and human-centred pedagogical practices. Consequently, scholars increasingly emphasise the need to balance technological innovation with critical engagement regarding the broader educational implications of AI adoption.

Ethical, Privacy, and Algorithmic Concerns

The growing integration of AI technologies in education has also intensified debates concerning ethics, privacy, and algorithmic accountability. AI-driven educational systems rely heavily on the collection and analysis of large volumes of student data, including behavioral patterns, learning progress, and personal information. While such data can generate valuable insights to improve educational outcomes, it also raises concerns about surveillance, data ownership, and privacy protection (Van Wyk, 2025).

Scholars such as Cheng et al. (2023) have warned that the extensive use of learning analytics may contribute to the emergence of surveillance-oriented educational environments in which students are continuously monitored through digital platforms. In such contexts, the boundaries between formative assessment and behavioral monitoring may become blurred, potentially undermining student autonomy and trust within learning environments (Williamson & Eynon, 2020).

Algorithmic bias represents another significant concern associated with the adoption of AI in education. AI systems are trained on historical datasets that may reflect existing social inequalities. Consequently, automated decision-making processes may inadvertently reproduce biases related to race, gender, language, or socio-

economic status (Bernacki et al, 2021). In educational contexts, biased algorithms could influence decisions about student assessment, academic support, or admissions, thereby reinforcing structural inequalities.

Critical Digital Pedagogy (CDP) provides an important theoretical lens for examining these ethical challenges. Rooted in critical theory, CDP emphasizes that digital technologies are not neutral tools, but rather socio-technical systems shaped by political, economic, and cultural dynamics (Lewis, 2022). From this perspective, AI adoption in education must be evaluated not only in terms of efficiency and innovation but also in relation to issues of power, agency, and social justice.

CDP therefore calls for greater transparency and accountability in the design and deployment of educational technologies. Educators and institutions are encouraged to critically examine the values embedded within AI systems and to ensure that technological innovations support equitable and inclusive learning environments. This perspective highlights the importance of human oversight and ethical governance mechanisms in implementing AI-supported educational systems.

Digital Inequality and Institutional Readiness

The potential benefits of AI in education are closely linked to the availability of digital infrastructure and institutional capacity. In many parts of the Global South, including South Africa, higher education institutions operate within contexts characterised by uneven access to technological resources. Limitations in internet connectivity, hardware availability, and technical support may significantly constrain the adoption of AI-enabled educational systems (Msomi & Mthethwa, 2024).

Digital inequality can manifest in multiple forms within higher education environments (Mac Faden et al, 2024). Students from disadvantaged socio-economic backgrounds may lack reliable access to personal computers or stable internet connections, limiting their ability to participate fully in digitally mediated learning environments. Similarly, institutions with limited financial resources may struggle to invest in the advanced technological infrastructure required to support AI implementation.

Institutional readiness, therefore, plays a crucial role in determining the success of AI adoption in higher education (Moloi & Maringe, 2022). Moloi and Maringe (2022) emphasise that effective digital transformation requires not only technological infrastructure but also strategic planning, policy frameworks, and professional development opportunities for educators. Without adequate institutional support, the introduction of AI technologies may place additional burdens on educators who must independently learn to navigate complex digital systems.

From a TPACK perspective, educator capacity development is particularly important. Teachers must develop the skills necessary to interpret AI-generated insights, evaluate algorithmic recommendations, and integrate technological tools within pedagogically meaningful instructional strategies. Without such professional development, the potential benefits of AI may remain underutilised or unevenly distributed across educational contexts.

Research Gap

The literature reviewed above demonstrates that AI technologies hold considerable promise for transforming educational practices through personalised learning, administrative efficiency, and data-informed decision-making. At the same time, scholars emphasise the ethical, pedagogical, and institutional challenges associated with AI adoption, particularly in contexts characterised by digital inequality.

Despite this growing body of scholarship, several gaps remain in the literature. First, much of the existing research focuses on technological capabilities or large-scale quantitative evaluations of AI systems, while fewer studies examine the lived experiences of educators and students interacting with these technologies in everyday educational contexts. Second, empirical research from the Global South remains limited, even though issues of digital inequality and infrastructural disparity are particularly pronounced in these regions. Third, existing studies often examine technological adoption or ethical concerns separately, rather than exploring how these dynamics intersect within real institutional environments.

Addressing these gaps requires context-sensitive research that explores how stakeholders experience and interpret the integration of AI technologies within their specific educational settings. By examining the perspectives of educators, students, and educational technology specialists at South African universities, this study seeks to deepen understanding of the socio-technical dynamics shaping AI adoption in higher education.

Theoretical and Conceptual Background

To give more support to the study theoretically, this article picks up two frameworks that are:

Technological Pedagogical Content Knowledge (TPACK)

First, Mishra and Kohlher (2006), in their work describing the Technological Pedagogical Content Knowledge framework, give a clear description that the TPACK framework is a comprehensive lens through which changes in the work of teachers are seen when they use technology, which is integrated in teaching and learning, in a meaningful way. The TPACK frames teacher knowledge as a lively and continual dialogue between three aspects: content knowledge, pedagogical knowledge and technological knowledge. Regarding the application of AI, TPACK traces the effective union to the power of a single technical skill and calls for a deeper understanding of how AI tools shape content delivery, alter pedagogical strategies, and integrate with the learning context.

Under this view, technological knowledge would mean the educator's capability to grasp and utilise GenAI-derived tools such as adaptive learning platforms, automatically assessing schools of thought, virtual worlds, and augmented-reality-type immersive learning solutions.

In the meantime, pedagogical knowledge would be the educator's skill and artistry in the creation of instructional activities, the drawing in and involvement of the students, and the provision of support and guidance that aids the students' ever-growing understanding, whereas content knowledge would be the knowledge of facts within a certain area of study or course.

With TPACK, elements of technology, pedagogy, and content knowledge are shown to interact critically; this interconnection clearly indicates that technology per se cannot lead to enhanced learning outcomes; rather, it is the employment of technology in a way which is compatible with both pedagogical principles and disciplinary knowledge that brings about this outcome. With AI as one of the characters in the TPACK framework drama, we face a double-edged sword. Positively, intelligent tutoring systems and adaptive platforms will facilitate personalised instruction through offering data-driven insights into student performance, a process that will eventually lead to pedagogical responsiveness.

The negative side of the argument argues that educators must be capable of evaluating AI-generated suggestions for their suitability, correctness, and ethical implications. Thus, for example, if educators rely heavily on algorithm-driven learning paths without sufficient understanding and skills to modify these tools, this may, in turn, unintentionally limit curricular scope or restrict teacher creativity. So, in holding this view, TPACK identifies the teacher as one who does not passively receive but rather actively negotiates between AI and pedagogical goals.

In short, AI integration is not a one-shot success story, but it demands continuous professional development, reflective practice, and institutional support from the education sector.

Teachers need to equip themselves with the skills necessary to make sense of AI-driven data, identify significant trends in student performance, and translate those insights into practical, executable instructional strategies.

This ties in with the TPACK's emphasis on focal-point-sensitive knowledge: an AI that is well integrated depends on factors such as the specific learning environment, student demographics, and school regulations.

So, overall, TPACK is a very powerful conceptual framework that combines elements for the study of embedding AI tools into teaching, benefiting student learning while safeguarding teacher autonomy and ensuring pedagogical consistency.

The application of the TPACK framework in this study leads to the conclusion that technologies, pedagogy, and content delivery are closely intertwined.

Further, it allows a probe into the ways teachers deal with the socio-technical intricacies of AI in education, and knowledge, practice, and technology get engaged in producing substantial, ethical, and efficient learning experiences.

Critical Digital Pedagogy (CDP)

Critical Digital Pedagogy provides a vital theoretical foundation for examining the social, political, and moral aspects of AI use in education (Gutiérrez-Ujaque, 2024). Rooted in critical theory and emancipatory pedagogical traditions, CDP maintains that educational technologies are never neutral; rather, they reflect the values, assumptions, and power structures of the societies in which they are created and used (Lewis, 2022). Consequently, AI-driven tools have come with implicit ideas about learning, intelligence, efficiency, and human behaviour. These ideas influence not only the ways in which learners acquire knowledge, but also how they are categorised, watched, and graded.

One of the major points of CDP is the idea that digital technologies can either increase or limit learner agency, depending on their design and implementation. In cases where AI systems guide learning pathways, calculate risk scores, or make decisions by using secret algorithms, they might limit students' freedom without even realising it and turn learning into mechanical processes controlled by data-driven classifications. Here, the issue of the gradual disappearance of academic freedom and student self-determination, especially in situations where algorithmic recommendations are treated as of primary value rather than merely as a help, comes to the fore.

CDP also draws attention to the political aspect of AI, particularly the way it amplifies structural inequalities when underlying datasets contain social biases rooted in historical exclusion (Noble, 2018). In this regard, AI can become a device to produce various forms of epistemic injustices whereby it favours certain cultural norms, linguistic patterns or behavioural markers while at the same time, it disfavours the students whose identities or experiences happen to be the ones that fall beyond algorithmically "standardised" categories. From this viewpoint, AI is a battleground where problems of fairness, representation, and recognition must be examined critically.

Another point CDP significantly emphasises is its demand for transparency, accountability, and ethical reflexivity. Educators and institutions are expected to question technology firms' motives, the ownership of student data, and the long-term effects of embedding algorithmic systems in learning environments. Rather than taking efficiency as a sufficient reason, CDP prompts us to question whose interests are served, whose voices are silenced, and what kinds of work or decision-making are displaced if AI technologies become dominant.

Besides this, CDP regards the teacher not as a technologist who passively embraces a new gadget but rather as a thoughtful, engaged professional who negotiates between the algorithmic and the human forms of knowledge. Therefore, AI, through this lens, is not merely a tool to improve teaching; it is a socio-technical agent to be interacted with, contested, and understood in its context. Hence, it is through the educator that students are made aware of the need for critical digital literacy so they can understand how AI works, how data is obtained, and how they can resist unfairness brought about by algorithms. This corresponds with the wider objective of implementing socially just, human-centred educational methods in the digital era.

To sum up, Critical Digital Pedagogy offers the necessary concepts for analysing AI incorporation not only as a technological breakthrough but also as a phenomenon deeply intertwined with power, ethics, identity, and social justice. It points out that despite the increase of automated learning systems, human agency, transparency, and critical awareness are still very much needed. The use of CDP in this research enables the uncovering of the underlying themes in participants' talk about surveillance, bias, autonomy, and the socio-political aspects of AI-driven educational reforms.

METHODOLOGY

Research Design

This study employed a qualitative approach, an interpretive phenomenological research design (Groenewald, 2004), to explore the lived experiences of educators, students, and educational technology specialists regarding the integration of artificial intelligence in higher education. Phenomenology focuses on understanding how

individuals interpret and make meaning of shared experiences within a particular phenomenon (Creswell & Poth, 2018). This approach was appropriate for examining stakeholders' perceptions of the opportunities, challenges, and ethical implications of AI adoption in university contexts.

Population and Sampling

The study involved 24 participants, comprising 10 educators, 8 university students, and 6 educational technology specialists from three South African universities with varying levels of technological infrastructure and institutional resources. Purposive sampling was used to recruit participants who had direct experience with AI-supported educational technologies in teaching, learning, or institutional administration.

Participants were recruited through institutional mailing lists and professional networks within the participating universities. Individuals were invited to participate if they had prior experience with AI-enabled educational technologies, such as adaptive learning platforms, learning analytics systems, plagiarism-detection tools, or AI-assisted writing applications.

Data collection

The data was gathered through semi-structured interviews lasting 45 to 60 minutes each. The semi-structured interviews were chosen because of their flexibility, i.e., they allow interviewees to present their experiences in detail and the interviewer to explore emerging issues and obtain further clarification (Kallio et al., 2016). The interview guide included questions about the participants' interactions with AI tools, perceived benefits and challenges, ethical concerns, and reflections on institutional readiness. With the participants' permission, all conversations were recorded and later transcribed verbatim to ensure accuracy and reliability of the data (Saldana, 2021).

Data Analysis

The data analysis comprised six stages and followed the thematic analysis procedure of Braun and Clarke (2006, 2019). The stages were not linear and included becoming familiar with the data, generating initial codes, identifying patterns, and developing themes. The researchers used only the data they received from participants and generated the codes inductively, so participants' stories would lead to the themes. At the same time, they paid attention to the deductive aspect by aligning their findings with theoretical constructs, especially TPACK and Critical Digital Pedagogy. The blending of inductive and deductive approaches deepened the analysis and ensured a link between the newly discovered data and the theoretical frameworks (Fereday & Muir Cochrane, 2006).

Trustworthiness of the study

The issues of trustworthiness and rigour were addressed through tried-and-tested qualitative measures. One of these was credibility obtained through member checking, which gave participants a chance to confirm initial interpretations (Lincoln & Guba, 1985). The dependability was supported by a rigorous audit trail that documented the decisions regarding the methods and the procedures of the analysis (Shenton, 2004). Confirmability was facilitated through reflexive journaling and peer debriefing, which reduces researcher bias and ensures that the findings reflect participants' views (Creswell & Poth, 2018). Transferability was supported by detailed, richly descriptive accounts of the participants, settings, and the socio-technical dynamics, allowing readers to judge the extent to which the findings are applicable across different contexts (Merriam & Tisdell, 2016).

Ethical Considerations

Ethical issues formed the backbone of the research plan. The research received the green light from the Turfloop Research Ethics Committee (TREC), and the participants consented to take part in the study. They were promised that the research would be conducted confidentially, that their anonymity would be respected, and that they could withdraw from the research at any time if they wished (Orb, Eisenhauer, & Wynaden, 2001). The researchers ensured that sensitive information about the AI systems, institutional policies, and participants' personal experiences was handled with care to maintain the highest ethical standards.

To sum up, the research design, sampling strategy, data collection, and analysis procedures were all aligned with the study's objectives. Through the usage of a phenomenological approach and the incorporation of the TPACK and Critical Digital Pedagogy frameworks into the analysis, the research could unveil the subtle aspects of the presence, the problems, and the socio-technical complexities of AI integration in education.

Limitations of the study

This study has several limitations that should be considered when interpreting the findings. First, the sample was limited to three universities and therefore may not fully represent the diversity of higher education institutions across South Africa. Second, the study relied on self-reported experiences, which may reflect participants' perceptions rather than objective measures of AI implementation. Third, the phenomenological design prioritised depth of understanding over generalisability; consequently, the findings should be interpreted as context-specific

insights rather than broadly generalisable conclusions. Future research could expand the scope of investigation by including additional institutions and employing mixed methods approaches to examine the broader impact of AI adoption in higher education.

FINDINGS

This section presents and interprets the findings derived from the thematic analysis of interview data collected from lecturers in a rural South African higher education context. Guided by the theoretical lenses of Technological Pedagogical Content Knowledge (TPACK) and Critical Digital Pedagogy (CDP), the analysis identified four dominant themes:

- Lecturers' emerging technological pedagogical practices,
- Digital inequality and uneven access to AI technologies,
- Pedagogical transformation and critical engagement with AI, and
- Institutional and structural constraints affecting AI integration.

These themes reveal both the transformative potential of artificial intelligence (AI) technologies and the contextual challenges shaping their adoption in rural higher education institutions.

Lecturers' Emerging Technological Pedagogical Practices

The findings indicate that lecturers are increasingly experimenting with AI technologies to support teaching preparation, content delivery, and assessment design. Participants described using AI tools to generate lecture outlines, summarise academic readings, and develop formative assessment questions. These practices demonstrate the early stages of integrating technological knowledge with pedagogical and content expertise, which is central to the TPACK framework.

Several lecturers explained that AI-assisted tools help them simplify complex theoretical material for students who often struggle with academic language and conceptual abstraction. One lecturer explained:

> *"Sometimes the theories we teach are very complex for first-year students. When I use AI tools to generate different explanations, I can select the version that is easier for students to understand".*

This illustrates how lecturers are beginning to align content knowledge with technological resources to improve pedagogical accessibility. In this sense, AI tools serve as mediators that help lecturers adapt disciplinary knowledge to diverse students' learning needs.

However, the findings also suggest that lecturers' technological engagement remains largely instrumental rather than deeply pedagogical. While participants reported frequent use of AI for content preparation and administrative tasks, fewer lecturers described systematic integration of AI into classroom learning activities. As one participant noted:

> *"Most of us are still experimenting. We use AI mainly for preparing notes or summarising articles, but we are still figuring out how to integrate it properly into teaching."*

From a TPACK perspective, this indicates that lecturers have begun to develop technological knowledge but may not yet possess the integrated technological pedagogical knowledge required for transformative teaching practices. Effective AI integration requires not only familiarity with digital tools but also the ability to align those tools with pedagogical strategies and disciplinary objectives. The findings, therefore, suggest that lecturers' engagement with AI remains in a transitional phase of technological adaptation.

Digital Inequality and Uneven Access to AI Technologies

A second major theme emerging from the data relates to persistent digital inequalities that shape the adoption and effectiveness of AI technologies in rural higher education institutions. Participants consistently emphasised that

limited internet connectivity, inadequate digital infrastructure, and students' financial constraints significantly hinder the integration of AI tools into teaching and learning.

Lecturers reported that many students struggle to access reliable internet services, particularly those living in rural areas or informal settlements. As a result, the benefits of AI-supported learning are unevenly distributed. One lecturer explained:

> *"Some students can use AI platforms easily because they have good internet and laptops, but others rely only on mobile phones and limited data. That creates an unfair learning situation."*

This finding highlights how technological innovations can inadvertently reproduce existing educational inequalities. From the perspective of Critical Digital Pedagogy, digital technologies cannot be understood as neutral tools; rather, they are embedded within broader socio-economic contexts that influence access and participation.

Participants further emphasised that unequal access to digital infrastructure may limit the pedagogical benefits of AI-based learning systems. Students who lack stable connectivity often cannot fully participate in AI-supported activities such as digital research, collaborative writing, or automated feedback platforms. Consequently, lecturers are required to adapt their teaching strategies to avoid exacerbating educational disparities.

Some lecturers described adopting hybrid pedagogical approaches that combine traditional teaching methods with limited AI-supported resources. As one participant noted:

> *"We must balance technology with reality. Not all students can access these tools, so we still rely on face-to-face explanations and printed materials."*

These adaptive strategies demonstrate lecturers' awareness of structural inequalities and their efforts to maintain inclusive learning environments. Such practices reflect the critical orientation advocated by Critical Digital Pedagogy, which encourages educators to interrogate how digital technologies may reinforce or challenge existing power relations within education.

Pedagogical Transformation and Critical Engagement with AI

While AI technologies present opportunities for enhancing teaching and learning, the findings also reveal that lecturers are critically reflecting on their pedagogical implications. Participants acknowledged that AI systems can generate academic content, support student writing processes, and facilitate independent learning. At the same time, lecturers expressed concerns about the potential impact of AI on students' critical thinking and academic integrity.

Several participants worried that students might become overly dependent on AI-generated responses, thereby weakening their ability to engage in independent intellectual analysis. One lecturer stated:

> *"If students rely too much on AI to write their assignments, they may stop thinking critically about the material. We need to guide them on how to use it responsibly."*

This concern reflects broader debates within higher education regarding the ethical and pedagogical implications of generative AI technologies. From the perspective of Critical Digital Pedagogy, educators are encouraged to engage critically with digital tools rather than adopting them uncritically.

In response to these concerns, some lecturers reported incorporating discussions about responsible AI use into their teaching practices. These discussions focus on issues such as academic integrity, digital authorship, and the reliability of AI-generated information. One participant explained:

> *"Instead of banning AI, we discuss it openly with students. We analyse the responses it produces and ask whether the information is accurate or biased."*

By using AI-generated content as an object of critical analysis, lecturers transform AI from a passive productivity tool into a pedagogical resource that supports critical digital literacy. This approach aligns closely with the

principles of Critical Digital Pedagogy, which emphasise student agency, critical awareness, and democratic engagement with digital technologies.

Furthermore, the findings suggest that the emergence of AI technologies is prompting lecturers to reconsider traditional forms of assessment. Some participants reported shifting towards assessment strategies that require deeper analytical engagement, such as reflective essays, case studies, and oral presentations. As one lecturer observed:

> *"We now design assignments that require students to explain their thinking process, not just present information. That makes it harder to rely entirely on AI."*

These pedagogical adjustments indicate that AI may indirectly stimulate innovation in assessment design by encouraging lecturers to prioritise higher-order cognitive skills.

Institutional and Structural Constraints

Despite the pedagogical opportunities associated with AI technologies, the findings highlight several institutional barriers that limit their effective integration in rural higher education institutions. Participants frequently identified insufficient institutional support, limited professional development opportunities, and the absence of clear policy frameworks as significant challenges.

Many lecturers reported receiving little formal training in incorporating AI technologies into teaching and learning. As a result, lecturers often rely on informal experimentation or peer collaboration to develop their technological skills. One participant explained:

> *"There is no formal training on how to use AI for teaching. Most of us learn about these tools on our own."*

From a TPACK perspective, institutional support is essential for enabling lecturers to develop the integrated technological, pedagogical, and content knowledge necessary for effective digital teaching. Without structured training programmes, lecturers may struggle to move beyond basic technological use towards meaningful pedagogical transformation.

Participants also highlighted the absence of institutional policies addressing the ethical and academic implications of AI technologies. Lecturers expressed uncertainty regarding how AI-generated content should be treated within existing academic integrity frameworks. As one lecturer remarked:

> *"We don't have clear guidelines on how AI should be used by students. That creates confusion for both lecturers and learners."*

This policy gap underscores the need for higher education institutions to develop comprehensive regulatory frameworks that address responsible AI use, academic integrity, and digital scholarship.

Finally, participants emphasised that infrastructural limitations continue to constrain technological innovation in rural higher education settings. Limited internet connectivity, outdated computer laboratories, and inadequate digital resources reduce institutions' capacity to support advanced AI-based learning systems. Addressing these structural challenges remains essential if the potential benefits of AI technologies are to be realised.

Integrative Interpretation of the Findings

Taken together, the findings reveal that the integration of AI technologies within rural higher education institutions is characterised by both innovation and constraint. Lecturers are beginning to experiment with AI tools to support teaching preparation and content delivery, reflecting the gradual development of technological pedagogical content knowledge. However, the integration process remains uneven due to limited institutional support, infrastructural challenges, and persistent digital inequalities.

The findings also demonstrate the relevance of Critical Digital Pedagogy in understanding the broader implications of AI adoption. AI technologies do not operate in isolation from social realities; rather, they interact with existing economic, institutional, and cultural structures that shape educational access and participation. By

critically engaging with these dynamics, lecturers can ensure that AI integration promotes inclusive and reflective learning environments.

Ultimately, effective AI integration requires a balanced approach that combines technological competence, pedagogical innovation, and institutional support. Strengthening lecturers' TPACK capabilities while addressing the critical concerns highlighted by CDP may enable higher education institutions to harness the transformative potential of AI in ways that are both pedagogically meaningful and socially responsible.

Recommendations

Drawing on the study's findings and their interpretation through the Technological Pedagogical Content Knowledge (TPACK) framework and Critical Digital Pedagogy (CDP), several recommendations emerge to strengthen the responsible and effective integration of artificial intelligence (AI) technologies in higher education, particularly within rural institutional contexts. First, higher education institutions should prioritise structured professional development programmes that equip lecturers with integrated technological, pedagogical, and disciplinary competencies required for meaningful AI-supported teaching. Such training should move beyond basic technological orientation to focus on pedagogical strategies for embedding AI tools within curriculum design, assessment practices, and student engagement processes, thereby strengthening lecturers' TPACK capabilities. Second, universities should develop clear institutional policies and ethical guidelines governing the use of AI technologies in teaching, learning, and assessment. These frameworks should provide explicit guidance on issues such as academic integrity, responsible AI use, authorship, and transparency in AI-assisted learning to reduce uncertainty among both lecturers and students. Third, institutional leadership should prioritise investments in digital infrastructure, including reliable internet connectivity, updated digital learning platforms, and accessible computer facilities, particularly for students located in rural or resource-constrained environments. Addressing these structural inequalities is essential for ensuring that AI technologies do not reproduce existing educational disparities. Fourth, lecturers should be encouraged to integrate AI into teaching in ways that promote critical digital literacy, enabling students to evaluate, question, and responsibly engage with AI-generated knowledge rather than relying on it uncritically. This approach aligns with the principles of Critical Digital Pedagogy by positioning students as active and reflective participants in digitally mediated learning environments. Finally, future research should further explore the long-term pedagogical implications of AI adoption across diverse higher education contexts, with a particular focus on how lecturers develop sustained technological pedagogical content knowledge and how institutions can design inclusive digital strategies to ensure equitable access to emerging educational technologies. Collectively, these recommendations underscore that the transformative potential of AI in higher education can only be realised through coordinated institutional support, pedagogical innovation, and critical engagement with the social and ethical dimensions of digital technologies.

CONCLUSIONS

This study examined the integration of artificial intelligence (AI) technologies in teaching and learning within a rural higher education context, interpreted through the analytical lenses of Technological Pedagogical Content Knowledge (TPACK) and Critical Digital Pedagogy (CDP). The findings demonstrate that while lecturers are increasingly experimenting with AI tools to support teaching preparation, content delivery, and assessment design, the integration of these technologies remains largely emergent and uneven. From a TPACK perspective, lecturers are beginning to develop technological competence; however, the deeper pedagogical integration of AI with disciplinary knowledge remains limited, largely due to insufficient training, limited institutional guidance, and infrastructural constraints. At the same time, the study reveals that lecturers are critically aware of the ethical and pedagogical implications of AI technologies, particularly regarding academic integrity, students' dependence on automated systems, and the potential erosion of critical thinking. Through the lens of Critical Digital Pedagogy, the findings further highlight that the adoption of AI technologies is embedded within broader socio-economic realities, including persistent digital inequalities that shape students' access to technological resources and participation in AI-supported learning environments. Consequently, while AI holds significant potential to enhance pedagogical innovation, personalised learning, and knowledge accessibility, its transformative impact in

rural higher education institutions remains contingent on addressing structural barriers, including limited digital infrastructure, unequal access to connectivity, and the absence of clear institutional policy frameworks governing responsible AI use. The study, therefore, concludes that the effective integration of AI in higher education requires a balanced and critically informed approach that simultaneously strengthens lecturers' technological pedagogical capabilities, promotes critical digital literacy among students, and ensures that institutional strategies prioritise equitable access and ethical engagement with emerging educational technologies.

Declaration of Generative AI technologies

No AI technology used

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Monolingual versus Multilingual in CTCA 2.0: Effects on Critical Thinking and Problem-Solving in Business Law and Ethics

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ABSTRACT

Business Law and Ethics education demands that students demonstrate higher-order cognitive skills, including critical thinking and problem-solving, in more complex legal & ethical situations. Current monolingual teaching practices have not lived up to expectations, particularly in African settings, where linguistic diversity is pronounced. This study aims to examine how monolingual and multilingual teaching practices influence students' critical thinking and problem-solving skills through the application of the Culturo-Techno-Contextual Approach 2.0 (CTCA 2.0) in Sierra Leonean classrooms. Two geographically separated senior secondary schools were purposively sampled, taking into account the availability of qualified entrepreneurship teachers, the availability of internet-enabled devices to students, especially outside school hours, and the presence of monolingual and multilingual instruction. We used a quasi-experimental pretest-posttest non-equivalent groups design with 76 Senior Secondary School II students (equivalent to grade 11). 39 students were assigned to the CTCA 2.0 monolingual group, and 37 to the CTCA 2.0 multilingual group. The monolingual cohort was taught in English (100%) while the multilingual cohort was taught in English (70%), Krio (20%), Kathemne (8%), and Gen-Z slang (2%) using the CTCA 2.0 implementation steps. The Business Law and Ethics Problem-Solving in African Context Test (BLE-PSACT) and the Critical Thinking Test (CTT) were the instruments we used in the study. Multivariate analyses of covariates, controlling for pretest scores, revealed that multilingual instructional mode significantly enhanced problem-solving performance ($F(1,72) = 76.43$, $p < .001$, $\eta^2p = .515$), whereas the effect on critical-thinking scores, though higher in the multilingual group, was not statistically significant ($F(1,72) = 3.76$, $p = .056$, $\eta^2p = .050$). These findings suggest that multilingual pedagogies within CTCA 2.0 substantially improve students' ability to analyse and solve complex problems in the African context, while pointing to the potential to foster critical thinking with extended exposure.

Keywords: critical-thinking, culturo-techno-contextual-approach, monolingual, multilingual, problem-solving

INTRODUCTION

Business Law and Ethics are foundational to entrepreneurship and business education, equipping learners with the legal frameworks, ethical principles, and regulatory competencies to navigate complex, responsible business environments. Consequently, decision-making in contemporary entrepreneurial ecosystems is becoming increasingly dependent on the ability to interpret statutes, analyse contractual obligations, evaluate ethical dilemmas, and predict the potential legal consequences of business activities. These demands indicate a growing need for higher-order thinking skills, particularly critical thinking and problem-solving, among students enrolled in Business Law and Ethics courses.

However, traditional pedagogies (lecture methods and rote memorisation) utilised in many Business Law and Ethics classes often fail to foster deep learning and cognitive engagement (Biggs et al., 2022). The linear educational mode simply imparts ethical concepts but lacks reflective and dynamic thinking in a practical setting (Yuan et al., 2022). These pedagogies tend to conceptualise learners as mere recipients of information rather than active constructors of legal and ethical knowledge. The shortfalls of these traditional approaches, which tend to rely on lower-order thinking skills (Rodrigues, 2023), have contributed to the upsurge of interest in learner-centred, culturally responsive, and cognitively activating pedagogies that better align instruction with students' socio-cultural realities and cognitive needs (Anyichie, 2025; Darling-Hammond et al., 2024; Gay, 2023). For example, culturally responsive pedagogies are instructional approaches that are connected to students' cultures and lived experiences, thereby increasing their motivation and engagement (Anyichie, 2025). An example of such an innovative model is the Culturo-Techno-Contextual Approach to pedagogy. CTCA 2.0 rests on the premise that learning can be deeper when it is harnessed from learners' cultural backgrounds and contextual knowledge, thereby enabling them to link abstract disciplinary ideas, such as legal principles and ethical frameworks, to practical, realistic situations.

One of the critical yet underexplored dimensions of implementing CTCA 2.0 is the role of language in shaping learners' cognitive outcomes. In multilingual African classrooms, learners often navigate multiple languages, and the language of instruction plays a crucial role in shaping comprehension, participation, and reasoning (Heugh et al., 2022; Prah, 2009; Makalela, 2015).

In terms of sociocultural theories of learning, one must recognise the importance of the idea that language not only serves as a medium of communication, but it also plays an instrumental part in mediating one's thoughts and represents the way the learner makes sense of things, finds solutions to problems and thinks about complicated issues (Lomotey & Oblie, 2025; Mweli, 2018). Language as a mediational means is especially important for African theorists who describe language as a "cultural artefact" and a psychological tool needed for maximal cognitive development and socialisation (Mweli, 2018; Vandeyar & Vandeyar, 2012). In addition, it is the basis of abstract thinking and problem-solving, as well as a mediator in transforming external sociocultural processes into internal ones (Lomotey & Oblie, 2025). Therefore, the selection of the language of instruction is pivotal to learners' epistemological access and intellectual engagement with complex concepts (Makalela, 2015; Prah, 2009).

There are cognitive benefits associated with multilingual abilities, such as enhanced attention, memory, and metalinguistic awareness, and speaking several languages can aid thought processes for multilinguals themselves (Babatunde & Akinola, 2025). While monolingual modes of instruction may promote uniformity, they can also inhibit deeper conceptual understanding for students who have a different primary language than the official medium of instruction, especially because the major learning problem facing the African child is often linguistic in nature when instruction is given in a foreign language (Nyamekye, 2024)

In contrast, multilingual pedagogies, in particular translanguaging approaches, have also been shown to increase cognitive engagement, deepen understanding, and enhance learners' problem analysis and solving capabilities by enabling them to make the most of their full linguistic repertoire (Beltran-Palanques et al., 2025; Hattingh et al., 2022). Translanguaging may provide access to diverse knowledge and viewpoints that, in turn, lead to improved understanding while learning. According to (Beltran-Palanques et al., 2025), the cognitive demands of Business Law and Ethics and the transformative potential of CTCA 2.0 as an instructional model make it important to investigate how monolingual and multilingual modes of instruction influence students' development in critical thinking and problem-solving. How this relationship plays out will be particularly pertinent in multilingual educational contexts where learners' linguistic backgrounds intersect with their ability to process complex legal

and ethical content. As such, this study seeks to fill the gap by exploring the effectiveness of monolingual versus multilingual CTCA 2.0 instructional delivery in developing higher-order thinking skills in Business Law and Ethics education.

Problem Statement

While there is increasing appreciation for the value of using CTCA 2.0 as a pedagogy framework that can enhance the learners' higher-order thinking, little is known about how various language modes, specifically whether instruction is conducted in either monolingual or multilingual languages, can affect the learners' critical thinking and problem-solving skills in a CTCA 2.0 classroom. The available literature on CTCA highlights the approach's effectiveness but fails to examine the linguistic mode through which CTCA affects learners' cognitive outcomes (Pinxteren, 2022; Prah, 2009). This is especially important in multilingual African educational settings, where language use in the instructional process determines how learners understand and analyse concepts learned (Makalela, 2015). Thus, the lack of empirical data comparing monolingual and multilingual instructional processes in CTCA 2.0 limits the optimal use of the teaching technique for higher-order learning in courses such as Business Law and Ethics.

Despite its potential, there is limited evidence on the influence of the linguistic mode on the stated outcomes. Most studies have focused on assessing the model's effectiveness rather than analysing how the linguistic aspect affects learners' higher-order thinking skills (Prah, 2009). In light of the substantial body of literature demonstrating how the language of instruction affects analysis and problem-solving skills, especially in linguistically heterogeneous settings (Heugh et al., 2022), there seems to be a gap. Language development takes place hand in hand with cognitive and academic success and acts as the critical medium of higher-order cognition (Lomotey & Oblie, 2025; Mweli, 2018).

Most African educational institutions, such as those in Sierra Leone, The Gambia, South Africa, Ghana, and Nigeria, usually instruct students in only one language despite being linguistically heterogeneous (Madadzhe, 2019). Such methods can lead to a lack of conceptual clarity, making it difficult for students to process the information provided in the classroom (Heugh et al., 2022). The exclusive use of monolingual practices can create a significant "cognitive load" on students who do not share the same primary language as the medium of instruction, as it may prevent them from engaging in deep cognitive processes and advancing their ideas through teaching and learning (Makalela, 2015; Mweli, 2018). On the other hand, multilingual teaching strategies, including translanguaging, intensify meaning-making and promote cognitive engagement by enabling learners to draw on their full linguistic abilities (Heugh et al., 2022). Translanguaging reportedly improves students' "epistemic access," enabling them to draw on all their linguistic abilities to think critically about specific subjects.

However, there is a lack of empirical studies assessing the comparative effects of monolingual versus multilingual modes specifically within the CTCA 2.0 framework. This lack of investigation constitutes a serious omission, since CTCA 2.0 explicitly aims to connect with learners' cultural backgrounds, and language remains an essential core component of culture and identity (Prah, 2009; Vandeyar & Vandeyar, 2012). This lack of specific evidence makes it difficult for curriculum designers to optimise CTCA 2.0 for higher-order cognitive outcomes (Pinxteren, 2022). It is thus imperative to establish which language mode better predicts the development of critical thinking and problem-solving in Business Law and Ethics education.

Purpose of the Study

This study, therefore, seeks to establish the extent to which monolingual and multilingual instructional modes significantly predict students' critical-thinking and problem-solving performance in the instruction of Business Law and Ethics using the Culturo-Techno-Contextual Approach 2.0. Put differently, this study tries to establish whether the linguistic mode of instruction impacts the cognitive gains students realise under CTCA 2.0, a pedagogy that is designed to enhance contextual understanding, cultural relevance, and higher order reasoning. Ultimately, the study intends to provide empirical evidence on the role of language practices in optimising the effectiveness of CTCA 2.0 in promoting deeper learning outcomes. Indeed, this inquiry stands to generate valuable insights that will inform the optimisation of CTCA 2.0 implementation in Business Law and Ethics classrooms at the senior secondary and early tertiary levels in Sierra Leone and comparable Sub-Saharan African education systems, where English serves as the official language of instruction despite widespread student multilingualism (e.g., Krio and other indigenous languages). Given similar linguistic dynamics in other multilingual regions globally, the findings may also offer transferable implications for classrooms beyond Africa (Oladejo et al., 2025).

Research Questions

Based on the problem statement and the purpose of this study, the following research questions and null hypotheses are formulated to guide this investigation.

1. To what extent do monolingual and multilingual modes determine students' critical-thinking skills in Business Law and Ethics?
2. To what extent do monolingual and multilingual modes determine students' problem-solving skills in Business Law and Ethics?

Hypotheses

H_{01}: Monolingual and multilingual modes will not significantly determine students' critical-thinking skills in Business Law and Ethics.

H_{02}: Monolingual and multilingual modes will not significantly determine students' problem-solving skills in Business Law and Ethics.

LITERATURE REVIEW

The CTCA 2.0 instructional model was developed to address persistent challenges in African educational contexts, such as learner disengagement, cultural disconnect, and poor academic performance. The extended and improved CTCA 2.0 (from the earlier CTCA framework) is designed to ensure deeper integration of three core elements, namely: (i) cultural grounding, in which learners' socio-cultural backgrounds are mobilised as resources for meaning-making; (ii) contextualization, where local examples and indigenous knowledge are used to explain concepts; and (iii) technology-enhanced processes supporting interactive learning. It is based on the notions of culturally responsive pedagogy, which holds that recognising and valuing students' cultural identities is fundamental to good teaching and higher-order cognitive development.

A central pedagogical mechanism within CTCA 2.0 is the culturally grounded Cognitive Task Analysis (CTA). Traditional CTA deconstructs complex tasks into sequenced cognitive steps to scaffold learning (Clark & Mayer, 2023). Within CTCA 2.0, CTA is culturally located; these cognitive steps are mediated by students' linguistic frames, lived experience, and local analogies. This allows learners to analyse, evaluate, and solve domain-specific problems through reasoning processes that are congruent with their everyday realities. As such, it enhances cognitive engagement and fosters critical thinking and problem-solving skills, especially in analytically intensive subjects such as Business Law and Ethics.

In STEM education, for instance, there is evidence that CTCA 2.0 outperforms traditional teaching methods in increasing learner achievement, conceptual understanding, and higher-order thinking (Adekoya, 2023; Oladejo et al., 2025). Emerging studies in business education, including entrepreneurship, financial literacy, and ethics, report that an emphasis on contextual application in CTCA 2.0 strengthens students' reasoning skills, ethical judgement, and decision-making.

Monolingual vs Multilingual Instructional Modes

Monolingual and multilingual instructional modes are two philosophically and pedagogically different approaches to language use in education. Monolingual instruction is the exclusive use of one language, usually a dominant or official one, as the medium for teaching, learning, and assessment (Heugh et al., 2022). This model is generally underpinned by ideological notions of linguistic uniformity and efficiency, premised on the assumption that immersive, single-language exposure accelerates mastery of that language and simplifies curricular delivery and standardisation.

By contrast, multilingual instruction would deliberately use two or more languages within the pedagogical process, either simultaneously or sequentially, to scaffold understanding, affirm learners' identities, and deepen cognitive engagement. This theoretically stems from translanguaging, which has reconceptualised bilingual and

multilingual speakers as not maintaining separate linguistic systems but rather drawing fluidly on a unified, integrated repertoire of linguistic features when communicating and making meaning. Multilingual instruction leverages this natural cognitive process as a pedagogical resource for accessing prior knowledge, negotiating complex concepts, and developing academic literacy across languages.

Theoretical and Conceptual Background

The conceptual foundations of the present study are grounded in an integrative theory that combines sociocultural, constructivist, and cognitive paradigms. Such an interdisciplinary theoretical perspective allows for a comprehensive account of how linguistic approaches to teaching, varying from monolingual to multilingual, affect cognitive achievements and development of high-order thinking skills among students in the CTCA 2.0 learning environment (Ademola et al., 2023; Gbeleyi et al., 2023).

Sociocultural Theory: Language as a Mediator

According to the sociocultural theory proposed by Vygotsky, learning is a socially mediated process rather than an individual endeavour, and language is the primary means for such mediation (Moraes & Salomão, 2022; Pare, 2007). Cognitive development begins socially through interaction and then becomes internalised. Thus, Vygotsky defines the "zone of proximal development" as the distance between what learners can achieve independently without linguistic support and what they can accomplish with assistance (Bheki & Mthembu, 2022). The student's problem-solving abilities are thus conditioned by the linguistic skills they possess.

Constructivist Learning Theory: Construction of Knowledge through Contexts

Based on the studies of Jean Piaget and Lev Vygotsky, the Constructivist Learning Theory is anchored on the belief that a learner is an active agent capable of constructing knowledge by resolving conflicts between new information and already constructed schemas within the mind (Abdulhadi et al., 2024; Anderson & Krathwohl, 2008). CTCA 2.0 is based on a constructivist approach, as it enables learners to draw on their indigenous, topic-specific knowledge and environments to learn (Adam et al., 2025; Gbeleyi et al., 2023). Through the integration of cultures within cultural milieus, such as West African communities, CTCA 2.0 enables Business Law and Ethics to be learned within the learner's social world (Abdulhadi et al., 2024; Oladejo et al., 2025).

Bloom’s Cognitive Theory: Developing Higher-Order Thinking Skills

The extent to which CTCA 2.0 has the capacity to support deeper learning is gauged through the application of Bloom's Cognitive Theory. The theory recognises a difference between lower-level skills such as recall and comprehension and higher-level cognitive processes, including analysis, evaluation, and synthesis (Mytra et al., 2021; Tangkui & Keong, 2023). In the subject of Business Law and Ethics, students need to progress from merely recalling the legislation to developing critical and analytical thinking skills (Loyens et al., 2023). The combined theory posits that when teaching methodologies use familiar language, they minimise unnecessary cognitive load, hence freeing up cognitive resources for higher-order thinking tasks (Mytra et al., 2021; Üzümcü, 2023).

Empirical Studies

Critical-Thinking in Business Law and Ethics

The need to develop critical thinking in Business Law and Ethics is imperative. The legal and ethical landscape of business is inherently intricate, ambiguous, and contextual, requiring analysis and judgment rather than simple rule memorisation (Muhammad, 2023). Critical thinking thus provides the learner with the ability to deconstruct implications of business decisions, foresee potential legal consequences of each, and investigate ethical trade-offs in everything from contract law and corporate governance to consumer rights and equity in the workplace. Besides, it enhances fundamental competencies to reason through case law, interpret legislation, identify logical fallacies, and resolve moral dilemmas-those vital for responsible professional practice and ethical entrepreneurship alike (Muhammad, 2023). In times of dynamic regulatory and market uncertainty, such competencies are essential for preparing students for complexity and making appropriate, justifiable choices.

Collectively, the literature points to one clear principle: the best approach to encouraging critical thinking in Business Law and Ethics involves a conscious move toward learning strategies that emphasize active participation, cultural sensitivity, and linguistic diversity. These are not peripheral considerations but rather central, interlocking features of the CTCA 2.0 framework. Hence, CTCA 2.0 emerges not simply as a compatible model but as a theoretically coherent and contextually responsive pedagogy for developing higher-order cognitive competencies in light of the discipline's increasing demands.

Problem-Solving Skills in Entrepreneurship Education

Problem-solving is an induction-related cognitive process at the heart of entrepreneurship education. It involves the systematic identification of a problem, analysis of its components, creation and evaluation of alternative solutions, and application of the best course of action (Ghoreyshi et al., 2025). More than a simple mental process, it is a recursive and reflective process that necessitates prior knowledge, analytical reasoning, creativity, and strategic decision-making (Ashiqin Wan Ali et al., 2022). This inherently involves both convergent and divergent thinking to enable learners to deal with a range of well-structured to ill-structured problems that characterise the real world of entrepreneurship.

In this realm, problem-solving is not only a skill but an essential entrepreneurial competence. Entrepreneurship, in essence, revolves around identifying opportunities, surmounting obstacles, and operating under uncertainty (Kuratko, 2025; Padilla-Angulo et al., 2022). Entrepreneurs must make crucial decisions under conditions of ambiguity, incomplete information, and rapid change. Hence, the ability to solve problems effectively will enable learners to interpret prevailing market conditions, assess risks, identify patterns, draft innovative business models, and respond to sudden challenges. This means it underlies the recognition of opportunities, strategic innovation, and the management of sustainability-critical elements for venture performance directly (Donaldson et al., 2025). Stronger problem-solving skills are, therefore, vital for synthesising the ethical, legal, and operational realms of business into sound judgment and viable solutions.

Pedagogical design has a profound impact on the development of these competencies. Traditional, teacher-centred pedagogies centred on the transmission of content constrain opportunities for authentic cognitive engagement and reflective decision-making (Biggs et al., 2022). However, there is greater potential in the use of experiential, context-based, and culturally responsive pedagogies, such as project-based learning, simulations, and CTCA 2.0, that provide richer settings for the development of problem-solving competence (Darling-Hammond et al., 2024; Oladejo et al., 2025). CTCA 2.0 is especially relevant because it explicitly exploits learners' cultural backgrounds and local socio-economic realities to scaffold their ability to interpret complex problems, generate contextually grounded solutions, and justify decisions collaboratively. The linguistic modality of instruction acts as a vital facilitator, with multilingual pedagogies reportedly significantly enhancing problem-solving performance through reducing cognitive overload, enhancing comprehension, and enabling learners to reason and conceptualize with greater fluency (Wei & García, 2022; Hattingh et al., 2022).

METHODOLOGY

In this study, the research design was quasi-experimental, specifically a pretest-posttest non-equivalent groups design. We chose this design because of the natural setting of the school environment in which this study was undertaken, where it was not possible for us to randomly assign students to the experimental groups. This design permitted exploring the causal effect of this treatment, which was CTCA 2.0 delivered through both monolingual and multilingual instruction, on students' critical thinking and problem-solving skills toward the concept of Business Law and Ethics.

Participants in the Study

The target audience was Senior Secondary School Two (SSS2) students or (Grade 11), who are studying in the stream of Economics, Business, and Entrepreneurship in Kambia District of Sierra Leone. The selected grade was chosen because the Business Law and Ethics topic is exclusively taught at that level in the entrepreneurship curriculum.

The two senior secondary schools were purposively sampled, taking into account criteria involving the school's availability of qualified entrepreneurship teachers, the internet-enabled device available to the students, especially outside school hours, and the presence of distinct instruction contexts, which are monolingual, involving only English, and multilingual, involving English (70%), Krio (20%), Kathemne (8%), and Gen-Z slang (2%). The two

schools were geographically separated to reduce contamination and interaction, which influenced the study's outcome.

A total of 76 SSS2 students were recruited for the study and divided into two groups for the intervention. Experimental Group I, which used CTCA 2.0-Monolingual, had 39 members, including 10 male and 29 female students, whereas Experimental Group II, which used CTCA 2.0-Multilingual, had 37 members, including 9 male and 28 female students. These members were allowed to use mobile phones, tablets, and personal computers for their learning, which was essential in the CTCA 2.0 delivery framework.

Instruments

Business Law and Ethics Problem-Solving in African Context Test (BLE-PSACT)

The Business Law and Ethics Problem-Solving in African Context Test contains 40 multiple-choice items and has been created and calibrated to measure students' problem-solving capabilities in applying Business Law and Ethics in African entrepreneurship contexts. The items are worded in familiar scenarios, such as market transaction cases, contract disputes, consumer protection cases, family businesses, and community ethical issues, to build students' prior exposure to and understanding of entrepreneurship from their lived realities on the African continent and its cultures and environments. The items for measuring student responses are based on the ideals of the Culturo-Techno-Contextual Approach (CTCA 2.0).

The development of the items was guided by Bloom's Revised Taxonomy and Okebukola's 20 Golden Rules of Multiple-Choice Item Construction. The content validity of the test was ensured through expert judgment by qualified teachers and researchers in entrepreneurship, and its reliability was established using the split-half method with Spearman-Brown correlation. The reliability coefficient (0.87) was high enough to demonstrate that the BLE-PSACT scale is reliable for measuring students' problem-solving skills in Business Law and Ethics.

Critical Thinking Test (CTT)

The Critical Thinking Test (CTT) is an open-ended, scenario-based tool designed to measure the analytical skills and ethical and evidence-based decision-making of Business Law and Ethics students. The test incorporates four real-life tasks and draws on recognised frameworks of critical learning, including the Okebukola Critical Thinking Test (OCTT). The test measured higher-order learning through open-ended tasks that required students to constructively compose answers to demonstrate higher-order learning of facts.

Students' performance was measured using CTT based on the important aspects of logic, moral awareness, and reasoning clarity, using a comprehensive analytical scoring system (on a scale of 1 to 4). Two raters analyzed the responses for a sample of students in a bid to ensure the objectivity of the scoring. A high inter-rater correlation coefficient of 0.79 was obtained. A Cronbach's alpha of 0.82 demonstrated high internal consistency of the construct, which illustrates a reliable measurement of the construct. A panel of four experts in entrepreneurship education validated the content, reporting a Validity Index (CVI) of 0.88. Hence, CTT is a valid and reliable tool for assessing critical thinking skills.

Data Collection

Before the commencement of the study, a pre-test was administered to both experimental groups, comprising the two SSS 2 schools involved in the present study, to establish the baseline level of students' academic proficiency in Business Law and Ethics. Subsequently, test results formed the basis for comparing learning outcomes following the intervention. Following the said pre-testing phase, the instructional treatment was continued for five weeks.

During the treatment, the CTCA 2.0 monolingual treatment group was instructed strictly in English, whereas the CTCA 2.0 multilingual treatment group received instruction in a mix of English, Krio, Kathemne, and selected Gen Z expressions, augmented with culturally familiar examples to facilitate deeper understanding and participation.

CTCA 2.0 in the classroom

Both experimental groups, CTCA 2.0 monolingual and CTCA 2.0 multilingual, were instructed in Business Law and Ethics using the six-step instructional framework of CTCA 2.0. These steps have systematically integrated cultural context, technological support, and curriculum content to accelerate active learning, contextual problem-solving, and higher-order thinking throughout the lesson.

1. Inform students ahead of time of the topic to be learned in class. Ask each student to (a) reflect on indigenous knowledge or cultural practices and beliefs associated with the topic or concept. (b) use their mobile phones or other internet-enabled devices to search the web for resources related to the lesson (first technology flavour of the approach).

2. At the start of the lesson and after the introduction by the teacher, students are grouped into mixed-ability, mixed-sex groups to share individual reflections on (a) the indigenous knowledge and cultural practices and beliefs associated with the topic; and (b) summaries of ideas obtained from web resources. All such cultural and web-based reflections are documented and presented to the whole class by the group leaders.
3. The teacher progresses the lesson, drawing practical examples from the immediate surroundings of the school. Such examples should be physically observed by students to make science (or any subject) real. This is one of the "context" flavours of the approach. The teacher should sprinkle delivery with some content-specific humour and Indigenous cultural analogies and metaphors.

4. As the lesson progresses, the class is reminded of the relevance of the indigenous knowledge and cultural practices documented by the groups for a meaningful understanding of the concepts. If misconceptions are associated with cultural beliefs, the teacher clears them up.

5. At the close of the lesson, the teacher conducts a short quiz (oral or written) to evaluate the lesson and provides the topic for the next lesson, which will be the starting point of step 1.

6. As a follow-up to the lesson, the teacher sends a summary of the lesson (two pages) via SMS, WhatsApp, Telegram, or any other messaging app to all students.

Indigenous Knowledge Relating to Business Law and Ethics

The indigenous knowledge systems in Sierra Leone offer a rich cultural foundation for understanding fundamental elements of Business Law and Ethics. For example, in most of these places in Freetown, Kambia, and Kabala, there are informal market institutions such as osusu savings clubs, mini traders' associations, and Sunday markets, where members follow informal guidelines that rely more on trust and collective advantage than on written laws.

The traditional conflict-resolution mechanisms facilitated by the chiefdom councils and paramount chiefs are ideal for addressing economic disputes, such as land and oral-contract violations. The application of decision-making grounded in community values and oral traditions is supported by judicial values such as equity and a fair hearing. On the other hand, trust and reputation in honour-led lending emphasise values such as honesty and good faith. The practices of bride-price negotiations, land inheritance, and market regulation in this culture demonstrate critical aspects of contract law and ethical compliance. The incorporation of such practices into the teaching of Business Law and Ethics is invaluable for enhancing contextualisation and moral reasoning among students.

Method of Data Analysis and Assumption Checks

Parametric assumptions were examined as a prerequisite for using MANCOVA. Normality was assessed using the Shapiro–Wilk test. For posttest problem-solving scores (PSACT), the monolingual group met the normality assumption (Shapiro–Wilk $W = 0.961$, $p = 0.188$), whereas the multilingual group did not ($W = 0.899$, $p = 0.003$). For posttest critical-thinking scores (CTT), both groups showed significant deviations from normality ($p < 0.001$). Despite these deviations, MANCOVA's robustness, especially with a sample size of 39, encouraged us to proceed with other parametric checks. Graphical inspection of histograms and Q-Q plots supported these conclusions, revealing no deviations that would compromise the analyses.

Homogeneity of variance was also assessed by us using Levene's Test. The results indicated that error variances across groups were equal for both PSACT ($F(1,74) = 0.010$, $p = 0.920$) and CTT ($F(1,74) = 0.219$, $p = 0.641$), satisfying the assumption for univariate ANCOVA. The equality of covariance matrices, an essential assumption for MANCOVA, was tested with Box's M test, which was not significant (Box's $M = 3.131$, $F = 1.013$, $p = 0.386$),

confirming that the covariance matrices of the dependent variables were equal across groups. Skewness and kurtosis values for all variables were within acceptable ranges, indicating reasonable symmetry and peakedness for parametric analysis.

Multivariate Analysis of Covariance (MANCOVA) was employed to determine the impact of instructional mode on posttest PSACT and CTT scores, with pretest scores as covariates to adjust for baseline differences. Following a significant multivariate effect, follow-up univariate ANCOVA analyses were performed for each dependent variable. Partial eta squared (η^2p) was reported to quantify effect sizes. All hypotheses were tested at a 0.05 significance level.

RESULTS

Research Question 1: To what extent do monolingual and multilingual modes determine students' critical-thinking skills in CTCA 2.0 Business Law and Ethics teaching?

Students' critical-thinking skills were measured using the Critical-Thinking Test (CTT). As presented in Table 1, students exposed to the CTCA 2.0 multilingual instructional mode obtained a higher mean posttest OCTT score ($M = 2.57$, $SD = 0.93$, $N = 37$) than those taught using the CTCA 2.0 monolingual mode ($M = 2.05$, $SD = 0.79$, $N = 39$). This descriptive result suggests an advantage for multilingual instruction in fostering critical-thinking skills.

Table 1. Descriptive Statistics of Posttest Critical-Thinking and Problem-Solving Scores by Instructional Modes

	Group	Mean	Std. Deviation	N
Posttest PSACT	CTCA 2.0 Monolingual	18.31	3.246	39
	CTCA 2.0 Multilingual	24.49	4.004	37
	Total	21.32	4.764	76
Posttest CTT	CTCA 2.0 Monolingual	2.05	.793	39
	CTCA 2.0 Multilingual	2.57	.929	37
	Total	2.30	.895	76

A multivariate analysis of covariance (MANCOVA) was conducted to examine the effect of instructional language mode on students' cognitive outcomes while controlling for pretest scores. The multivariate results in Table 2 show a statistically significant overall effect of instructional group, Pillai's Trace = .531, $F(2, 71) = 40.174$, $p < .001$, partial $\eta^2 = .531$, indicating that instructional language mode accounted for a substantial proportion of variance in students' combined cognitive outcomes.

Table 2. Multivariate Analysis of Covariance (MANCOVA) Results for Instructional Language Mode on Cognitive Outcomes

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pretest PSACT	Pillai's Trace	.414	25.048	2.000	71.000	.000	.414
Pretest CTT	Pillai's Trace	.117	4.687	2.000	71.000	.012	.117
Group	Pillai's Trace	.531	40.174	2.000	71.000	.000	.531

Follow-up univariate ANCOVA results for critical-thinking skills (CTT) are reported in Table 3. After adjusting for pretest OCTT scores, the effect of instructional language mode on posttest critical-thinking was not statistically significant, $F(1, 72) = 3.762$, $p = .056$, partial $\eta^2 = .050$. Although the observed difference did not reach the conventional .05 significance level, the effect size suggests a small-to-moderate practical effect. Additionally, pretest CTT emerged as a statistically significant covariate ($F(1, 72) = 8.743$, $p = .004$), indicating that prior critical-thinking ability significantly influenced posttest performance.

Table 3. Univariate ANCOVA Results for Posttest Critical-Thinking and Problem-Solving Scores

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Pretest PSACT	Posttest PSACT	330.053	1	330.053	36.705	.000	.338
	Posttest CTT	.256	1	.256	.380	.540	.005
Pretest CTT	Posttest PSACT	2.770	1	2.770	.308	.581	.004
	Posttest CTT	5.890	1	5.890	8.743	.004	.108
Group	Posttest PSACT	687.233	1	687.233	76.426	.000	.515
	Posttest CTT	2.535	1	2.535	3.762	.056	.050

The results from Table 3 indicated that, while students taught using the CTCA 2.0 multilingual mode demonstrated higher adjusted mean critical-thinking scores than those taught in the monolingual mode, the difference was marginal and not statistically significant at the .05 level. This suggests that critical-thinking skills, as measured by CTT, may be relatively stable and strongly influenced by prior cognitive dispositions, requiring longer instructional duration or repeated exposure to multilingual scaffolding for stronger effects to emerge.

Therefore, null hypothesis H_{01} is not rejected, as monolingual and multilingual modes did not significantly determine students' critical-thinking skills within the duration of the intervention, although the observed effect size indicates meaningful educational potential.

Research Question 2: To what extent do monolingual and multilingual modes determine students' problem-solving skills in CTCA 2.0 Business Law and Ethics teaching?

Students' problem-solving skills were assessed using the Problem-Solving in African Context Test (PSACT). Descriptive statistics in Table 1 reveal that students in the CTCA 2.0 multilingual group achieved a substantially higher mean posttest PSACT score ($M = 24.49$, $SD = 4.00$, $N = 37$) than their counterparts in the monolingual group ($M = 18.31$, $SD = 3.25$, $N = 39$), indicating an astronomical advantage for the multilingual instructional approach.

The multivariate test results in Table 2 confirm a statistically significant overall effect of instructional language mode on students' combined cognitive outcomes, justifying further univariate analyses.

Univariate ANCOVA results presented in Table 3 show that instructional language mode had a statistically significant effect on students' posttest problem-solving skills after controlling for pretest scores, $F(1, 72) = 76.426$, $p < .001$, partial $\eta^2 = .515$. This represents a very large effect size, indicating that instructional language mode accounted for over 51% of the variance in posttest problem-solving performance. Furthermore, pretest PSACT was a significant covariate ($F(1, 72) = 36.705$, $p < .001$), confirming that baseline problem-solving ability was appropriately controlled in the model.

The results provide strong evidence that the instructional language mode significantly influences students' problem-solving skills in CTCA 2.0 Business Law and Ethics teaching. The superior performance of students in the multilingual group suggests that integrating multiple languages within the CTCA 2.0 framework enhances conceptual processing, task interpretation, and solution strategies in cognitively demanding problem-solving contexts.

Accordingly, null hypothesis H_{02} is rejected, as the monolingual and multilingual modes differ significantly in their effects on students' problem-solving skills, with the multilingual mode demonstrating clear superiority.

DISCUSSION

The results of the study revealed a significant, large-effect advantage for the multilingual mode in developing problem-solving skills, while its effect on critical-thinking skills, though positive and showing a small-to-moderate effect size, did not reach statistical significance during the intervention period.

The positive effect of the multilingual CTCA 2.0 mode on problem-solving aligns with sociocultural and cognitive theories and with a growing body of empirical research in multilingual education. From a Vygotskian perspective, language is the primary cultural tool for mediating thought. By enabling students to access and utilise their full linguistic repertoire (English, Krio, Kathemne, Gen-Z slang), the multilingual mode provides a more effective psychological tool for decoding complex, context-rich business and ethical problems. This finding also aligns with studies by Beltran-Palanques et al. (2025), who demonstrated that translanguaging pedagogies enhance comprehension, participation, and analytical reasoning in multilingual science and humanities classrooms by reducing linguistic barriers to conceptual engagement.

Cognitively, the result supports Cognitive Load Theory (Sweller, 2023). Teaching abstract legal and ethical concepts solely in English (the monolingual mode) likely imposed a high extraneous cognitive load on students for whom English is not a first language. The multilingual approach, by explaining concepts in familiar languages and using culturally resonant analogies (e.g., *osusu* savings clubs, chiefdom dispute resolution), reduced this extraneous load. This freed up working memory capacity for the intrinsic cognitive processes required for problem-solving: analysing scenario components, generating solutions, and evaluating alternatives (Ghoreyshi et al., 2025). This explanation is consistent with research in African contexts showing that monolingual education policies often create cognitive barriers that impede deep learning (Heugh et al., 2022).

The non-significant finding for critical thinking, despite a higher mean score in the multilingual group, invites a more nuanced discussion. Critical thinking, as measured by the CTT, which involves open-ended ethical reasoning and justification, may be a more stable, dispositional trait that requires longer, more sustained intervention to yield statistically significant gains (Muhammad, 2023). This interpretation is supported by the finding that pretest critical-thinking scores were a significant covariate, indicating the strong influence of prior ability. The result is partially at odds with studies reporting immediate gains in critical thinking from active pedagogies (Darling-Hammond et al., 2024). However, it aligns with literature suggesting that deep criticality, especially in ethics, involves internalised habits of mind that develop over time through repeated practice in cognitively safe environments (Muhammad, 2023). The multilingual mode, by validating students' linguistic identities and cultural knowledge, may have begun to create such an environment, as suggested by the meaningful effect size (η^2p = .050). This suggests that, with a longer intervention, significant differences in critical thinking could emerge, a hypothesis supported by longitudinal research on culturally responsive pedagogies (Gay, 2023).

Overall, the pattern of results, strong for problem-solving and promising but non-significant for critical-thinking, extends the evidence base for CTCA 2.0. It confirms its efficacy in STEM (Adekoya, 2023; Oladejo et al., 2025) and business education by empirically demonstrating that its impact is significantly amplified when its cultural grounding principle is enacted through deliberate multilingual practice. It provides concrete evidence that, in multilingual African classrooms, leveraging linguistic diversity is not merely an equity issue but a cognitive strategy that directly enhances the problem-solving competence essential for entrepreneurship (Kuratko, 2025; Donaldson et al., 2025).

CONCLUSIONS

This study investigated the pivotal role of monolingual and multilingual instructional modes in shaping students' critical-thinking and problem-solving skills within the CTCA 2.0 pedagogy for Business Law and Ethics. The key findings indicate a clear hierarchy of effects. The multilingual mode proved to be a powerful and statistically significant determinant of superior problem-solving performance, accounting for a large proportion of the variance in outcomes. For critical-thinking, while the multilingual group outperformed the monolingual group descriptively and showed a meaningful practical effect, the difference did not attain statistical significance within the study's timeframe, suggesting that critical-thinking may require more prolonged linguistic and cultural scaffolding to show a measurable shift.

The study makes a substantial contribution to the fields of multilingual business education, culturally responsive pedagogy, and entrepreneurial skills development. It moves beyond advocating for CTCA 2.0 in general to providing empirical evidence on how to implement it for optimal cognitive gains in linguistically diverse contexts. The results strongly suggest that the full potential of CTCA 2.0's cultural grounding is realised through pedagogical translanguaging. For educators in Business Law and Ethics, particularly across Africa, this research underscores that embracing students' multilingual repertoires is a critical strategy for developing the problem-solving agility and ethical reasoning needed to navigate complex entrepreneurial landscapes. Therefore, multilingual CTCA 2.0 is not merely an alternative instructional method but a necessary, evidence-based approach for achieving deeper learning and cognitive skill development in multilingual classrooms.

Limitations

Several limitations qualify the interpretation and generalisability of the findings. First, the sample size was restricted to two schools in one district of Sierra Leone, involving 76 students. This limits the external validity of the results to other regions with different linguistic configurations and educational cultures. Second, the quasi-experimental design, while practical, meant that groups were not randomly assigned. Despite including pretests as covariates, unmeasured confounding variables (e.g., subtle differences in teacher enthusiasm or peer dynamics) could have influenced outcomes. Third, measurement constraints exist. The Problem-Solving Assessment (PSACT) was multiple-choice, which may not capture the full depth of ill-structured problem-solving processes. The Critical Thinking Test (OCTT), while open-ended, assessed a specific set of tasks; other facets of critical thinking (e.g., argument analysis, identification of bias) were not measured. Finally, the five-week intervention duration may have been insufficient to foster significant changes in deeper critical-thinking dispositions, highlighting a temporal limitation.

Suggestions for Further Research

Future studies should address these limitations by pursuing several avenues. Large-scale, multi-site randomised controlled trials across African countries and educational levels would strengthen the evidence base and inform policy. Longitudinal research tracking students over an academic year or more could determine whether sustained exposure to multilingual CTCA 2.0 significantly enhances critical thinking and supports skill retention. Qualitative studies, such as classroom discourse analysis and think-aloud protocols, are needed to understand how translanguaging within CTCA 2.0 facilitates problem-solving and reasoning in real time. Investigating effective models for pre- and in-service teacher training in multilingual CTCA 2.0 pedagogy is important for scalable implementation. Additionally, applying similar research designs to other subjects in the business curriculum and beyond would help test the generalisability of the multilingual advantage for higher-order thinking.

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Data for this study will be made available on request by the author (Omarbundcamara@gmail.com).

Declaration of Generative AI technologies

The authors declare that Grammarly was used exclusively for language editing and stylistic improvements. All intellectual content, analysis, and conclusions remain the responsibility of the authors.

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Instructional leadership for inclusive curriculum delivery in full-service schools of the Limpopo province, South Africa

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ABSTRACT

South Africa's commitment to inclusive, equitable, high-quality education positions instructional leadership as a key lever for strengthening curriculum delivery in contexts of learner diversity. Full-service schools are mandated to model inclusion by providing support that enables learners experiencing barriers to access, participate, and achieve. However, persistent gaps between policy and classroom practice highlight the need for leadership approaches that integrate vision, collaboration, and pedagogy. This article examines how instructional leaders enact inclusive curriculum delivery through an Integrated Leadership Model that synthesises transformational, distributed, and instructional leadership to enhance learner participation and performance in two full-service schools in Limpopo Province. Guided by Transformational Leadership Theory and an interpretivist qualitative paradigm, the study adopted a multiple-case design across one primary and one secondary school. Semi-structured interviews with twelve instructional leaders (principals, deputy principals, and departmental heads) were analysed using inductive thematic analysis. Findings show that inclusive curriculum delivery is conceptualised as a multidimensional process grounded in culture, belonging, relevance, and learner participation. Leadership practices emphasised inclusive school cultures, curriculum relevance, learner voice, and differentiated pedagogy. Teacher support was largely informal and practice-based, relying on collaboration and distributed leadership rather than formal professional development. The study also reveals systemic constraints, including resource shortages, limited specialised training, curriculum rigidity, and resistance to change. Despite these challenges, leaders demonstrated adaptive agency through strategies such as remedial support, peer tutoring, flexible grouping, learner-led initiatives, and strengthened school–community partnerships. The article argues that strengthening instructional leadership through an integrated model is essential for narrowing the policy–practice gap. It concludes that transformational leadership provides vision, distributed leadership enables collaboration, and instructional leadership operationalises inclusive pedagogy. Recommendations include institutionalising professional learning communities, sustaining practice-based development, and aligning resources and monitoring systems with inclusive priorities.

Keywords: instructional leadership; inclusive curriculum; curriculum delivery; learner performance; full-service schools

INTRODUCTION

Inclusive education has become a defining principle of global education reform, as systems seek to ensure that all learners, irrespective of disability, socio-economic status, language, culture, migration histories, or other forms of difference, can access meaningful, high-quality learning opportunities (Booth, 2011). In South Africa, inclusive education is anchored in a rights-based policy architecture that frames inclusion as both a moral imperative and a systemic response to historical inequalities. Full-service schools play a distinctive role within this architecture, as they are expected to model inclusive education in mainstream settings by providing differentiated pedagogical support and coordinated learner support systems.

However, research repeatedly shows that inclusive education is unevenly implemented, particularly in rural and under-resourced contexts, where shortages of specialist personnel, teaching materials, and assistive technologies constrain implementation (Mpu & Adu, 2021). These constraints often intersect with pressures to pace the curriculum, assessment accountability regimes, and variable teacher preparedness for inclusive pedagogies, resulting in a persistent policy-practice gap. In this context, instructional leadership becomes a critical mediator between inclusive policy intent and classroom enactment.

Instructional leadership refers to leadership practices that directly prioritise the improvement of teaching and learning by setting pedagogical direction, strengthening teacher capacity, monitoring curriculum coverage and learner progress, and creating the conditions for effective classroom practice. Within inclusive education, instructional leadership must also be equity-oriented: it must support differentiation, cultivate inclusive learning cultures, and ensure that curriculum and assessment practices respond to learner variability rather than treating diversity as deviation.

This article examines how instructional leaders (principals, deputy principals, and departmental heads) in full-service schools conceptualise inclusive curriculum delivery, support teachers in enacting inclusive practices, and navigate constraints as they seek to strengthen learner performance in Limpopo Province. The study advances a "golden thread" argument: leaders' interpretations of inclusive curriculum delivery shape (i) the pedagogical culture they cultivate, (ii) the teacher-support routines they institutionalise (formally or informally), and (iii) the performance-enhancement strategies they prioritise under conditions of constraint.

Problem statement

Despite South Africa's progressive, inclusive education policy framework, articulated in Education White Paper 6 (Department of Education, 2001) and operationalised through the Screening, Identification, Assessment and Support (SIAS) Policy (DBE, 2014), the full enactment of inclusive education in full-service schools remains uneven and constrained. While these policies provide a strong normative and procedural foundation for identifying and supporting learners experiencing barriers to learning, their translation into classroom practice is inconsistent, particularly in rural and under-resourced contexts such as Limpopo Province.

Existing scholarship attributes this policy-practice gap primarily to resource constraints, limited teacher capacity, and systemic inefficiencies. However, this study argues that a deeper, under-theorised gap lies in the absence of a clearly articulated transformational vision, sustained motivational leadership, and the technical means required to institutionalise inclusive practices within schools. In many cases, leadership for inclusion remains fragmented, lacking coherence across vision (Transformational Leadership), collaborative structures (Distributed Leadership), and pedagogical enactment (Instructional Leadership). Consequently, inclusive education is often reduced to ad hoc practices rather than being embedded as a systemic, school-wide instructional priority. This fragmentation limits the capacity of full-service schools to function as intended, as centres of inclusive excellence capable of modelling differentiated curriculum delivery and coordinated learner support.

This study addresses this gap by conceptualising leadership for inclusive curriculum delivery through an Integrated Leadership Model, where Transformational Leadership provides vision and motivation, Distributed Leadership structures collaborative enactment, and Instructional Leadership operationalises inclusive pedagogy. The study, therefore, seeks to understand how leadership practices can be reconfigured to move beyond compliance toward meaningful transformation of school culture, teaching practices, and learner outcomes.

Research questions

Primary research question: How does an Integrated Leadership Model encompassing transformational, distributed, and instructional leadership shape the enactment of inclusive curriculum delivery in full-service schools?

The following specific research questions (SRQs) guide the study:

- SRQ1: How do instructional leaders conceptualise inclusive curriculum delivery in relation to culture, belonging, and relevance?
- SRQ2: How do instructional leaders support differentiation and flexible pedagogy to enable inclusive curriculum delivery?
- SRQ3: How do instructional leaders incorporate learner voices to inform inclusive teaching practices?
- SRQ4: How do instructional leaders support teachers through professional learning and collaboration?
- SRQ5: What challenges do instructional leaders encounter, and how do they respond to strengthen learner participation and performance?

LITERATURE REVIEW

Inclusive curriculum delivery as culture, belonging, and relevance

Inclusive curriculum delivery is increasingly conceptualised as a cultural and relational transformation, rather than a mere structural adjustment within schooling systems. Contemporary scholarship emphasises that inclusion requires the reconfiguration of school culture, pedagogy, and curriculum to ensure that all learners experience belonging, dignity, and meaningful participation (Booth, 2011; Kefallinou, Symeonidou, & Meijer, 2020).

In this regard, inclusion is not limited to physical placement in mainstream classrooms. Still, it involves intentional efforts to create learning environments in which learners' identities, experiences, and sociocultural contexts are recognised and valued. Curriculum relevance is therefore central to inclusive practice, as it enhances learner engagement and reduces barriers to participation by connecting learning to lived realities (UNESCO, 2023; Kefallinou et al., 2020).

From a leadership perspective, this aligns strongly with transformational leadership, which positions leaders as agents who shape shared values, beliefs, and expectations. Transformational leaders cultivate inclusive cultures through idealised influence and inspirational motivation, framing inclusion as a moral and instructional priority (Burns, 1978; Bass, 1990). In under-resourced contexts, where material constraints persist, relational practices such as affirming learners' identities and creating safe learning environments serve as practical, immediate mechanisms for advancing inclusion (Mpu & Adu, 2021; Sepadi, 2025).

Differentiation and flexible pedagogy as access mechanisms

Inclusive curriculum delivery is operationalised through pedagogical responsiveness, which involves designing learning experiences that anticipate and accommodate learner variability (Booth, 2011; Kefallinou et al., 2020). Within this framing, differentiation and flexible pedagogy serve as critical access mechanisms that enable learners to engage meaningfully with curriculum content.

Universal Design for Learning (UDL) provides a widely recognised framework for inclusive pedagogy, emphasising multiple means of engagement, representation, and expression (CAST, 2025). Complementing UDL, differentiated

instruction focuses on adapting content, process, and assessment in response to learner readiness and needs (Bray et al., 2024).

However, research consistently highlights that differentiation is unevenly implemented, particularly in contexts characterised by time constraints, limited teacher training, and pressure to pace the curriculum (Mpu & Adu, 2021; Sepadi, 2025). These challenges underscore the importance of instructional leadership, which provides the pedagogical guidance and support necessary for teachers to translate inclusive principles into classroom practice (Hallinger, 2011).

Importantly, emerging scholarship emphasises that effective inclusive pedagogy requires not only technical knowledge but also ongoing professional learning, modelling, and feedback, enabling teachers to integrate differentiation into routine practice rather than perceiving it as an additional burden (European Agency for Special Needs and Inclusive Education, 2018).

Learner voice and participatory routines

Learner voice has emerged as a critical dimension of inclusive education, reflecting a shift toward recognising learners as active participants in their own learning processes (Booth, 2011; UNESCO, 2023). Inclusive classrooms are therefore characterised by participatory routines that allow learners to express their experiences, challenges, and learning needs, informing instructional decision-making.

This participatory approach aligns with evidence suggesting that inclusion is strengthened when classroom practices are informed by learner participation data, rather than solely by performance outcomes (Kefallinou et al., 2020). In resource-constrained contexts, learner voice serves as a low-cost, high-impact mechanism for identifying barriers and adapting instruction in real time (Sepadi, 2025).

From an instructional leadership perspective, learner voice serves as evidence-informed practice, enabling teachers to refine their pedagogy based on learner feedback. At the same time, it aligns with transformational leadership, as leaders cultivate a culture where learners' perspectives are valued and legitimised. Furthermore, emerging accountability scholarship highlights that inclusive systems should incorporate participation, access, and support indicators alongside traditional performance measures, positioning learner voice as both an instructional tool and a monitoring mechanism (Kuyini, 2025).

Teacher support through informal professional learning and collaboration

Teacher capacity is central to inclusive curriculum delivery, with research consistently highlighting the importance of professional learning and collaboration in strengthening inclusive practice (Holmqvist & Lelinge, 2021). In many under-resourced contexts, teacher support is enacted through informal, practice-embedded learning routines, including coaching, peer discussions, and collaborative problem-solving (Sepadi, 2025).

Professional Learning Communities (PLCs) are widely recognised as effective mechanisms for enhancing teaching and learning when they are intentionally structured, sustained over time, and centred on the systematic use of learner evidence to inform practice. However, in many school contexts, collaborative practices remain largely informal, episodic, and insufficiently institutionalised, thereby constraining their potential to generate meaningful improvements in pedagogy and learner outcomes (DuFour, 2004; Vescio et al., 2008).

This highlights the role of distributed leadership, in which leadership responsibilities are shared among principals, deputy principals, and departmental heads to support teacher development. In this regard, departmental heads function as key instructional enactors, facilitating collaboration and guiding pedagogical practice (Manase et al., 2024; Spillane, 2006; Harris, 2008).

At the same time, transformational leadership fosters a culture of collaboration and collective efficacy, while instructional leadership ensures that this collaboration is anchored in pedagogical improvement and learner outcomes.

Thus, effective teacher support requires integrating all three leadership dimensions (Leithwood et al., 2020; Hallinger, 2011; Robinson et al., 2008).

Constraints and leadership responses to strengthen learner performance

The implementation of inclusive education is significantly shaped by systemic constraints, including limited resources, inadequate training, curriculum rigidity, and accountability pressures (Mpu & Adu, 2021; Mahlaule et al., 2024). These constraints highlight the persistent gap between policy intentions and classroom realities, particularly in under-resourced contexts. Implementation scholarship increasingly frames inclusion as both a capacity and systems-readiness challenge, requiring coordinated resourcing, functional support services, and effective monitoring systems (OECD, 2023). Without these enabling conditions, schools often resort to improvisational practices, limiting the sustainability of inclusive education.

However, research also demonstrates that leaders can mediate these constraints through contextually responsive strategies, including peer tutoring, differentiated support, and community partnerships (Kuyini, 2025). These strategies reflect a form of adaptive leadership, in which leaders innovate within constraints to enhance learner participation and performance. From a theoretical perspective, these responses illustrate the integration of leadership dimensions:

Transformational leadership sustains motivation and commitment to inclusion; distributed leadership enables collective problem-solving and resource mobilisation; and, lastly, instructional leadership ensures that strategies are pedagogically grounded. This reinforces the argument that effective inclusive curriculum delivery depends not on eliminating constraints, but on leadership's capacity to navigate and mediate them through integrated practices.

Theoretical framework: Integrated Leadership Model for Inclusive Curriculum Delivery

This study is grounded in Transformational Leadership Theory, conceptualised as a relational process through which leaders and followers elevate one another to higher levels of motivation, commitment, and moral purpose. This process is operationalised through the core dimensions of idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration (Burns, 1978; Bass, 1990). To enhance its explanatory power in the context of curriculum enactment, the study adopts a transformational instructional leadership perspective, reframing transformational leadership as pedagogically oriented leadership. Within this framing, leadership is enacted through curriculum direction-setting, the development of teacher capacity, the strategic use of evidence, and the cultivation of inclusive school cultures to strengthen learner participation and performance in full-service schools (Burns, 1978; Bass, 1990).

Emerging empirical evidence further reinforces the relevance of this theoretical lens for inclusive education. Recent studies indicate that leadership influences teachers' inclusive education literacy both directly and indirectly through mechanisms such as stress reduction, professional support, and the activation of teacher agency (Feng et al., 2025; Leithwood et al., 2020; Hallinger, 2011). Complementary research further demonstrates that leadership practices shape teachers' beliefs, efficacy, and classroom enactment of inclusive pedagogy through structured support, collaborative cultures, and instructional guidance (Ainscow, 2020; Spillane, 2006).

This body of scholarship suggests that transformational instructional leadership extends beyond symbolic visioning to include the deliberate orchestration of enabling organisational and pedagogical conditions that support teachers in implementing differentiated and inclusive practices within real classroom contexts, particularly in settings characterised by learner diversity and systemic constraints.

Building on this foundation, the study is framed through an Integrated Leadership Model that synthesises Transformational, Distributed, and Instructional Leadership into a coherent analytical framework to strengthen learner participation and performance in two full-service schools in Limpopo Province. Within this model, Transformational Leadership provides the vision, moral purpose, and motivational impetus necessary to position inclusion as a core institutional priority (Burns, 1978; Bass, 1990). Distributed Leadership delineates the collaborative architecture—the 'who'—through which leadership functions are shared and enacted across multiple actors within the school (Spillane, 2006), thereby enabling collective responsibility for inclusive curriculum delivery. Instructional Leadership, in turn,

constitutes the pedagogical core—the 'what'—focusing on curriculum delivery, teaching practices, assessment, and learner support (Hallinger, 2011), ensuring that inclusive principles are translated into classroom practice.

The integration of these leadership dimensions establishes a coherent "golden thread" that runs across the study, ensuring conceptual and analytical alignment from the abstract through to the conclusion. Within this integrated framework, leadership for inclusion is conceptualised as a multidimensional and dynamic construct in which vision, collaboration, and pedagogy are mutually reinforcing and collectively strengthen learner participation, engagement, and performance in full-service schools.

The value of transformational leadership to inclusive curriculum delivery

Transformational instructional leaders communicate inclusion as a core instructional value and build shared norms that protect belonging, dignity, and high expectations for all learners, because teachers' enactment of inclusion is shaped by what is collectively valued, monitored, and supported under pressure (Booth, 2011; European Agency for Special Needs and Inclusive Education, 2018).

Leaders enable teachers to question routine practices, experiment with differentiated strategies, and redesign learning tasks for accessibility, which is central to UDL-aligned enactment. Evidence on technology and UDL implementation suggests that innovation requires structured teacher learning and design capacity rather than merely adding tools (Bray et al., 2024; CAST, 2025).

Transformational instructional leadership includes differentiated support to teachers (coaching, feedback, recognition) and the organisation of learner support systems that respond to specific needs without lowering expectations; evidence that leadership effects operate through job stress and teacher agency clarifies why individualised consideration is central to sustaining inclusion work (Feng et al., 2025; Sepadi, 2025).

Transformational instructional leaders align collaborative routines (planning, moderation, learner support meetings, PLC inquiry) with evidence of learner progress; cross-national evidence shows PLC engagement is strongly linked to teacher job satisfaction, indicating that collaboration can stabilise the professional conditions for sustained improvement when it is purposefully organised and instructionally anchored (Christensen & Jerrim, 2025; Holmqvist & Lelinge, 2021).

METHODOLOGY

Research paradigm and design

The study adopted a qualitative design within an interpretivist paradigm (Creswell, 2014; Creswell & Poth, 2018). A multiple-case study design (Yin, 2018) enabled in-depth exploration of leadership enactment across two full-service schools in Limpopo Province, one primary and one secondary. The design allowed comparison across cases while preserving the specificity of each school's organisational culture and resource conditions.

Participants and Sampling

Participants were anonymised using coded identifiers (P = Principal; D = Deputy Principal; DH = Departmental Head) to ensure confidentiality and protect identities. The sample comprised twelve instructional leaders, including principals (P1–P4), deputy principals (D1–D4), and departmental heads (DH1–DH4), drawn from two full-service schools (one primary and one secondary). This composition enabled representation across leadership levels and supported the examination of distributed leadership dynamics within inclusive curriculum delivery. All participants had between 5 and 20 years of teaching experience and had been exposed to inclusive education through formal training, workshops, or in-service programmes.

Inclusion criteria required participants to: (i) hold a formal leadership position within a full-service school; (ii) possess a minimum of five years' teaching experience; and (iii) be actively involved in curriculum delivery and learner support

processes. Educators without leadership responsibilities or those not directly engaged in instructional decision-making were excluded. The purposive and theoretically informed sampling strategy ensured the selection of information-rich participants and facilitated triangulation across roles, thereby strengthening the study's analytical depth and rigour.

The presentation of participant details in tabular form enhances transparency and enables readers to contextualise verbatim excerpts in relation to participants' roles, experience, and institutional settings, which is critical for qualitative interpretation and trustworthiness (Patton, 2015). Table 1 below illustrates the participants' details.

Table 1: Biographical data of participants

Code	Gender	Portfolio	School	Years of Experience
P1	Male	Principal (1)	School A (Primary)	18 years
P2	Female	Principal (2)	School B (Secondary)	20 years
P3	Male	Principal (3)	School A (Primary)	15 years
P4	Female	Principal (4)	School B (Secondary)	17 years
D1	Female	Deputy Principal (1)	School A (Primary)	12 years
D2	Male	Deputy Principal (2)	School B (Secondary)	14 years
D3	Female	Deputy Principal (3)	School A (Primary)	10 years
D4	Male	Deputy Principal (4)	School B (Secondary)	13 years
DH1	Female	Departmental Head (1)	School A (Primary)	8 years
DH2	Male	Departmental Head (2)	School B (Secondary)	9 years
DH3	Female	Departmental Head (3)	School A (Primary)	7 years
DH4	Male	Departmental Head (4)	School B (Secondary)	6 years

Site selection and participants

Purposive sampling was used to select the two schools, as they were designated full-service schools expected to model inclusive education. Twelve participants were purposively selected because they occupied formal instructional leadership roles: principals (n=4), deputy principals (n=4), and departmental heads (n=4). The researcher used pseudonyms to protect confidentiality.

Data generation and ethical considerations

Ethical clearance for the study was obtained through a formal institutional review process before data collection. The researcher submitted a detailed application to the College of Education Ethical Clearance Committee, outlining the study's purpose, research design, participant recruitment procedures, data collection methods, and strategies for ensuring ethical compliance. The proposal underwent review to ensure adherence to principles of respect for persons, beneficence, and justice. Approval was subsequently granted under ethical clearance reference number 2024/11/15000000384/07RB, confirming that the study met institutional and national ethical standards for research involving human participants.

To operationalise ethical compliance, several procedures were implemented. First, informed consent was secured from all participants before participation. Participants were provided with an information sheet detailing the purpose of the study, the voluntary nature of participation, their right to withdraw at any stage without penalty, and how the data would be used. Written consent was obtained before conducting the interviews. Second, confidentiality and anonymity were ensured by assigning pseudonyms and removing all identifying information from transcripts and reports. Audio recordings and transcripts were securely stored on password-protected devices accessible only to the researcher.

Furthermore, the use of a self-developed semi-structured interview guide was aligned with ethical standards by ensuring that questions were non-intrusive, respectful, and directly related to the research objectives. Participants were also allowed to review their responses during member checking, thereby reinforcing ethical principles of transparency

and participant validation. These procedures ensured that the study upheld ethical integrity throughout the research process (Creswell & Creswell, 2018).

Data analysis

Inductive thematic analysis was conducted following a systematic, data-driven approach that allowed themes to emerge from participants' accounts rather than being imposed a priori. First, all interview transcripts were transcribed verbatim and read repeatedly to achieve data familiarisation, with initial insights captured through reflexive memoing. During the initial coding phase, the researcher generated open, descriptive codes by identifying recurring meanings, patterns, and significant statements across the dataset. These codes were applied consistently across transcripts to ensure analytic rigour.

In the second phase, codes were examined for similarities and differences and subsequently clustered into broader categories. Through a process of constant comparison, related codes were grouped to form preliminary themes. These themes were then reviewed and refined by checking their coherence within and across data extracts, ensuring that they accurately represented participants' perspectives. Particular attention was given to aligning theme development with the study's analytic "golden thread," namely: (i) leaders' conceptualisations of inclusive curriculum delivery, (ii) leadership and teacher support routines, and (iii) strategies for addressing systemic constraints and strengthening learner performance.

In the final phase, themes were clearly defined, named, and supported with representative verbatim excerpts to enhance interpretive depth and transparency. The iterative movement between data, codes, and themes ensured that the analysis remained inductive, rigorous, and grounded in participants' lived experiences (Braun & Clarke, 2006).

Trustworthiness

Trustworthiness was established in accordance with the criteria of credibility, dependability, confirmability, and transferability (Lincoln & Guba, 1985). Credibility was further strengthened through a rigorous member-checking process. After transcription, interview transcripts were returned to participants for verification of accuracy, allowing them to confirm, clarify, or amend their responses. Subsequently, preliminary themes and interpretive summaries were shared with participants to validate whether the emerging interpretations authentically reflected their experiences and perspectives. Feedback from participants was incorporated into the refinement of codes and themes, thereby enhancing the authenticity and accuracy of the findings. This iterative validation process ensured that the analysis remained grounded in participants' meanings rather than researcher assumptions (Birt et al., 2016).

Dependability was ensured by maintaining a comprehensive audit trail documenting coding decisions and theme development processes. Confirmability was strengthened through reflexive journaling to minimise researcher bias and ensure that findings were grounded in participants' accounts. Transferability was supported by providing thick descriptions of the research context and participant characteristics, enabling readers to assess the applicability of the findings to similar contexts.

FINDINGS

Theme 1: Inclusive curriculum delivery as culture, belonging, and relevance

Participants consistently described inclusive curriculum delivery as intentionally cultivating a learning culture in which learners experience belonging, respect, and recognition. This framing aligns with inclusive education scholarship, which defines inclusion as a transformation of school culture and classroom relationships, not merely learner placement, enabling participation and achievement for all learners. It also resonates with evidence that, in under-resourced contexts, inclusion is often enacted through relational work (safe spaces, dignity, affirming interactions) because these are immediately actionable even when specialist supports are limited.

Subtheme 1.1: Fostering a sense of belonging and respect

Participants emphasised that fostering a sense of belonging and respect is central to inclusive practice. A departmental head noted, *"We make sure that every learner feels accepted in the classroom, regardless of their background or ability, because that is where learning begins" (Dh3).*

A deputy principal similarly explained, ***"****Creating a supportive environment where learners feel valued helps them to participate more confidently in class activities" (D4).* At the leadership level, a principal stated, *"We prioritise building a school culture where every learner is respected and given equal opportunities to succeed" (P2).* These accounts illustrate how inclusive curriculum delivery is deeply rooted in relational and cultural practices shaped by leadership.

This emphasis on culture is strongly underpinned by transformational leadership, in which leaders shape beliefs and expectations about learners' potential. As one principal noted: *"Inclusion starts with how we think as leaders. If we don't believe every learner can succeed, teachers won't either" (P1).* This illustrates how leadership vision and moral purpose influence the broader instructional culture and teacher dispositions toward inclusion.

This transformational orientation is further reflected in how leaders actively shape teachers' attitudes and expectations. A deputy principal remarked, *"We constantly remind teachers that every learner has potential, and it is our responsibility to support them to achieve it" (D4).* In a similar vein, a departmental head stated, *"We encourage teachers to change their mindset and see diversity in the classroom as an opportunity rather than a challenge" (Dh1).* These perspectives reinforce the role of leadership in cultivating a shared commitment to inclusive values and practices.

Subtheme 1.2: curriculum relevance as foundational to performance

Leaders' emphasis on curriculum relevance as foundational to performance mirrors research showing that inclusive curriculum enactment strengthens when curriculum content is connected to learners' lived realities, identities, and contexts, thereby increasing engagement and reducing barriers to participation (Booth, 2011; Kefallinou et al., 2020). In the South African context, where inclusive policy interpretations vary across phases and school types, making learning meaningful and culturally accessible serves as a practical mechanism by which leaders translate inclusive intent into classroom routines that support achievement (Mahlaule, McCrindle, & Napoles, 2024; Mpu & Adu, 2021).

Participants further highlighted the importance of contextualising curriculum content to enhance learner engagement. A departmental head explained, *"When lessons are linked to learners' everyday experiences, they become more interested and can understand better" (Dh4).* A deputy principal added, *"We encourage teachers to adapt the curriculum so that it speaks to the realities of our learners, especially in this community" (D1).* At the strategic level, a principal noted, *"Making the curriculum relevant helps learners to connect with what they are learning, which improves both participation and performance" (P3).* These accounts demonstrate how instructional leadership supports the alignment of curriculum with learners' contexts as a key strategy for inclusion.

Theme 2: Differentiation and flexible pedagogy as access mechanisms

Leaders linked inclusion to differentiated pedagogy and flexible methods, visual scaffolds, storytelling, structured group work, varied questioning strategies, and adjustments to pacing, which reflects a pedagogy of responsiveness in which learner variability is treated as usual rather than exceptional (CAST, 2025; Kefallinou et al., 2020). Their accounts align implicitly with UDL principles of multiple means of representation and expression, as well as with evidence that accessible design choices broaden participation and reduce reliance on late-stage remediation (CAST, 2025; Bray et al., 2024).

Subtheme 2.1: Curriculum relevance as foundational to classroom practice

Participants highlighted how differentiated pedagogy is enacted through practical classroom strategies. A departmental head noted, *"Teachers are encouraged to use different methods such as visual aids, group activities, and storytelling so that all learners can understand the content" (Dh4)*.

Similarly, a deputy principal explained, *"We emphasise flexible teaching approaches where teachers adjust their methods depending on the needs of the learners in the class" (D4).*

At the strategic level, a principal stated, *"Inclusive teaching means recognising that learners are different and ensuring that our teaching approaches accommodate that diversity in meaningful ways" (P2)*. These accounts reflect an instructional leadership orientation that promotes responsiveness to learner variability.

Subtheme 2.2: Leadership support to teachers to implement flexible pedagogy.

This instructional dimension of leadership is reflected in how leaders actively support teachers to adapt pedagogy. As one deputy principal explained*: "We support teachers with strategies like grouping learners and adapting tasks, but many still need more training"* (D1). This highlights both the presence of instructional leadership practices and the ongoing need for capacity-building to strengthen inclusive pedagogy.

This need for sustained support is further reinforced by participants' reflections on leadership practices. A departmental head indicated, *"We guide teachers on how to modify their lessons, but it is not always easy because they need more practical training to do it effectively" (Dh3).*

A deputy principal added, *"We try to demonstrate different strategies during meetings, but teachers still require continuous support to confidently apply them in class" (D1).* These perspectives underscore the importance of instructional leadership in bridging the gap between policy expectations and classroom practice.

At the same time, leaders noted uneven teacher confidence in designing differentiated tasks under curriculum pacing and assessment demands. This finding is consistent with research demonstrating that implementation gaps often emerge when teachers lack practice-based learning opportunities and when accountability pressures incentivise uniform pacing and narrow assessment routines that inadvertently marginalise learners needing alternative representations or extended time (Mpu & Adu, 2021; Kuyini, 2025). The result is a tension between inclusive intent and classroom feasibility, suggesting that leadership must provide not only encouragement but also structured professional learning and monitoring routines that translate differentiation into repeatable instructional practices (European Agency for Special Needs and Inclusive Education, 2018; Holmqvist & Lelinge, 2021).

Participants further highlighted this tension between curriculum demands and inclusive practice. A principal observed, *"Teachers are under pressure to complete the syllabus, which sometimes makes it difficult for them to slow down and support learners who need more time" (P4).*

A departmental head similarly noted, *"Some teachers struggle to balance curriculum coverage with adapting lessons for different learners, especially when classes are large" (Dh1).*

A deputy principal added, *"There is a need for ongoing professional development because many teachers are not yet confident in applying differentiated strategies consistently" (D4).* These accounts illustrate how systemic pressures intersect with teacher capacity, reinforcing the need for sustained instructional leadership and structured professional learning.

Learner voice and participatory routines

Departmental heads foregrounded learner voice through class discussions, learner forums, and reflective check-ins, with leaders reporting that learner feedback shaped decisions about remediation, group support, and the redesign of teaching approaches. This is consistent with the view that inclusion is strengthened when learners are recognised as active participants in their learning and when classroom practices are adjusted in response to evidence of participation rather than only attainment data (Booth, 2011; Kefallinou et al., 2020). Participatory routines also function as low-

cost inclusion mechanisms in contexts where formal specialist provision is limited, helping teachers identify barriers early and adapt instruction in situ (Sepadi, 2025; European Agency for Special Needs and Inclusive Education, 2018).

Participants emphasised that learner voice plays a critical role in shaping instructional decisions at the classroom level. A departmental head explained, *"We give learners opportunities to express where they struggle, and that helps us to adjust our teaching methods to support them better" (Dh3*).

Another departmental head highlighted the role of continuous engagement, noting, *"Through class discussions and feedback sessions, learners tell us what works for them, and we use that information to improve our lessons" (Dh2).* These accounts demonstrate how learner voice is embedded in instructional leadership practices and used as a resource for responsive pedagogy.

At the leadership level, the importance of learner participation was also emphasised. A deputy principal noted, *"We encourage teachers to listen to learners because their feedback helps us understand the challenges they face in the classroom" (D1).*

Similarly, a principal reflected on the strategic value of learner input, stating, *"When learners are involved in the learning process, it becomes easier for us to identify gaps and plan appropriate interventions" (P4).* These perspectives reinforce the role of leadership in legitimising learner voice within an inclusive school culture.

The finding that learner voice informed pedagogical redesign also speaks to emerging accountability arguments that inclusive systems should be accountable not only for test outcomes but also for participation, access, and support quality dimensions, which are often made visible through learner experience data and classroom-level evidence (Kuyini, 2025; UNESCO, 2023). In this way, learner voice serves as both an inclusion strategy and a monitoring signal, enabling leaders to connect instructional decisions to equity goals and learner engagement trajectories (European Agency for Special Needs and Inclusive Education, 2018; Kuyini, 2025).

This dual function of learner voice as both an instructional and accountability mechanism was further reflected in participants' accounts. A deputy principal explained, *"We use learners' feedback not only to support them academically but also to monitor whether our teaching approaches are effective" (D3).*
In a similar vein, a departmental head stated, *"When learners share their experiences, it helps us to see if our support strategies are working or if we need to change them" (Dh1).* At the strategic level, a principal added, *"Learner feedback gives us evidence that goes beyond marks; it shows whether learners are actually participating and benefiting from our teaching" (P3)*. These responses illustrate how learner voice is leveraged as both a pedagogical tool and a mechanism for strengthening inclusive accountability practices.

Teacher support through informal professional learning and collaboration

Teacher support was predominantly enacted through informal professional learning routines, coaching conversations, classroom walk-throughs, feedback dialogues, and reflective staff discussions, rather than consistently institutionalised PLC structures. This aligns with evidence that in under-resourced settings, inclusive practice is often sustained through embedded, practice-based learning and relational leadership supports when formal professional development is limited (Sepadi, 2025; European Agency for Special Needs and Inclusive Education, 2018). It also coheres with findings that collaboration contributes to teacher learning and the professional conditions necessary for sustained change, provided it is instructionally anchored and supported by leadership (Holmqvist & Lelinge, 2021; Christensen & Jerrim, 2025).

Participants emphasised that teacher support is largely embedded in everyday professional interactions rather than formalised structures. As one principal noted, *"We do not always have formal workshops, but we support teachers through continuous discussions and checking their work in classrooms" (P3).*

Similarly, a deputy principal explained, *"Most of our support happens during walk-throughs and feedback sessions where we guide teachers on how to improve their lessons" (D2).*

A departmental head reinforced this perspective, stating, *"We sit with teachers, look at their lesson plans, and suggest ways to include all learners in the activities" (DH2).* These accounts illustrate how instructional leadership is enacted through ongoing, practice-based engagement with teachers.

The distributed nature of leadership in supporting teachers is evident in the role of departmental heads as instructional enactors. As one departmental head stated: "We work as a team. The principal sets direction, but we as DHs guide teachers daily on how to adjust lessons" (DH3). This reflects the collaborative architecture of distributed leadership, where responsibility for inclusive curriculum delivery is shared and operationalised across leadership levels.

This distribution of leadership responsibility is further echoed by deputy principals and principals. A deputy principal highlighted coordination across leadership levels, noting, *"The principal gives the vision on the designing of annual teaching plan and assessment plans, but we work closely with the HODs to make sure teachers are supported in their daily lesson plans design and classroom practice" (D1).*

A principal similarly emphasised collective responsibility, stating, *"Inclusive teaching is not the responsibility of one person; it requires all of us to work together and support teachers continuously" (P1).* These perspectives reinforce the idea that inclusive curriculum delivery is sustained through shared leadership practices rather than hierarchical control.

Leaders' use of routine staff interactions to discuss curriculum interpretation, learner errors, and intervention planning reflects the literature's emphasis on collaborative inquiry grounded in learner evidence. Research shows that PLCs and collaborative professional learning are most effective when they focus on concrete learner work, formative assessment patterns, and co-designed instructional adjustments, precisely the kinds of discussions leaders described, albeit informally (Holmqvist & Lelinge, 2021; Christensen & Jerrim, 2025). The reported subject-focused collaboration across schools further reflects a "networked improvement" logic, in which schools pool expertise and resources to strengthen instructional capacity, particularly when system supports are limited (European Agency for Special Needs and Inclusive Education, 2018; UNESCO, 2023).

Participants further highlighted how these collaborative routines are anchored in learner evidence and instructional improvement. A departmental head explained, "We analyse learners' work together and identify where they struggle so that we can adjust our teaching strategies" (DH4). A deputy principal added, *"During our meetings, we focus on learner performance and discuss what teachers can do differently to support those who are struggling" (D3).* At the leadership level, a principal noted, "*We encourage teachers to share challenges and solutions so that we learn from each other and improve our teaching practices" (P2).* These accounts demonstrate how informal collaborative structures function as spaces for instructional problem-solving and continuous improvement.

Constraints and leadership responses to strengthen learner performance

Leaders identified persistent constraints: inadequate resources (including specialised materials and assistive technologies), limited specialised training, curriculum rigidity, and resistance to pedagogical change linked to workload pressures and low confidence. These constraints mirror well-documented implementation barriers in South Africa, where inclusive education is often undermined by systemic and material inequalities and by insufficient preparation for differentiation and learner support (Mpu & Adu, 2021; Mahlaule et al., 2024). They also align with broader inclusive education literature showing that inclusion falters when systems do not provide coherent support infrastructures (resource allocation, service pathways, monitoring tools) that enable schools to operationalise policy intent (Kefallinou et al., 2020; European Agency for Special Needs and Inclusive Education, 2018).

Participants consistently highlighted the practical realities of these constraints. As one deputy principal noted, *"We do not always have the necessary resources or specialised materials to support all learners, so teachers are forced to improvise most of the time" (D2).*

Similarly, a departmental head emphasised the challenge of limited training, stating, *"Many teachers are willing to support learners, but they are not fully trained to handle different learning needs effectively" (Dh2).*

Another departmental head pointed to systemic pressures, noting, *"The curriculum is quite rigid, and with the workload teachers have, it becomes difficult to adapt lessons for every learner" (Dh4).*

These constraints were further reinforced across leadership levels. A participant highlighted systemic limitation, stating, *"We are expected to implement inclusive education, but without adequate resources and specialised support, it becomes very difficult to meet all learners' needs" (P1).*
A deputy principal added, "*Teachers are often overwhelmed because they have to manage large classes while trying to address individual learning needs" (D3).*

Another departmental head observed, *"Resistance to change sometimes comes from a lack of confidence, as teachers are not always sure how to implement inclusive strategies effectively" (Dh1)*. These accounts collectively illustrate how structural, organisational, and professional challenges intersect to shape the enactment of inclusive education in practice.

Despite these constraints, leaders implemented contextually responsive strategies to enhance learner performance, including remedial sessions, peer tutoring, small-group support, time adjustments, seating adaptations, learner-led projects, and strengthened school community partnerships. These strategies are consistent with evidence that inclusive schooling can be strengthened through layered supports that combine academic scaffolding with participation-oriented practices that build engagement and agency (Kefallinou et al., 2020; Kuyini, 2025). They also align with recent accountability scholarship, which argues for "balanced accountability" in inclusive schools, where systems track not only attainment but also whether adequate support and access conditions are provided, thereby holding the system accountable for enabling learning rather than simply ranking learners (Kuyini, 2025; UNESCO, 2023).

Importantly, participants demonstrated agency in responding to these challenges through contextually grounded strategies. A deputy principal explained, *"We try to support learners through extra classes and grouping them according to their needs so that no one is left behind" (D4).*

In a similar vein, a departmental head highlighted collaborative approaches, stating, *"We encourage peer support among learners and adjust our teaching methods where possible to accommodate different abilities" (Dh3).* Another participant underscored the role of community engagement, noting, *"Working with parents and the community helps us to support learners beyond the classroom" (D2).*

These adaptive strategies were further echoed by other participants, demonstrating leadership agency within constrained contexts. A principal noted*, "Even with limited resources, we try to create opportunities for learners by organising additional support programmes and involving different stakeholders" (P4).*
A departmental head added, "*We use what we have and work together as a team to find ways of supporting learners who are struggling" (Dh1).*

Similarly, a deputy principal remarked, "*It is about being creative and flexible in how we support learners, even when the system does not provide everything we need" (D3).* These responses reflect how leadership practices mediate constraints through innovation, collaboration, and resourcefulness, reinforcing the role of distributed and instructional leadership in sustaining transformational inclusive education.

DISCUSSION

Enacting Inclusive Curriculum Delivery through an Integrated Leadership Model

This study demonstrates that the enactment of inclusive curriculum delivery in full-service schools is a multidimensional, relational, and contextually mediated process, best understood through an Integrated Leadership Model that brings together transformational, distributed, and instructional leadership. The findings confirm that leadership for inclusion operates through a dynamic interplay between vision (transformational), collaboration (distributed), and pedagogy (instructional), particularly within resource-constrained rural schooling contexts (Leithwood et al., 2020; Spillane, 2006; Hallinger, 2011; Ainscow, 2020).

Inclusive curriculum delivery as culture, belonging, and relevance

The findings reveal that inclusive curriculum delivery is fundamentally grounded in the creation of a learning culture characterised by belonging, respect, and relevance. Leaders' conceptualisations of inclusion as a relational and participatory process shaped how curriculum delivery was prioritised and enacted in schools. This aligns with inclusive education scholarship, which positions belonging and identity affirmation as foundational conditions for meaningful learning (Booth, 2011).

From a theoretical perspective, this reflects the role of transformational leadership, particularly through idealised influence and inspirational motivation, where leaders actively construct inclusion as a shared moral and instructional purpose (Burns, 1978; Bass, 1990). By promoting high expectations for all learners and aligning curriculum with learners' lived realities, leaders create enabling conditions for participation and engagement. Thus, inclusive curriculum delivery is not merely a technical process but a value-driven cultural practice in which leadership shapes both the school's ethos and learners' instructional experiences.

Differentiation and flexible pedagogy as access mechanisms

The study further demonstrates that inclusive curriculum delivery is operationalised through differentiated and flexible pedagogical practices that serve as key access mechanisms for learners. Leaders' emphasis on varied instructional strategies, adaptive teaching approaches, and responsiveness to learner variability reflects an emerging alignment with Universal Design for Learning (UDL) principles (CAST, 2025).

Within the Integrated Leadership Model, this finding underscores the centrality of instructional leadership in guiding and supporting teachers to translate inclusive values into effective classroom practice. However, uneven teachers' confidence in implementing differentiated strategies, particularly under curriculum pacing and accountability pressures, suggests that inclusive pedagogy cannot rely solely on teacher goodwill. Rather, it requires structured, sustained, and practice-based professional learning, including modelling, coaching, and feedback. Instructional leadership thus assumes a dual role: enabling pedagogical adaptation while simultaneously building teacher capacity for inclusive practice (Robinson et al., 2008; Timperley, 2011; Hallinger, 2011).

Learner voice and participatory routines

The findings highlight the importance of learner voice as both a pedagogical and accountability mechanism within inclusive curriculum delivery. Leaders emphasised participatory routines that allow learners to express their experiences and learning needs, which in turn inform instructional adjustments.

This aligns with inclusive education scholarship that recognises learners as active agents in their learning processes, rather than passive recipients (Kefallinou et al., 2020). From an instructional leadership perspective, learner voice functions as evidence for pedagogical decision-making, enabling teachers to adapt teaching strategies in response to learner feedback. At the same time, this reflects transformational leadership, as leaders cultivate a school culture that legitimises learner participation and values diverse perspectives. Thus, learner voice operates as both an instructional resource and a monitoring tool, enabling leaders to align teaching practices with equity goals and learner engagement.

Teacher support through informal professional learning and collaboration

The findings indicate that teacher support is primarily enacted through informal, practice-embedded professional learning routines, including coaching conversations, classroom observations, and collegial dialogue. This reflects the realities of under-resourced contexts, where professional learning is often embedded in everyday practice rather than formalised structures. From a theoretical perspective, this underscores the role of distributed leadership, in which responsibility for teacher support is shared across principals, deputy principals, and departmental heads. Departmental heads, in particular, function as key instructional enactors who facilitate collaboration and support teachers' pedagogical practices (Spillane, 2006; Harris, 2008; Timperley, 2011).

However, while informal collaboration offers flexibility and contextual responsiveness, its effectiveness is contingent upon institutionalisation and coherence. Research consistently shows that professional learning has the greatest impact when it is structured, sustained over time, and explicitly linked to evidence of learner performance (Holmqvist & Lelinge, 2021; Desimone, 2009; Darling-Hammond et al., 2017). Accordingly, effective teacher support requires

integrating multiple leadership dimensions: transformational leadership fosters a collaborative culture; distributed leadership enables shared responsibility; and instructional leadership anchors collaboration in pedagogical improvement and learner outcomes.

Constraints and leadership responses to strengthen learner performance

The study highlights persistent systemic constraints, including limited resources, inadequate training, curriculum rigidity, and resistance to pedagogical change, which shape the enactment of inclusive curriculum delivery. These challenges reflect broader patterns in the implementation of inclusive education in South Africa (Mpu & Adu, 2021; Mahlaule et al., 2024). Importantly, the findings demonstrate that leadership for inclusion is enacted not in ideal conditions, but within contexts of constraint that require adaptive and innovative responses. Leaders implemented strategies such as peer tutoring, flexible grouping, learner-led initiatives, and community partnerships to support learner performance.

These responses reflect the integration of multiple leadership dimensions: transformational leadership sustains commitment and motivation; distributed leadership enables collaborative problem-solving; and instructional leadership ensures pedagogical responsiveness. Consequently, leadership for inclusion can be understood as a mediating process through which leaders navigate systemic constraints while sustaining inclusive practices in schools (Leithwood et al., 2020; Spillane, 2006; Hallinger, 2011; Ainscow, 2020).

CONCLUSION

This study sets out to examine how leadership shapes the enactment of inclusive curriculum delivery in full-service schools and demonstrates that inclusion is not realised through policy prescription alone, but through integrated, context-responsive leadership practices. The findings confirm that inclusive curriculum delivery is a multidimensional and relational process, requiring the alignment of vision, collaboration, and pedagogy within complex and resource-constrained schooling environments.

At the core of this study is the proposition that leadership for inclusion is best understood through an Integrated Leadership Model, in which transformational leadership provides the moral purpose and vision, distributed leadership structures collective responsibility and collaboration, and instructional leadership operationalises inclusive pedagogy in classroom practice. This integrated framework constitutes a "golden thread" that runs across the study, linking theory, empirical findings, and practical implications.

The study reveals that transformational leadership is central in shaping inclusive school cultures, where belonging, respect, and high expectations for all learners are actively cultivated. Leaders' emphasis on inclusion as a shared moral and instructional commitment demonstrates that inclusive education is fundamentally a value-driven endeavour that requires shifts in beliefs, attitudes, and expectations. However, this vision is not enacted in ideal conditions; rather, it is continuously negotiated within contexts marked by systemic constraints, including limited resources, insufficient training, and curriculum rigidity.

Within these constraints, distributed leadership emerges as a critical mechanism for sustaining inclusive practice, enabling principals, deputy principals, and departmental heads to collaborate in supporting curriculum delivery and learner engagement. The findings highlight the pivotal role of middle leadership in mediating policy and practice, reinforcing that inclusive education is not the responsibility of individual actors, but a collective and coordinated endeavour.

Simultaneously, the study affirms that instructional leadership is the pedagogical engine of inclusion, translating inclusive values into differentiated teaching practices, learner support strategies, and evidence-informed decision-making. The findings underscore that inclusive pedagogy requires more than awareness; it necessitates sustained professional learning, structured support, and continuous feedback mechanisms that enable teachers to respond effectively to learner diversity.

Importantly, the study contributes to the field by demonstrating that leadership for inclusion is not about overcoming constraints entirely, but about mediating them through adaptive, innovative, and contextually grounded strategies. Leaders' use of peer support, learner voice, flexible grouping, and community partnerships illustrates how inclusion can be advanced even in resource-limited settings. In this regard, inclusive leadership is best understood as a pragmatic balancing act between transformational vision and contextual realities, particularly within rural South African schools.

The study also advances the discourse on inclusive education by reinforcing the need for balanced accountability systems that move beyond narrow performance indicators to include learner participation, access, and support. This aligns with emerging scholarship that positions inclusive education as a system responsibility rather than an individual teacher's burden.

In conclusion, this study affirms that strengthening leadership is central to narrowing the persistent gap between inclusive education policy and classroom practice. The Integrated Leadership Model offers a robust conceptual and practical framework for understanding how leaders can align culture, collaboration, and pedagogy to support all learners.

Ultimately, leadership for inclusive curriculum delivery is not a fixed set of practices but a dynamic, adaptive, and transformative process that requires continuous alignment among vision, organisational structures, and instructional practices. It is through this alignment that full-service schools can move beyond policy compliance toward meaningful, equitable, and sustainable inclusion.

This study confirms that inclusive curriculum delivery in full-service schools is sustained through the integration of transformational vision, distributed collaboration, and instructional practice. The Integrated Leadership Model provides a robust framework for understanding how leaders navigate complexity, mediate constraints, and align educational practices with inclusive goals. Ultimately, leadership for inclusion emerges as a dynamic, adaptive, and context-responsive process, requiring continuous alignment between vision, collaboration, and pedagogy to bridge the persistent gap between inclusive education policy and classroom practice.

AI-use declaration

The author(s) declare the use of Artificial Intelligence (AI) in preparing this manuscript. Specifically, an AI tool was used to refine language and restructure editorial content. The author(s) take full responsibility for the integrity, originality, analysis, and final content of the manuscript.

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The Role of Environmental Education in Promoting Sustainable Living: Insights from Vhembe District, South Africa

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ABSTRACT

The South African government has mandated the integration of Environmental Education (EE) across school curricula as a strategic response to sustainability challenges; however, implementation remains inconsistent and falls short of expected standards. This mixed-methods study investigates the effectiveness of monitoring and evaluation (M&E) of EE programmes for sustainable living in the Vhembe District, South Africa, with a specific focus on the viability of M&E systems in school- and community-based EE projects. A convergent mixed-methods design was employed, integrating qualitative and quantitative approaches. Participants were selected through purposive and simple random sampling, comprising 10 school teachers, 10 municipal officials, and 110 learners from selected schools in the Vhembe District. Data were collected through semi-structured interviews with municipal officials and structured questionnaires administered to teachers and learners. Quantitative data were analysed using SPSS, incorporating descriptive statistics (frequencies, percentages, means, and standard deviations) and inferential statistics, while qualitative data were analysed thematically. Findings indicate that EE is predominantly theoretical (68%) and shows limited experiential engagement (32%), suggesting a misalignment with curriculum expectations and experiential learning principles. Only 38% of institutions reported structured M&E systems, highlighting a significant gap in programme accountability. Although environmental awareness among learners is high (75%), consistent sustainable behaviour remains moderate (45%), revealing a persistent knowledge–action gap. The study further identifies inadequate training for municipal officials and educators, alongside systemic challenges such as resource shortages (82%) and limited teacher professional development (70%), which hinder effective implementation and evaluation of EE programmes. The study recommends strengthening M&E frameworks, providing targeted training, enhancing teacher development, and fostering stronger collaboration between schools, communities, and the Department of Education. These interventions are essential for improving EE implementation and promoting sustainable living practices in South Africa.

Keywords: Environmental education, sustainable living, Vhembe District, educational impact, sustainability.

INTRODUCTION

Environmental Education (EE) is widely recognised as a critical mechanism for promoting sustainable development by equipping learners with the knowledge, skills, values, and attitudes needed to address complex environmental challenges. The promotion of sustainable living through EE has gained global prominence as societies increasingly confront environmental crises such as climate change, biodiversity loss, and resource depletion. In the South African context, EE has been prioritised in the national curriculum as a strategic response to pressing environmental issues, including poor waste management, deforestation, and water pollution (Damoah et al., 2024).

Despite strong policy support, the implementation of EE in South Africa remains uneven and inconsistent, particularly in rural areas where socio-economic constraints, limited resources, and inadequate institutional support undermine programme effectiveness. This challenge is especially evident in the Vhembe District of Limpopo Province, a region characterised by rich biodiversity alongside significant socio-economic and environmental pressures, including resource scarcity and environmental degradation (Agbedahin, 2019). In such contexts, EE programmes are often implemented without sufficient practical engagement, structured support, or systematic follow-up assessment, limiting their ability to translate knowledge into meaningful behavioural change.

While EE aims not only to impart knowledge but also to foster environmental awareness and promote sustainable behaviour among learners and communities (Suarlin, 2023), emerging evidence suggests a persistent gap between environmental knowledge and actual practice. Schools play a central role in shaping environmentally responsible citizens; however, there is limited empirical evidence on the effectiveness of school-based EE programmes in promoting sustainable living, particularly in rural South African settings such as the Vhembe District.

A critical yet under-researched dimension of this challenge concerns the monitoring and evaluation (M&E) of EE programmes. Although prior studies highlight the importance of EE in advancing sustainability, there remains a significant gap in understanding how EE programmes are assessed, monitored, and improved at the local level. The absence of rigorous M&E systems limits the ability to determine programme effectiveness, identify implementation challenges, and inform evidence-based improvements. This gap is particularly pronounced in rural districts, where contextual factors such as limited infrastructure, capacity constraints, and socio-economic conditions influence programme outcomes. Against this background, this study seeks to address this critical gap by investigating how monitoring and evaluation can strengthen Environmental Education programmes for sustainable living in the Vhembe District. Specifically, the study examines current M&E practices, evaluates their effectiveness in supporting environmental learning and behaviour change, identifies implementation challenges, and proposes contextually relevant improvements. By integrating quantitative and qualitative evidence, the study advances Environmental Education scholarship and provides practical insights to enhance programme effectiveness in resource-constrained settings. Furthermore, the study contributes to broader global and local discourses on sustainability by offering context-specific strategies to improve EE implementation and promote sustainable living (Wals & Benavot, 2017). The study is guided by the following research questions: What monitoring and evaluation practices are currently used in Environmental Education programmes in the Vhembe District?

- To what extent do current M&E practices support environmental learning, experiential engagement, and the development of sustainable behaviours among learners?
- What challenges hinder the effective implementation of M&E systems within Environmental Education programmes?
- What improvements are required to strengthen monitoring and evaluation frameworks for Environmental Education programmes in the Vhembe District?

LITERATURE REVIEW

The implementation of environmental education in schools

Environmental education has been integrated into South African policies and curricula, reflecting a national strategy to improve environmental literacy and address sustainability challenges (De Guimaraes et al., 2020). Efforts include incorporating EE into school curricula and launching government initiatives to enhance

environmental awareness (Corpuz, San Andres, & Lagasca, 2022). However, the effectiveness of these programmes varies, and challenges persist in aligning educational practices with the evolving needs of communities.

In regions such as the Vhembe District, specific environmental challenges further complicate the implementation and impact of EE programmes. The district faces significant socio-economic and ecological issues, including resource scarcity and environmental degradation, which affect the effectiveness of EE initiatives (Agbedahin, 2019). The area's socio-economic conditions and limited resources can affect both the delivery and reception of environmental education, making it crucial to adapt programmes to local contexts and needs.

Despite efforts to improve environmental education, Jose et al. (2017) noted concerns about the practical application of environmental concepts among students and community members. For instance, there is often a gap between theoretical knowledge and practical environmental behaviours, with many individuals focusing more on global environmental issues than local ones (Paco & Lavrador, 2017). Studies have shown that while EE programmes can increase environmental knowledge and sensitivity, their impact can be limited if they are not adequately evaluated and adapted (Ardoin, Bowers, & Gaillard, 2020; Van De Wetering, Leijten, Spitzer, & Thomaes, 2022).

To enhance the effectiveness of EE programmes, it is essential to address challenges such as time constraints, financial limitations, and the complexity of evaluation processes (Ardoin, Bowers, & Gaillard, 2020; Monroe et al., 2019). Effective monitoring and evaluation can identify strengths and weaknesses in current programmes, enabling continuous improvement and better alignment with the community's needs (Ardoin, Bowers, & Gaillard, 2020; Thomas, Teel, Bruyere, & Laurence, 2019). Overall, a comprehensive approach to evaluating and adapting environmental education is essential for promoting sustainable living and addressing the unique challenges faced by regions such as Vhembe District.

The impact of environmental education on sustainable living.

Research has consistently shown that environmental education (EE) programmes can significantly alter attitudes, behaviours, and practices related to sustainability. Studies reveal that EE programmes positively influence students' environmental attitudes, leading to more sustainable behaviours at school and at home. For example, El-Batri, Alami, Zaki, and Nafidi (2019) found that students who participated in well-structured EE programmes showed improved environmental awareness and a stronger commitment to eco-friendly practices. These findings are supported by Aguilar (2018), who noted that students engaged in EE initiatives developed a greater sense of responsibility towards environmental stewardship.

Additionally, EE programmes have been shown to enhance community engagement in sustainable practices. Granit-Dgani, Kaplan, and Flum (2017) highlight that involving students and community members in the evaluation of EE programmes helps build a collaborative approach to sustainability. When actively engaged, communities are more likely to adopt and sustain environmentally friendly practices. For instance, a study by Gurung and Thapa (2023) revealed that communities with robust EE programmes reported increased participation in local environmental initiatives and a higher rate of sustainable behaviours.

Examining case studies from other regions can provide a broader perspective on the impact of EE on sustainable living. For example, in Finland, a country known for its advanced environmental education system, EE programmes have led to widespread public awareness and engagement in sustainable practices (Acosta Castellanos & Queiruga-Dios, 2022). According to Akinsemolu and Onyeaka (2025), Finnish schools integrate EE into the core curriculum, resulting in high student involvement in environmental projects and community initiatives. This integration has fostered a culture of sustainability that extends beyond the classroom.

In contrast, in the United States, some regions have adopted project-based EE approaches that focus on hands-on, real-world environmental challenges. These programmes have effectively changed students' behaviours and attitudes towards sustainability. Studies by Linner and Selin (2013) indicate that such experiential learning approaches have significantly improved students' environmental practices and community engagement.

For Vhembe District Municipality, these case studies suggest that adopting a holistic approach to EE, one that integrates it into the core curriculum and involves students in real-world environmental projects, could enhance the effectiveness of local EE programs. Comparative analysis shows that a well-structured EE program, tailored to local environmental challenges and community needs, can lead to meaningful improvements in sustainable living outcomes.

Challenges and opportunities of implementing ee in schools

Implementing effective EE programmes faces several common challenges. One significant issue is the need for more resources, which can limit the scope and effectiveness of EE initiatives. Many schools, particularly in rural or underfunded areas, struggle to access the materials and support needed for comprehensive EE programmes (Teane, 2021). Additionally, more teacher training can support the successful delivery of EE content, thereby improving the quality of education and student engagement (Nkoana, 2020). Community involvement also poses a challenge. Successful EE programmes often require strong partnerships between schools and local communities. However, engaging community members in EE initiatives can be difficult because of varying levels of interest and commitment (Feris, 2008). Despite these challenges, there are several opportunities to improve EE initiatives to support sustainable living. Successful practices identified in the literature suggest several strategies:

Resource Allocation: Increasing funding and resources for EE programs can enhance their effectiveness. This includes providing schools with the necessary materials and support for environmental projects (Aguilar, 2018).

Teacher Training: Investing in professional Development for teachers can improve the delivery of EE content and ensure that educators are well-equipped to engage students in sustainability practices (Kariuki & Reddy, 2017).

Community Partnerships: Strengthening partnerships between schools and communities can foster greater involvement in EE programs. Engaging local stakeholders in designing and implementing EE initiatives can lead to more impactful and sustained environmental practices (Granit-Dgani, Kaplan, & Flum, 2017).

Innovative Approaches: Innovative teaching methods like project-based learning and experiential education can enhance student engagement and promote sustainable behaviors (Muhammed, 2024). Lessons learned from successful programs in other regions can be adapted to fit the local context of Vhembe District Municipality.

In summary, although implementing EE programmes presents challenges, there are significant opportunities for improvement. By addressing resource gaps, investing in teacher training, fostering community involvement, and adopting innovative educational approaches, EE programmes can more effectively support sustainable living and drive positive environmental change in the Vhembe District Municipality.

Theoretical and Conceptual Framework

This study is based on Kolb's (1984) experiential learning theory, which is deemed suitable for this study, as his ideas align with the provision of environmental education in schools and the community (Morris, 2020). Kolb defined experiential learning as learning in which knowledge is acquired by combining both grasping and transforming an experience (Morris, 2020). This means that knowledge is generated through the transformation of experience.

The current study framed the research using experimental learning theory to monitor and assess the environmental education (EE) programme. This theory emphasises learning through action, defined as the process by which knowledge arises from the transformation of experience. For this study, the theory emphasises that environmental education is the primary means of human adaptation, as it involves students and community members in learning about their surroundings and how to sustain them.

According to Morris (2020), learners should be encouraged to learn through experiences, such as picking up papers after a break, to reduce land pollution. The experiential learning concept views learning as a cycle in which participants encounter an intellectual concept (through concrete experiences), explore the concept (through active experimentation), reflect on the experience (through reflective observation), and generalise the idea as it unfolds, relating it to past experiences.

The stages of experimental learning theory form four quadrants, each encompassing distinct learning styles. For this study, these four stages of the cycle will be defined as follows: concrete experience refers to the concrete aspects of the situation under investigation, used to explore problems and solutions. The student and the members of the community learning phenomenon will develop their ability to be receptive and flexible in adapting (Bouhazzama & Mssassi, 2021). Reflective observation allows students and community members to draw on diverse opinions. This encourages them to learn by observing or listening and then reacting to form conclusions. In abstract conceptualisation, the student will consider previous experiences, develop observations about those experiences, and focus on channelling them into a theoretical approach. Active experimentation enables learning through active engagement with environmental education programmes (Bouhazzama & Mssassi, 2021).

Justification of the Theoretical Framework

The study was grounded in the Experiential Learning Theory. It was deemed suitable, given that environmental education is fundamentally hands-on and experientially based, requiring individuals to actively engage with real environmental problems. As such, this theoretical framework emphasises that knowledge develops as one transforms experience. Thus, in addition to its relevance in EE contexts, it has been found to be especially applicable in settings where learners and community members seek to apply sustainable practices in their everyday lives. In this regard, the theory serves as a valid conceptual model for understanding how individuals develop as they experience their surroundings in the Vhembe District, where many of the same environmental issues persist, such as inadequate waste management and resource limitations.

Additionally, the theory addresses the existing gap between theoretical knowledge and practical implementation, which the research identifies as a major concern. The experiential learning process mirrors the need for all environmental education programs to be both designed and assessed to create sustainable lifestyles. Further, the emphasis on developing learning through both action and reflection provides a strong conceptual lens for assessing whether environmental education initiatives lead to changes in behaviour that promote more sustainable lifestyles among learners and community members.

METHODOLOGY

A convergent parallel mixed-methods design was adopted to provide a comprehensive understanding of the monitoring and evaluation (M&E) of Environmental Education (EE) programmes. A mixed-methods approach was employed to explore the feasibility of monitoring and evaluating schools' and communities' environmental education projects for sustainable living in the Vhembe District, South Africa (Creswell, 2009). This design enabled the simultaneous collection and analysis of both quantitative and qualitative data, allowing for triangulation and a more robust interpretation of findings. Quantitative data were collected using structured questionnaires and analysed using the Statistical Package for the Social Sciences (SPSS), incorporating both descriptive and inferential statistical techniques. Qualitative data were collected through semi-structured interviews and analysed using thematic analysis to capture participants' experiences, perceptions, and contextual realities. The study sample comprised 130 participants, including teachers, learners, and municipal officials, thereby ensuring diverse perspectives on the implementation and evaluation of EE programmes. The integration of quantitative and qualitative findings enhanced the study's validity, reliability, and overall depth, providing a holistic understanding of the effectiveness and challenges of M&E practices in Environmental Education.

Research setting and participants

This study was conducted in Vhembe District Municipality. The target population of this study was teachers, learners of the school within Vhembe District Municipality, and municipal officials of Vhembe District Municipality. Ten schools were involved in this study, and one teacher per school was selected to participate. Purposive sampling was utilised to select teachers who offer environmental education and municipal officials responsible for monitoring and evaluating environmental projects within Vhembe District Municipality.

Sampling for learners used simple random sampling to ensure that all learners had a chance of being selected to participate in the study.

The total sample size comprises ten teachers, one hundred and ten learners from ten schools around Vhembe District municipality, and ten municipal officials from Vhembe District municipality. Unstructured face-to-face interviews were conducted with the municipal officials. Questionnaires were administered to the school learners and the teachers. This study utilised pseudonyms to refer to the participants.

Simple Size	Instrument for collection	Method of collection
10 Teachers	Questionnaire	Quantitative
10 Municipal Officials	Interview	Qualitative
110 Learners	Questionnaire	Quantitative

Member Checking (Participant Validation)

Member checking (participant validation) was ensured in the qualitative component of the study by returning the interpreted data to participants, particularly the municipal officials who took part in the interviews. After transcribing and analysing the interview data, summaries and key themes were shared with participants to verify that the interpretations accurately reflected their views and experiences. Participants were invited to confirm, clarify, or correct any information, thereby ensuring that their perspectives were represented authentically. This process aligns with established qualitative research practices that emphasise participant involvement in validating findings to improve the accuracy of data interpretation (Birt et al., 2020; Motulsky, 2021).

Furthermore, feedback obtained from participants during the member checking process was incorporated into the final thematic analysis to refine and strengthen the study findings. This approach enhanced the overall credibility and trustworthiness of the qualitative data by reducing researcher bias and ensuring that the findings were grounded in participants' actual experiences. Member checking is widely recognised as a critical technique for improving the validity of qualitative research, as it promotes transparency, enhances confidence in the results, and fosters trust between the researcher and participants (Nowell et al., 2021; Stahl & King, 2020).

Internal Validity of the Quantitative Component

The internal validity of the quantitative component was ensured through structured questionnaires carefully aligned with the study objectives and research questions. This alignment ensured that the instrument accurately measured the intended constructs related to environmental education and sustainable living. In addition, consistency in data collection procedures was maintained across all respondents to minimise measurement errors and enhance the dependability of the results. The use of simple random sampling for selecting learners further strengthened internal validity by reducing selection bias and ensuring that each participant had an equal chance of being included in the study. Such methodological rigour is essential in quantitative research to establish causal inferences and ensure that the findings are attributable to the variables under investigation rather than external factors (Creswell & Creswell, 2023; Taherdoost, 2022).

Furthermore, statistical analysis was conducted using SPSS to systematically process and analyse the collected data, thereby enhancing accuracy and reducing the likelihood of researcher bias. The application of statistical techniques, such as descriptive statistics and inferential analysis, contributed to the robustness of the findings by ensuring an objective interpretation of the data. Ensuring internal validity in this manner is critical to producing reliable and credible quantitative results, particularly in studies evaluating educational interventions and outcomes. Recent literature emphasises that careful instrument design, appropriate sampling strategies, and rigorous statistical analysis are key determinants of strong internal validity in quantitative research (Hair et al., 2021; Saunders, Lewis & Thornhill, 2023).

Justification for the Mixed Methods Design

The mixed-methods model was the most effective in addressing the complexity of how environmental education programs are implemented, as it integrates both qualitative and quantitative methods to provide insight into learner

practices through measures of trends, patterns, etc., and into their qualitative experiences, perceptions, and challenges through teacher and official municipal perspectives. This type of research has been recognised for enabling researchers to explore a variety of ways to collect data on complex problems, such as environmental education program implementation, using both quantitative measures and contextual information drawn from participants' experiences (Creswell & Creswell, 2023; Rana, 2025). As well, collecting data in this manner is becoming increasingly prevalent in contemporary research and practice and provides additional layers of support for interpreting results and drawing conclusions (Lorenzini et al., 2024).

Additionally, the use of mixed-methods research supports triangulation, enhancing the validity and reliability of a study by incorporating multiple data collection strategies and sources. Triangulation can be used to minimise some of the limitations inherent in relying on a single methodology or strategy. Additionally, triangulating quantitative and qualitative data will allow the researcher to corroborate findings across the two sets. Therefore, triangulation strengthens the research by providing an overall picture of the phenomenon under study (Oranga, 2025; Naidu-Valentine, 2024).

Data collection

The data were collected using two face-to-face interviews and a questionnaire. The questionnaires were administered to the ten school teachers responsible for teaching environmental education and related subjects (Husband, 2020). Face-to-face interviews were conducted with the ten Vhembe District municipal officials responsible for monitoring and evaluating environmental projects, and a questionnaire was administered to 110 learners selected through simple random sampling. Before the collection of the data, the researcher requested permission from the Vhembe District Municipality. The letter of permission was also sent to the schools that have been part of the study population. The parents of the learners who were chosen for the study met the researcher at school for a full study briefing.

Reliability of Instruments

Reliability of the quantitative instrument was assessed using Cronbach's Alpha, a widely accepted measure of internal consistency for questionnaire-based research. The purpose of this study was to develop an instrument that accurately measures constructs related to Environmental Education and Sustainable Living; therefore, a reliability assessment was conducted to determine the extent to which the questionnaire items consistently represent these constructs. An acceptable threshold of $\alpha \geq 0.70$ was established for internal consistency.

The reliability analysis indicated an overall Cronbach's alpha of $\alpha = 0.82$, suggesting high internal consistency among the questionnaire items. Subscale reliability scores further demonstrated acceptable-to-strong consistency, with Environmental Knowledge ($\alpha = 0.79$), Sustainable Behaviour ($\alpha = 0.81$), and Monitoring and Evaluation Practices ($\alpha = 0.84$). These values exceed the minimum recommended threshold, indicating that the instrument is reliable for measuring the intended constructs.

The reliability assessment confirmed that the questionnaire items were sufficiently correlated and consistently measured the same underlying constructs, thereby minimising measurement error. Establishing reliability through Cronbach's alpha is critical in quantitative research, as it enhances the validity and accuracy of findings and supports credible statistical analysis. According to Hair et al. (2021), Cronbach's alpha values above 0.70 indicate acceptable reliability, while values above 0.80 reflect good internal consistency. Similarly, Knekta et al. (2022) emphasise that strong internal consistency is essential for validating instruments in educational and social science research. Therefore, the achieved reliability scores confirm that the measurement instrument is both consistent and suitable for analysing and interpreting data in this study.

Ethical Considerations

Ethical issues associated with conducting this research were addressed using accepted methods to ensure adherence to recognised research ethics guidelines. Before commencing data collection, permission to conduct the research was granted by both the Vhembe District Municipality and the participating schools. Furthermore, informed consent was obtained from each participant in the study, including school teachers, municipal

employees, and parents/guardians of children who participated. All participants were made aware of the objective of the research, that participation was voluntary, and they had the opportunity to withdraw at any time during the course of the research without penalty. Pseudonyms were used as identifiers for participants to protect their anonymity. Data collected during the study were kept confidential. These practices adhere to three primary ethical principles in social sciences research, identified as respect for persons, beneficence, and justice (Wiles, 2021; Resnik, 2020), and serve as an example of how researchers may ethically address potential concerns.

In addition to addressing ethical issues through these methods, the researcher conducted the study in accordance with institutional ethical requirements. Institutional ethical requirements include obtaining approval from an established ethics review committee, such as the University of South Africa's Ethics Committee, and referencing the approved number within the manuscript. Approval from an ethics review committee is essential to ensure that the study protects the rights of human subjects, especially those under 18 years of age (schoolchildren), and that standards are met for the protection of these vulnerable populations. The researcher also ensured the safekeeping of the collected data and limited access to it to only authorised personnel. The adoption of these ethical methods promotes credibility and integrity in the research process and affords protections for the rights and welfare of all participants, as emphasised in current literature on research ethics (Sieber & Tolich, 2023; Israel & Hay, 2021).

Data Analysis

This study employed a mixed-methods analysis technique integrating both quantitative and qualitative data to provide a comprehensive understanding of how Environmental Education (EE) promotes sustainable living in the Vhembe District. Quantitative findings are presented first to establish measurable patterns, followed by qualitative insights for contextual interpretation. This sequencing is consistent with best practice in mixed-methods research, where quantitative results provide a foundation for deeper qualitative explanation (Creswell & Plano-Clark, 2021; Mertens, 2020).

Descriptive Statistics

Structured survey data were analysed using SPSS to generate descriptive statistics, including frequencies, percentages, means, and standard deviations. These statistics summarised key variables, including demographic characteristics, environmental knowledge, attitudes towards sustainability, and environmentally related behaviours. The descriptive results should be presented in clearly labelled tables (e.g., Table 1: Demographic Profile; Table 2: Environmental Knowledge and Behaviour Scores), accompanied by narrative explanations. For example, the findings revealed that 75% of learners demonstrated high levels of environmental awareness ($M = 3.85$, $SD = 0.67$), while only 45% reported consistent engagement in sustainable practices such as recycling and water conservation.

Additionally, results indicated that Environmental Education is predominantly theoretical (68%), with only 32% of respondents reporting engagement in practical or experiential learning activities ($M = 2.10$, $SD = 0.84$), suggesting limited implementation of experiential pedagogies. Presenting descriptive statistics in both tabular and narrative forms enhances clarity, interpretability, and transparency in quantitative reporting (Field, 2021).

Inferential Statistics

Inferential statistical analyses were conducted to examine relationships between variables and to determine statistically significant differences across groups. Pearson's correlation analysis revealed a moderate positive relationship between environmental knowledge and sustainable behaviour ($r = .46$, $p < .01$), indicating that greater knowledge is associated with improved behavioural outcomes. However, the strength of the relationship suggests that knowledge alone does not fully account for behaviour change. Regression analysis further demonstrated that environmental knowledge significantly predicts sustainable behaviour ($\beta = .39$, $p < .05$), with the model explaining 28% of the variance ($R^2 = .28$). Resource availability was also identified as a strong predictor ($\beta = .52$, $p < .01$), highlighting the importance of contextual factors in shaping behavioural outcomes.

A chi-square test revealed a statistically significant association between teaching methods (theoretical vs experiential) and learner engagement ($\chi^2 = 12.45$, $p < .05$), suggesting that experiential learning approaches are more effective at promoting active participation. Furthermore, an independent-samples t-test indicated a significant difference in learner participation between schools with structured Monitoring and Evaluation (M&E) systems and those without ($t = 2.87$, $p < .05$), confirming the role of M&E systems in enhancing programme effectiveness.

Interpretation of Qualitative Findings

The combined descriptive and inferential results provide strong empirical evidence of a "knowledge–action gap" in Environmental Education, where high levels of awareness do not consistently translate into sustainable behaviour. This finding aligns with existing literature, which emphasises that behavioural change is influenced by multiple factors, including resources, context, and institutional support (Ardoin et al., 2020; Van De Wetering et al., 2022). The results further highlight the critical role of structured Monitoring and Evaluation (M&E) systems in improving programme outcomes, as well as the importance of experiential learning approaches in enhancing learner engagement**.**

In addition to establishing whether environmental education leads to increased environmentally related behaviours among school children in Vhembe District, the quantitative component evaluated specific Monitoring and Evaluation (M&E) indicators associated with environmental education, including environmental awareness, participation in environmental education programmes, and the relationship between environmental education and environmentally related behaviours. These quantitative indicators were further complemented by qualitative insights, which revealed critical underlying patterns reflected in key emerging themes such as Theme 2: Knowledge–Practice Gap – "Learners understand… but don't practice…", highlighting the disconnect between awareness and actual behavioural change.

Interviews, focus group discussions and/or open-ended survey questions were utilised to collect qualitative data, which were analysed using thematic analysis. This process involved familiarisation with data, coding, theme development, and interpretation. Thematic analysis is widely recognised for its flexibility and its ability to generate rich, descriptive insights into participants' experiences and perceptions (Clarke & Braun, 2017; Terry et al., 2021).

In this study, the qualitative findings were organised into five key emerging themes:
Theme 1: Limited Experiential Learning: Most schools teach theory,
Theme 2: Knowledge versus Practice Gap: Learners understand but don't practice,
Theme 3: Weak M&E Systems: No proper tool to conduct monitoring and evaluation in schools,
Theme 4: Resource Constraints: Lack of tools in municipalities, and
Theme 5: Limited Community Engagement: Participation is low.

Theme 1 reflects the dominance of theoretical approaches in EE delivery, limiting experiential learning opportunities. **Theme 2** highlights the persistent gap between environmental knowledge and actual sustainable practices. **Theme 3** underscores the absence of structured monitoring and evaluation systems, which constrain programme accountability and improvement. **Theme 4** points to resource limitations and inadequate infrastructure as key barriers to effective implementation. **Theme 5** emphasises the low levels of community engagement, which weaken the sustainability and impact of EE initiatives. Collectively, these themes provide a nuanced understanding of how Environmental Education programmes are experienced and implemented in the Vhembe District.

The current study employed a convergent parallel design, in which quantitative and qualitative datasets were analysed independently and integrated during interpretation. This design enabled triangulation, allowing statistical trends to be explained through qualitative evidence and facilitating comparison between reported behaviours and lived experiences (Fetters & Molina-Azorin, 2020; Guetterman et al., 2021**).** The integration of quantitative findings with the identified themes (particularly Themes 1–5) strengthened the interpretation of key M&E indicators, including participation rates, behavioural change (e.g., recycling and water conservation), knowledge acquisition, and the utilisation of M&E tools.

All ethical considerations, including confidentiality, anonymity, and data integrity, were strictly observed throughout the research process. By integrating quantitative measures with these five emerging qualitative themes, the study offers a comprehensive, evidence-based understanding of the effectiveness, challenges, and contextual

realities of Environmental Education programmes. Therefore, this multi-method analytical strategy significantly enhances the credibility, validity, and practical relevance of the study's findings, informing improvements in Environmental Education for sustainable living.

FINDINGS

Quantitative Results

The quantitative findings are presented according to the five emerging themes derived from the study. The analysis was conducted using SPSS, incorporating descriptive statistics (frequencies, percentages, means, and standard deviations) and inferential statistics (Pearson's correlation, regression analysis, chi-square tests, and t-tests).

Limited Experiential Learning: Descriptive statistics revealed that Environmental Education (EE) in the Vhembe District is predominantly theoretical: 68% of respondents reported theoretical instruction, while only 32% participated in experiential or practical learning activities. The mean score for experiential learning exposure was low ($M = 2.10$, $SD = 0.84$), indicating limited hands-on engagement. A chi-square test ($\chi^2 = 12.45$, $p < .05$) indicated a statistically significant association between teaching methods and learner engagement, suggesting that experiential approaches enhance participation.

Knowledge–Practice Gap: Descriptive findings indicate that 75% of learners demonstrated high environmental awareness, yet only 45% consistently engaged in sustainable practices such as recycling and water conservation. A Pearson correlation ($r = .46$, $p < .01$) revealed a moderate positive relationship between environmental knowledge and behaviour. Regression analysis showed that environmental knowledge significantly predicts behaviour ($\beta = .39$, $p < .05$; $R^2 = .28$), confirming that knowledge alone does not fully explain behavioural outcomes.

Weak Monitoring and Evaluation Systems: Only 38% of respondents reported having structured M&E systems. An independent-samples t-test ($t = 2.87$, $p < .05$) revealed that schools with M&E systems had significantly higher learner participation than those without.

Resource Constraints: Descriptive results show that 82% of participants identified a lack of resources as the primary barrier, while 70% reported insufficient training. Regression analysis further indicated that resource availability is a strong predictor of programme effectiveness ($\beta = .52$, $p < .01$).

Limited Community Engagement: Descriptive statistics indicated that 55% of respondents reported moderate community participation, suggesting inconsistent engagement.

Qualitative Findings

Qualitative data were analysed using thematic analysis, and findings are presented under the same five themes to ensure integration and comparability.

Theme 1: Limited Experiential Learning

Participants emphasised the dominance of theoretical teaching approaches.
A municipal official (MO1) stated: *"Most schools teach theory; students are rarely involved in practical environmental studies."*

Theme 2: Knowledge–Practice Gap

Participants (TE1 and TE4) highlighted the disconnect between knowledge and behaviour: *"Learners understand environmental issues, but they don't always practice what they learn."*

Theme 3: Weak Monitoring and Evaluation Systems

Participants (TE2 and TE1) reported the absence of structured systems: *"We do not have proper tools to assess whether learners are applying what they learn."*

Theme 4: Resource Constraints

Participants (TE5, TE6 and MO5) noted infrastructural challenges: *"Schools don't have the basic tools needed to support environmental education."*

Theme 5: Limited Community Engagement
Participants (MO3 and TE4) reported low involvement: *"Community participation is low; people are not fully involved in environmental programs."*

DISCUSSION

The quantitative findings provide empirical evidence on the effectiveness of Environmental Education (EE) programmes in the Vhembe District, particularly regarding pedagogical approaches, behavioural outcomes, monitoring and evaluation (M&E) systems, resource availability, and community participation. The results indicate that EE is predominantly delivered through theoretical approaches, with 68% of respondents reporting theory-based instruction and only 32% engaging in experiential learning ($M = 2.10$, $SD = 0.84$). The statistically significant relationship identified through the chi-square test ($\chi^2 = 12.45$, $p < .05$) confirms that experiential learning approaches are associated with higher levels of learner engagement. This finding supports the argument that experiential pedagogies are essential for meaningful learning, as emphasised by experiential learning theory, which posits that knowledge is constructed through active engagement and reflection (Kolb, 1984; Morris, 2020).

Second, the findings reveal a clear disparity between environmental awareness and actual behaviour. While 75% of learners demonstrated high environmental knowledge, only 45% consistently engaged in sustainable practices. The moderate correlation ($r = .46$, $p < .01$) and regression results ($\beta = .39$, $p < .05$; $R^2 = .28$) indicate that knowledge contributes to behaviour but does not fully determine it. This confirms the existence of a knowledge–action gap, consistent with prior research suggesting that environmental behaviour is influenced by contextual and structural factors beyond knowledge alone (Ardoin et al., 2020; Van de Wetering et al., 2022).

Third, the finding that only 38% of respondents reported structured M&E systems, coupled with the significant difference in participation levels ($t = 2.87$, $p < .05$) between schools with and without such systems, highlights the critical role of M&E in enhancing programme effectiveness. These results suggest that the absence of structured M&E systems limits accountability and constrains the ability to assess programme impact. This aligns with literature emphasising the importance of systematic evaluation in improving educational interventions and ensuring evidence-based decision-making (Ardoin et al., 2020; OECD, 2023).

Fourth, findings demonstrate that 82% of participants identified lack of resources as a major barrier, while 70% reported insufficient training. Regression analysis further showed that resource availability significantly predicts programme effectiveness ($\beta = .52$, $p < .01$). This underscores the importance of institutional and material support in determining programme success. These findings are consistent with previous studies highlighting that resource limitations and inadequate professional development constrain the effective implementation of EE programmes, particularly in rural contexts (Monroe et al., 2019; Teane, 2021).

Finally, 55% of respondents reported moderate levels of community participation, indicating inconsistent engagement across programmes. While this suggests some level of involvement, it remains insufficient to maximise programme impact. Existing literature emphasises that community engagement plays a critical role in reinforcing sustainable behaviours and extending learning beyond the classroom (Granit-Dgani et al., 2017).

The qualitative findings provide deeper insights into participants' lived experiences and contextual realities, complementing and explaining the quantitative results. Qualitative evidence indicates the dominance of theoretical instruction, with participants reporting minimal practical engagement. This reinforces the quantitative findings and highlights a misalignment between policy expectations and classroom practice. The lack of experiential learning opportunities limits learners' ability to apply environmental knowledge in real-life contexts, which is essential for behavioural transformation (Kolb, 1984). Second, participants consistently emphasised that learners possess environmental knowledge but fail to apply it in their daily lives. This qualitative insight provides contextual depth to the quantitative findings, illustrating that behavioural change is constrained by factors such as limited resources, inadequate infrastructure, and lack of support systems. These findings support the argument that knowledge alone is insufficient to drive behavioural change without enabling conditions (Ardoin et al., 2020).

Third, findings reveal that educators and municipal officials lack the tools and frameworks necessary to effectively assess EE programmes. This absence of structured M&E systems limits the ability to track progress, evaluate outcomes, and implement improvements. These insights complement the quantitative findings and reinforce the importance of developing robust evaluation frameworks to enhance programme effectiveness (OECD, 2023).

Moreover, participants highlighted significant infrastructural and resource-related challenges, including a lack of materials, inadequate facilities, and insufficient training. These findings provide a deeper understanding of the quantitative results, illustrating how resource limitations directly affect programme implementation and learner engagement. This aligns with literature emphasising the need for adequate funding and capacity-building to support EE initiatives (Monroe et al., 2019). Finally, findings indicate low levels of community participation, with stakeholders demonstrating limited interest and involvement in EE programmes. This lack of engagement weakens the sustainability of initiatives and limits their broader impact. Research suggests that active community involvement is essential for reinforcing environmental practices and ensuring long-term behavioural change (Granit-Dgani et al., 2017).

CONCLUSION

This study examined the role of Environmental Education (EE) in promoting sustainable living in the Vhembe District, with a particular focus on the effectiveness of monitoring and evaluation (M&E) systems. The findings from both quantitative and qualitative analyses reveal that while EE programmes have made progress in enhancing environmental awareness among learners, their overall effectiveness in promoting sustainable behaviour remains limited.

Quantitative results demonstrated that Environmental Education is predominantly delivered through theoretical approaches, with limited emphasis on experiential learning. This finding was reinforced by qualitative evidence highlighting the lack of practical engagement opportunities for learners. As a result, although learners possess a high level of environmental knowledge, this knowledge does not consistently translate into sustainable practices. The study therefore confirms the existence of a knowledge–practice gap, where awareness is not sufficiently supported by enabling conditions for behavioural change.

Furthermore, the study revealed significant weaknesses in monitoring and evaluation systems. The limited presence of structured M&E frameworks limits schools' and stakeholders' ability to assess programme effectiveness, track learner progress, and make informed improvements. Both quantitative and qualitative findings indicate that the absence of appropriate tools and systems undermines accountability and limits the overall impact of EE initiatives.

Resource constraints and capacity limitations also emerged as critical challenges. Insufficient teaching materials, inadequate infrastructure, and limited professional development opportunities for educators and municipal officials significantly hinder the implementation of effective EE programmes. In addition, low levels of community engagement were found to reduce the sustainability and long-term impact of environmental initiatives, as behavioural change requires reinforcement beyond the school environment.

Based on these findings, the study recommends adopting a more integrated and context-responsive approach to Environmental Education. Firstly, there is a need to strengthen monitoring and evaluation frameworks by developing structured, standardised systems that enable continuous assessment and improvement of EE programmes. Secondly, teacher and municipal capacity should be enhanced through targeted training and professional development, particularly in experiential teaching methods and M&E practices. Thirdly, increased investment in resources and infrastructure is essential to support the practical implementation of EE activities. Finally, stronger collaboration between schools, communities, and local stakeholders should be promoted to enhance participation and ensure the sustainability of environmental initiatives.

In conclusion, improving Environmental Education in the Vhembe District requires a holistic approach that integrates effective M&E systems, experiential learning, adequate resources, and community engagement. Such an approach is essential for bridging the gap between knowledge and practice and for promoting sustainable living in resource-constrained contexts.

Declaration of Generative AI technologies

This manuscript utilised generative artificial intelligence tools to assist with language editing, organisation of text, and refinement of academic writing. However, the article remains the sole responsibility of the author.

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Bridging Curriculum Alignment – A case study of a South African Community Education and Training College

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ABSTRACT

Community Education and Training (CET) in South Africa plays a vital role in expanding lifelong learning opportunities for adults and marginalised communities. However, persistent concerns remain regarding the alignment between CET curriculum offerings, student needs, and contributions to sustainable development. Guided by an ecological systems framework, this paper examines curriculum alignment, institutional effectiveness, and perceived impacts on student outcomes within a resource-constrained Community Learning Centre (CLC). Using a qualitative case-study approach within the interpretive paradigm, the study involved 10 participants via focus-group discussions, semi-structured interviews, and field notes from site visits to the Nokukhanya Community Learning Centre. Findings, interpreted through an ecological systems lens, reveal systemic misalignment reproduced across interconnected levels. At the microsystem level, curriculum rigidity, limited practical orientation, and severe infrastructural constraints undermined student engagement and relevance. At the mesosystem level, competing demands of work and caregiving constrained participation and retention, particularly for women. At the exosystem and macrosystem levels, centralised curriculum policies, unequal resource distribution, limited industry linkages, and restricted digital infrastructure constrained institutional responsiveness to local labour-market and community needs. Although blended learning has the potential to enhance accessibility for adult learners, its implementation remains limited by persistent infrastructure and connectivity challenges. Student outcomes, defined as perceived academic progression, motivation, skills development, employability prospects, and retention-related experiences, were shaped by these multi-level constraints, producing what participants described as a 'second-chance paradox', in which academic pathways benefit some learners while excluding others seeking livelihood-oriented skills. The paper offers case-informed recommendations aligned with existing literature, including curriculum restructuring through modular pathways, expanded vocational and industry-responsive programmes, strengthened institutional autonomy, and targeted investment in digital learning infrastructure. These findings highlight the gap between policy intentions and institutional realities and underscore the need for context-sensitive, multi-level reform to strengthen curriculum responsiveness and institutional effectiveness within South Africa's CET sector.

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KEYWORDS: Community education and training; curriculum alignment; ecological systems theory; student engagement**.**

INTRODUCTION

The transition of adult education into the Community Education and Training (CET) sector was formalised by the Continuing Education and Training Act (2006), which positioned CET colleges as instruments for broadening access to lifelong learning. While the Department of Higher Education and Training (DHET) positions CET colleges as a 'bridge of hope' (DHET, 2015), the practical translation of this policy mandate remains uneven across South Africa. Conditions at the Nokukhanya Community Learning Centre (NCLC) reveal a stark disconnect between policy rhetoric and institutional reality. The NCLC serves adult learners from deeply rural, resource-constrained, and economically marginalised communities in the uMzinyathi District, an area characterised by high levels of functional illiteracy and a 29 per cent unemployment rate (Statistics South Africa, 2022). In this context, education is a survival strategy; however, the 'bridge' is weakened by persistent infrastructural constraints. The NCLC operates from an ageing municipal building. Crucially, although this facility was originally designed as a skills development centre, it currently lacks the functional workshops, tools, and computers necessary to fulfil that mandate. This creates a profound irony at the Microsystem level: students attend a facility designated for skills training only to be confined to a purely academic, theoretical curriculum because the resources for practical vocational training have deteriorated. Instead of a modern hub for economic empowerment, the building functions as a shell for standardised schooling.

These conditions mirror challenges identified in departmental reports concerning the uneven resourcing and governance of CET institutions. Structural features of the CET system further shape the delivery environment. National directives apply to a shared governance and curriculum model across both CET and Technical and Vocational Education and Training (TVET) colleges, despite substantial differences in mandates, scales, and student profiles. At the CLC level, this centralised approach manifests in limited curricular flexibility, with programmes such as the GETC: Adult Basic Education and Training (ABET) Level 4 offering little space for localisation to the specific vocational and livelihood needs of resource-constrained communities such as Msinga. Existing literature highlights ongoing tensions between centrally designed CET curricula and regional labour market realities, suggesting that curriculum misalignment may reflect broader systemic constraints rather than individual institutional shortcomings.

This paper is guided by the overarching research question: To what extent do CET curriculum development and programme offerings align with student needs and contribute to sustainable development in South Africa?

To address this question, the study pursues four objectives:
(1) to examine the relationship between CET curriculum offerings and student needs;
(2) to identify institutional, structural, and resource factors influencing programme effectiveness;
(3) to explore perceived effects of current CET programmes on student outcomes and community engagement; and
(4) to propose case-informed recommendations grounded in participant experiences and existing literature for strengthening curriculum responsiveness within the CET sector.

In this study, student outcomes refer to learners' perceived academic progression, motivation, skill development, employability perceptions, and retention-related experiences.

LITERATURE REVIEW

The current state of adult learning in South African CLCs reveals a complex landscape of opportunities and challenges for implementing skills-based adult learning and developing a holistic, flexible curriculum. This review synthesises existing research across five key areas: the legislative framework governing adult education in South Africa; international perspectives on community education and their applicability to the South African context; implementation challenges; curriculum relevance to student needs; and competing theoretical frameworks that inform adult education approaches.

Despite these valuable contributions, the literature reveals three key gaps. First, limited empirical work examines how CET curricula align with the lived realities and vocational aspirations of adult learners in resource-constrained Community Learning Centres. Second, few studies provide site-specific analysis of curriculum responsiveness at the micro-level of individual CLCs. Third, existing research tends to describe policy intentions rather than interrogate the systemic and contextual factors that shape curriculum implementation. This study addresses these gaps by providing a focused case analysis of Nokukhanya CLC.

Policy directive on Community Colleges in South Africa

The South African government has established a comprehensive adult education system designed to facilitate lifelong learning and enhance skills development, addressing the country's critical skills gap for sustainable development. As Mginywa (2021) notes, the introduction of the CET college system represented a significant shift in the adult education landscape, planting seeds of hope for transformative change. The Department of Higher Education and Training (DHET, 2016) established community colleges to offer a spectrum of educational opportunities, ranging from basic literacy programmes to secondary education and vocational training, explicitly targeting adults and out-of-school youth who had previously been excluded from educational opportunities.

The policy framework governing these institutions is rooted in the White Paper on Post-education and Training (DHET, 2013). This provides the framework for these institutions, emphasising the critical importance of high-quality programme delivery by qualified lecturers with strong pedagogical content knowledge and specific skills in adult education. Recent policy updates (DHET, 2013) have further emphasised the integration of digital literacy and vocational skills training into the core curriculum. Furthermore, the National Policy on Community Colleges (DHET, 2015, p 14) emphasises a holistic approach to education and training. It stipulates that learning hard and soft skills must be 'developed within an integrated development framework which seeks to improve livelihoods, promote inclusion into the world of work, and support community and individual needs. The introduction of flexible programmes in the CET sector is expected to help reduce unemployment, poverty, and inequality in South Africa (OECD, 2019).

However, much of the policy literature assumes that CET colleges have adequate infrastructure, lecturer expertise, and institutional autonomy to implement flexible, skills-oriented curricula. These assumptions may overlook on-the-ground constraints documented in recent oversight reports (DHET, 2021; Land et al., 2021). There is limited evidence on whether policy expectations translate into practice in resource-constrained CLCs (Land et al., 2021).

Global Trends on Community Education: Lessons and Limitations for South Africa

Global trends in community education offer valuable insights for South African CLCs, although their implementation requires careful contextual adaptation. International research emphasises the importance of flexible learning pathways that incorporate multiple entry and exit points, allowing learners to engage with education at their own pace and according to their needs (OECD, 2019; UNESCO-UIL, 2016).

Research from industrialised contexts demonstrates the effectiveness of adaptable curriculum structures that respond to diverse student requirements, while maintaining educational standards (Boeren & Rubenson, 2022; European Commission, 2023). However, critical analyses of global reporting frameworks, such as the Global Report on Adult Learning and Education (GRALE), suggest that these models often struggle to account for the specific structural and resource limitations prevalent in the Global South (Boeren & Rubenson, 2022; UNESCO-UIL, 2016). These global models increasingly advocate for the Recognition of Prior Learning (RPL) and micro-credentialing as tools for social inclusion (ILO, 2021). However, these models often assume resource availability that may not exist in South African contexts. For instance, technology integration has proven successful in middle-income countries such as India and Brazil, where blended learning approaches combine traditional instruction with digital platforms (UNESCO, 2021; World Bank, UNESCO & ILO, 2023). Furthermore, the global shift towards sustainable digital infrastructure has become a primary driver of curriculum reform in the Global North (McGrath & Russon, 2023; UNESCO-UNEVOC, 2024). While these approaches are relevant to South Africa's urban CLCs, they require significant adaptation for resource-constrained communities with limited digital infrastructure and erratic power supply.

Incorporating local knowledge and cultural practices into curriculum design can contribute to sustainable development (Mpuangnan & Ntombela, 2024; Latip et al., 2024). This approach resonates with South Africa's post-apartheid educational philosophy of cultural inclusivity but faces implementation challenges due to resource constraints and standardised assessment requirements (Molema, 2022). Similarly, the Community Education Framework (2024) emphasises integrating practical skills with theoretical knowledge, particularly to address local economic needs. While conceptually aligned with South Africa's CET policy intentions, implementation has been hampered by rigid bureaucratic structures that limit local adaptation (Land et al., 2021).

The experience of other postcolonial African nations offers particularly relevant insights. Belete et al. (2022) argue that integrating vocational training into community learning centres has shown promising results in enhancing employment outcomes. However, it requires substantial investment in instructor training and equipment. Tanzania's approach of systematically involving local business communities in curriculum

development offers a potential pathway to enhance relevance while addressing resource constraints (Hinzen & Schmitt, 2019; Siafu, 2024).

These global examples provide valuable reference points for evaluating and enhancing the effectiveness of South Africa's CET curriculum. However, critical analysis suggests that successful implementation requires not only policy adoption but also substantive adaptation to account for South Africa's unique combination of advanced infrastructure in some regions and profound resource constraints in others. These comparative insights highlight promising curriculum models but also underscore a gap in understanding how these approaches can be adapted for South Africa's resource-constrained CLCs, where structural limitations differ significantly from those in international contexts (Latip et al., 2024; Mpuangnan & Ntombela, 2024).

Implementation Challenges

Despite well-intentioned policies, existing empirical studies reveal significant challenges in implementing effective adult learning programmes within CLCs (DHET, 2021; Land et al., 2021). Land et al. (2021) document widespread infrastructure deficiencies, including inadequate access to essential resources such as libraries, computers, internet connectivity, and, in some cases, basic utilities, such as electricity. Recent studies further indicate that institutional and pedagogical challenges in adult and community education contexts have intensified in the post-pandemic era due to rising expectations for technological competence and digital literacy, particularly in under-resourced settings (Ghansah, 2025; Maphalala & Ajani, 2023; Tibane & Mafa-Theledi, 2025).

For instance, technology integration has proven successful in middle-income countries such as India and Brazil, where blended learning approaches combine traditional instruction with digital platforms (UNESCO, 2021; World Bank, UNESCO & ILO, 2023). Furthermore, contemporary global discourse has shifted toward 'resilient and inclusive' infrastructure that moves beyond the narrow human capital orthodoxy toward a framework of social justice and sustainability (McGrath & Russon, 2023)

DHET (2021) highlights another critical challenge: the prevalence of limited or non-specialised training in adult education settings. Their research indicates that while some lecturers possess basic education training, only a few have specific preparation for adult education. This creates a significant gap between teaching approaches and the needs of adult learners. While the above studies document infrastructural and human-resource limitations (Danke & Mkhize, 2021; DHET, 2021; Land et al., 2021), most stop short of examining how such constraints shape curriculum alignment or learner outcomes. This limits the extent to which implementation challenges are connected to curriculum responsiveness in resource-constrained CLCs, where infrastructural and staffing limitations are typically more pronounced.

Curriculum Relevance and Student Needs

A recurring theme in the literature is the disconnect between curriculum offerings and the needs of adult learners (Danke & Mkhize, 2021; Land et al., 2021; Molema, 2022). These studies identify a critical misalignment between learner aspirations and adult education curricula, leading to increased student attrition. The latter study found that centres offering practical, skills-based training had significantly higher retention rates than those focusing solely on academic subjects (Danke & Mkhize, 2021; OECD, 2019). This finding is supported by Dhlamini and Heeralal's (2014) research, which shows that curriculum design often emphasises theoretical knowledge at the expense of practical applications, leading to decreased student engagement and reduced relevance to real-world needs.

Recent research by Latip et al. (2024) introduces the concept of adaptive curriculum frameworks that respond to both immediate community needs and broader economic trends. This approach aligns with best international practices while acknowledging local contexts. It emphasises integrating job-specific skills training with general education. Therefore, curriculum design should incorporate business skills and financial literacy, progressively integrate technology skills across all subjects, and embed practical life skills within academic subjects.

The literature consistently emphasises that CETCs and CLCs play a vital role in providing functional literacy, vocational skills, and work-related competencies to marginalised populations, particularly those unable to continue in formal education systems (Agency for Technical Cooperation and Development (ACTED), 2018). In addition, the OECD (2019) recommends a comprehensive approach encompassing employment skills, entrepreneurship training, digital literacy, and life skills programmes. Student preferences, as documented by Land et al. (2021), indicate a strong demand for practical programmes such as computer skills, culinary arts, sewing, mechanical training, and driver's education. A recent study by Tawiah and Ngmenkpieo (2018) provides

quantitative evidence that job-related practical skills effectively enable students to earn income, with more graduates reporting improved economic circumstances after acquiring these skills. Although this latter study and that of Land et al. (2021) report persistent misalignment between learner needs and curriculum offerings, very little empirical work examines how this misalignment manifests in resource-constrained CLCs. Nokukhanya CLC provides a context through which these gaps can be explored.

Integration of Theoretical Perspectives with Curriculum Development

The convergence of different theoretical perspectives offers valuable insights for curriculum development in South African CLCs. Ecological systems theory suggests that effective curricula must address influences across multiple levels, from classroom dynamics to broader socio-economic conditions. Transformative learning theory emphasises the importance of drawing on adults' lived experiences, while critical pedagogy foregrounds the role of education in challenging social inequities. The capabilities approach further highlights the importance of curricula that expand learners' opportunities and freedoms rather than focusing solely on narrow economic outcomes (Sen, 1999). Within adult education, this approach is particularly relevant as it foregrounds learners' capabilities to pursue valued life outcomes, including education, employment, and social participation, rather than treating skills acquisition as an end in itself.

Recent empirical studies suggest that successful curriculum interventions in South African CLCs tend to incorporate elements from multiple theoretical frameworks (Ngubane, 2023; Tibane & Mafa-Theledi, 2025). Dhlamini and Heeralal (2014) demonstrate that curriculum designs that emphasise theoretical content at the expense of practical application can diminish student engagement, a pattern that continues to be reported in more recent studies in South African CLC contexts (Ngubane, 2023). This finding aligns with capabilities approaches that stress practical reason alongside abstract knowledge. Similarly, Latip et al. (2024) conceptualise adaptive curriculum frameworks that respond to both community realities and broader economic shifts, integrating ecological systems thinking with human-capital considerations.

Situational, dispositional, and institutional factors also shape participation and retention in adult education. Classic adult education frameworks such as Cross's (1981) Chain-of-Response (COR) model, which links participation decisions to personal and contextual conditions, and empirical studies by Quigley (1997) on attrition and resistance in adult basic education, as well as Beder's (1990) work on non-participation in ABE, offer a more context-appropriate lens for interpreting the participation patterns of working adults and caregivers in resource-constrained CLCs.

Across these theoretical contributions, the literature consistently demonstrates that effective CET curricula integrate job-specific skills training with general education, incorporate business and financial literacy, progressively embed digital skills, and connect practical life skills to academic content. Implementation approaches, however, vary significantly depending on institutional capacity, local contexts, and the theoretical frameworks guiding curriculum design.

Few empirical studies, however, examine how these theoretical perspectives interact within the everyday practices of curriculum delivery in resource-constrained CLCs (Ngubane, 2023; Tibane & Mafa-Theledi, 2025). This study contributes by analysing curriculum alignment through an ecological systems lens, grounded in situated case evidence (Danke & Mkhize, 2021), to examine resource-constrained curriculum misalignment and learner-reported outcomes.

Theoretical Framework

This paper employs Bronfenbrenner's Ecological Systems Theory (1979; 2000) as its overarching analytic framework. The theory provides a robust, context-sensitive lens for examining how multiple environmental systems shape adult learning experiences in South African CLCs. Its emphasis on interconnected structures of influence aligns well with the complex realities of South Africa's adult education sector, where historical, socio-economic and policy factors intersect to shape institutional functioning and learner engagement.

Bronfenbrenner conceptualises human development as embedded within nested systems that range from immediate interpersonal interactions to wider societal and policy environments. The framework's focus on contextual interdependence mirrors the holistic orientation of South African adult education policies, which emphasise integrating social, economic, and community dimensions into learning environments.

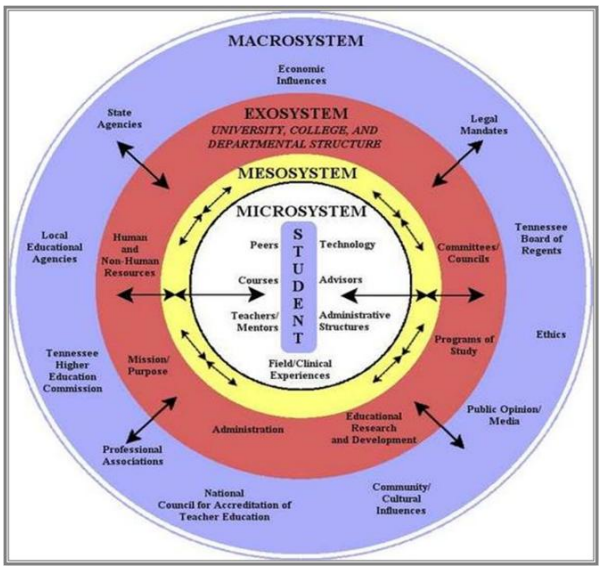

Figure 1: Bronfenbrenner's Ecological Systems Theory (2000)

In applying Bronfenbrenner's theory to this study paper, four ecological levels were used to structure the analysis:

The microsystem refers to the immediate learning environment of the CLC, including interactions among learners, educators, and administrators, as well as curriculum content, teaching practices and available physical resources. These direct encounters shape learner motivation, participation and perceived relevance of programmes. The mesosystem captures the interactions between different microsystems in learners' lives, such as how family responsibilities, workplace dynamics or community roles influence and intersect with participation in CLC programmes. The mesosystem comprises the linkages and processes taking place between two or more settings in which the learner actively participates (Bronfenbrenner, 1979). This study focuses on the synergy among the microsystems of the NCLC, students' home environments, and their workplaces. For adult learners, the mesosystem is a critical site of tension where the academic demands of the curriculum often clash with immediate domestic and survival responsibilities. Analysing these inter-setting transitions, the study identifies how a lack of alignment between the institution and the student's lived reality at home contributes to attrition. The exosystem encompasses structures that indirectly affect learners, for example, local labour markets, community-based organisations, NGO partnerships, and social services. These factors influence the degree to which learners can access opportunities that complement or constrain their educational goals. The macrosystem includes the broader socio-economic, cultural, and policy contexts that shape adult education in South Africa. National CET policies, resource allocation mechanisms, institutional governance structures, and societal values regarding adult learning operate within this level and significantly shape CLC functioning. Bronfenbrenner's framework has been widely applied in South African and international education research. Nand (2017) applied it to examine adult learning in culturally diverse communities, and Filander (2015) used it to analyse curriculum decisions in higher education. These studies demonstrate the framework's analytical clarity and its effectiveness in unpacking how multiple system-level influences shape educational experiences. Situating adult education within four interconnected ecological levels allows the framework to support a nuanced interpretation of how curriculum alignment, institutional constraints, lecturer capacity, and learner needs converge in CET contexts. It enables analysis that links micro-level classroom dynamics to meso-level learner circumstances, exo-level community resources, and macro-level policy expectations, thereby offering a holistic understanding of curriculum responsiveness in resource-constrained CLCs.

METHODOLOGY

Research Method

This paper adopted a qualitative approach (Creswell & Poth, 2016) and employed a single-case study design (Yin, 2009) situated within the interpretivist paradigm, enabling an in-depth exploration of the complexities of adult learning in South African CLCs. The choice of a qualitative case study design was particularly apt for this paper

as it enabled a rich, contextual understanding of the challenges faced in implementing skills-based adult learning and developing a holistic, flexible curriculum. Using a case study design (Rule & John, 2011), the paper provides a focused, detailed examination of curriculum responsiveness in a resource-constrained Community Learning Centre (CLC) context. Nokukhanya CLC was selected as a typical resource-constrained case in which resource constraints, a centralised curriculum, and local labour-market dynamics converge, offering transferable insights for similar CLCs rather than statistical generalisation.

The Nokukhanya Community Learning Centre (NCLC) is located in Msinga, within the uMzinyathi District Municipality (UZDM) of KwaZulu-Natal (KZN), South Africa. The broader context in KZN is marked by high levels of functional illiteracy, low educational attainment, unemployment, and poverty, posing significant challenges for adult learning. The NCLC is situated in UZDM, a predominantly resource-constrained district and the second poorest in KZN (Umzinyathi District Municipality, 2020). The unemployment rate is 29 per cent (Umzinyathi District Municipality, 2020). The NCLC has 11 lecturers and around 156 students enrolled across its limited programme offerings. The NCLC operates within this challenging environment. Specifically, the centre is housed in an old municipal skills development centre, with limited resources, including classrooms, and a lack of computers and workshops. Programme offerings are currently limited to the General Education and Training Certificate (GETC) - ABET Level 4, in contrast to the broader range of programmes offered by the KZN CETC. The centre's operations face challenges, particularly in programme diversity.

Sampling

The purposive sample included ten participants across three categories. The student group (n=5) comprised individuals aged 19-45 years, with three females and two males. Their educational backgrounds ranged from Grade 9 to incomplete matric, and their employment status showed three unemployed individuals and two part-time employees. The lecturer group (n=4) had teaching experience ranging between 5 and 15 years, with specialisations in languages, mathematics, life skills, and vocational training. All lecturers held teaching credentials, with two having specific training in adult education. The centre management participant (n=1) was a centre manager with eight years of experience in adult education administration. Participants were recruited directly by the researchers via email for staff and WhatsApp for students to ensure voluntary participation and minimise potential power dynamics.

Data Collection Tools

Data were collected through a combination of research methods, including focus groups, semi-structured interviews, classroom observation, and field notes generated during site visits to ensure comprehensive coverage and enhance the credibility and trustworthiness of the findings (Lincoln & Guba, 1985). A 90–minute focus group discussion was conducted with five students. Semi-structured interviews comprised four 60–minute sessions with lecturers and one 90–minute session with the centre manager, all of which were audio-recorded and transcribed. Site observations consisted of two full-day visits using a structured protocol focused on physical resources and narrative field notes. Interviews and focus groups were conducted in isiZulu and English, with participants' consent.

Data Analysis

The data analysis employed reflective thematic analysis following Braun and Clarke's (2021) six-phase approach: a hybrid strategy of inductive coding of semantic content and theory-informed review during consolidation and interpretation against the ecological framework. The six phases (familiarisation → coding → candidate themes → review → define/name → reporting) were followed with explicit reflexive memoing, including familiarisation with data, initial coding, theme development, theme review, theme definition, and report production. This balanced analytical approach ensured that the findings were grounded in the data while also contributing to broader theoretical discussions in adult education. For observational data analysis, checklist items were summarised descriptively (presence/absence and adequacy notes). Field notes were coded inductively and triangulated with interview and focus group data during theme development.

Trustworthiness

To enhance credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985), several strategies were used. Prolonged engagement was achieved through two full-day site visits, allowing immersion in the centre’s operations and verification of environmental constraints. Triangulation involved comparing (a) learner and lecturer accounts of curriculum relevance, (b) interview and focus-group descriptions of digital access

with observation data on ICT availability, and (c) participant narratives on programme limitations with CET policy documents. An audit trail was maintained through versioned codebooks, reflexive memos, analytic decision logs, and a matrix linking codes to ecological levels. Participant validation was undertaken during data collection, with the researcher using summarising and reflective probing to confirm participants' meanings and ensure accuracy of interpretation. In addition, preliminary thematic interpretations were informally discussed with selected participants and the centre manager to assess their experiences. An audit trail and reflexive notes were maintained to support dependability and confirmability.

How was participant validation (member checking) ensured in the trustworthiness process?

Ethical considerations

The study received approval from the University Research Ethics Committee (HSS/1217/017M). KZN CET College granted gatekeeper permission. Written informed consent covered participation, audio-recording, and use of anonymised quotes. Pseudonyms, redacted specific job titles and rare attributes, aggregated small subgroups, and de-linked quotes from identifiable roles.

Researchers Positionality and Reflexivity

The researcher's positionality was explicitly considered throughout the study. The primary researchers are adult education practitioners with experience in CET policy and practice, with prior engagement in community education initiatives. This background offered contextual insight into CET operational environments but also introduced potential assumptions about curriculum responsiveness and institutional constraints. To address this, reflexive strategies were used throughout the study. During data collection, the researchers maintained a reflexive journal documenting prior assumptions, emotional responses, and decisions regarding probing and follow-up questioning. Reflexive notes were reviewed during coding to identify how interpretive judgments may have shaped theme development. Peer debriefing sessions with colleagues who were not involved in the CET sector provided an additional layer of reflexive critique and helped reduce interpretive bias. These practices align with recommendations for credibility and confirmability in qualitative research, particularly within naturalistic inquiry frameworks.

FINDINGS

This section presents the study's findings derived from reflexive thematic analysis of semi-structured interviews, a student focus group discussion, and field notes generated during site observations at the Community Learning Centre. A total of ten participants were included, comprising students, lecturers, and centre management. To provide contextual clarity and enhance transparency, the biographical characteristics of participants are summarised in Table 1. Participant codes are used throughout the findings to protect anonymity.

Table 1: Participant Biographical Information

Participant Code	Role	Gender	Age Range	Data Source
S1	Student	Female	35–45	Focus group
S2	Student	Male	19–25	Focus group
S3	Student	Female	26–35	Focus group
S4	Student	Male	26–35	Focus group
S5	Student	Female	36–45	Focus group
L1	Lecturer	Male	36–45	Interview
L2	Lecturer	Female	46–55	Interview
L3	Lecturer	Male	36–45	Interview
L4	Lecturer	Female	46–55	Interview
LCM	Learning Centre Manager	Male	46–55	Interview

The findings are organised according to Bronfenbrenner's ecological systems framework, which serves as the overarching analytical lens. The four ecological levels (microsystem, mesosystem, exosystem, and macrosystem)

represent the main themes derived from the data. Subthemes within each level were identified through reflexive thematic analysis and are presented below to illustrate how curriculum responsiveness and learner experiences are shaped across interconnected systems of influence.

The themes identified through reflexive thematic analysis were interpreted through Bronfenbrenner's ecological systems theory to illuminate how learning experiences and curriculum responsiveness are shaped across interlinked levels of influence. At the microsystem, themes centred on learner–lecturer interactions, classroom practices, and immediate learning conditions, including curriculum rigidity, student engagement, and critical resource shortages. The mesosystem revealed tensions arising from the interplay between learners' work demands, family responsibilities, and education, highlighting structural barriers to attendance and retention. At the exosystem level, themes reflected limited integration with community resources, absence of industry partnerships, and inadequate coordination with municipal digital facilities. Finally, the macrosystem encompassed broader systemic forces, including national curriculum mandates, funding patterns that prioritise academic subjects, and cultural norms, particularly those shaping women's participation. Together, this ecological reading demonstrates that curriculum misalignment is reproduced across interconnected structural, institutional, and socio-cultural layers rather than being confined to the instructional level.

Theme 1: Microsystem Level

The microsystem includes the immediate learning environment of the CLC, encompassing relationships between learners, educators, and administrative staff, as well as the physical resources and curriculum. The results show both opportunities and challenges for enhancing relationships among students, educators, physical resources, and the curriculum.

Sub-theme 1.1: Curriculum delivery and Student Engagement

The immediate learning environment revealed complex dynamics between curriculum delivery and student engagement. Lecturer 2 stated:

> *In the classroom, we try our best to make the content relevant, but the standardised curriculum constrains us. We often find that when we introduce real-life examples or adapt lessons to align with students lived experiences, engagement improves significantly. However, because we are required to follow a rigid curriculum structure, we do not always have the flexibility to incorporate these contextualised learning approaches. Some students are clearly more engaged when we relate topics to their daily lives. Still, without the ability to adapt teaching materials, we sometimes struggle to maintain their interest and motivation.*

Lecturer 3 also stated that supervisors were told to offer the same subjects on their satellites:

> The centre manager called the supervisors' meeting and told them that our centres should offer the same subjects to ensure consistency across all CLCs. However, our supervisor later informed us that during discussions with the district departmental official, it was clarified that while centres were indeed expected to follow a standardised subject offering, they were also given the flexibility to add subjects, provided they had the necessary resources and capacity. This created some confusion among us because, in practice, many centres struggle with resource constraints, making it challenging to introduce supplementary subjects, even when there is apparent student demand.

Subtheme 1.2: Attainment of Educational Goals

Student experiences varied significantly based on their educational goals. As Student 3 noted:

> *I am truly grateful for this second chance to improve my matric results. For me, this is not just about getting a certificate –it is about creating better prospects for my future. I had limited options after my initial matric results, but now, with the support from this centre, I can work towards university admission. This second chance means everything to me because it allows me to pursue my dreams and open doors that were previously closed.*

Subtheme 1.3: Academic support to students

The sentiments shared by Student 3, expressing gratitude for a second chance to improve matric results and pursue university studies, align closely with Student 5's statement about improving mathematics to gain university admission. Both perspectives highlight the significant role that CLCs play in providing alternative educational pathways for individuals who may have struggled in traditional school systems.

These statements reflect a broader theme on how CLCs serve as academic support structures for students aiming to re-enter formal education. The optimism expressed by these students underscores the perceived value of the CLC's academic offerings in shaping their prospects. However, while some students find these opportunities beneficial, the curriculum's effectiveness in truly preparing them for university remains a critical area for further exploration. This emphasises the need for CLCs to ensure that their academic support is not only accessible but also aligned with the requirements of higher education institutions.

However, other groups of students expressed dissatisfaction, particularly regarding the curriculum's lack of flexibility and its limited relevance to their daily lives. Many felt that the current curriculum structure hindered their ability to improve their financial situations.

As Student 1, an older student explained, *'I came here hoping to learn practical skills for business, but we spend most of our time on academic subjects that do not help me earn money.'* This sentiment reflects a broader concern about the disconnect between policy intentions and real student needs, particularly for those who require vocational training rather than purely academic instruction.

Subtheme 1.4: Challenges related to the lack of curriculum flexibility and poor infrastructure issues

Lecturers perceived that some students withdrew due to the curriculum's lack of flexibility. The results above reveal significant challenges in implementing a holistic educational approach in the CLCs. The current offerings are limited to a prescribed set of subjects, including IsiZulu, English, life orientation, natural sciences, mathematical sciences, ancillary health care, and early childhood development. This narrow focus contradicts the National Policy on Curriculum Development and Implementation (DHET, 2017), which mandates that CLCs add non-formal programmes to their offerings. Depending on the centre's capabilities, these offerings could include school governing body training, civic and citizenship education, small, medium, and micro-enterprise training, co-operative training, learner driver's license training, life skills, voter education, and consumer education.

The data further shows that physical infrastructure limitations have a significant impact on learning experiences. These constraints include inadequate computer facilities and internet connectivity, limited access to current learning materials, insufficient vocational training equipment, and a lack of specialised facilities for practical skills training. Lecturer 1 and the Learning Centre Manager (LCM) highlighted these challenges:

> *We want to offer computer training because we know how essential digital skills are in today's job market. Many of our students have never had the opportunity to work with computers, and providing them with these skills could open doors to better employment and further education. However, we lack both the necessary equipment and a reliable internet connection, which makes it nearly impossible to implement such a programme effectively. Without these resources, our students are missing out on crucial opportunities to develop digital literacy, which is now a basic requirement in many industries.*

The learning centre manager (LCM) said:

> *We have only one computer lab, and unfortunately, the machines we have are outdated and barely functional. Many of them are slow, prone to technical issues, and unable to support the latest software needed for proper digital skills training. This makes it incredibly difficult, if not impossible, to teach students modern digital competencies that are now essential in most workplaces. Without access to updated technology, our efforts to integrate computer literacy into the curriculum remain severely limited. Even when students are eager to learn, the lack of reliable infrastructure hinders their progress, further widening the digital divide.*

This challenge reinforces lecturers' concerns about the lack of equipment and internet access, underscoring that the centre struggles to provide adequate computer training. The combination of outdated facilities and poor

connectivity prevents students from acquiring the digital skills necessary for employment and further education, leaving them at a disadvantage in an increasingly technology-driven world.

Student 2 echoed the frustrations shared by lecturers and the centre manager regarding resource shortages, highlighted the impact of these limitations on the learning experience, and stated:

> *Sometimes, we do not even have enough chairs for everyone in the classroom. We are forced to stand or share desks, which makes it difficult to concentrate. How can we focus on learning when even the most basic resources are missing? It feels like education is not a priority when we lack the essentials to support our studies.*

This statement underscores the broader issue of inadequate infrastructure, extending beyond outdated technology and unreliable internet access. The lack of fundamental resources, such as seating and proper classroom facilities, directly affects student engagement and motivation. Without improvements in these basic provisions, efforts to enhance learning through curriculum reforms or digital training will remain ineffective.

Theme 2: Mesosystem Level

Subtheme 2.1: Balancing work, study time and adaptable learning space

A recurring theme in the data was the challenge of balancing work and education. Lecturer 1 highlighted a significant challenge faced by adult learners, emphasising the conflict between their educational pursuits and work responsibilities. They explained:

> *Many students miss classes because of work commitments. They must choose between earning a living and attending lessons, which often leads to inconsistent attendance or even dropping out. We need more flexible scheduling options, such as evening or weekend classes, to accommodate their realities. If we could structure lessons around their availability, more students would be able to complete their studies successfully.*

This statement underscores the need for a more adaptable learning structure within CLCs, particularly for working adults who struggle to balance employment and education. Without flexible scheduling, many students are forced to prioritise immediate financial stability over long-term academic and career growth, limiting the effectiveness of CET programmes.

Similarly, Student 4 shared their struggle of having to choose between employment and education, emphasising that the centre does not consider the needs of working students:

> I had to choose between my part-time job and attending classes, as the centre does not consider our needs as working students

Subtheme 2.2: Managing family responsibility

Female students also faced significant challenges in managing their family responsibilities alongside their studies. Lecturer 4 expressed concern over the impact of childcare demands on student retention:

> Female students often struggle with balancing childcare and studies. We have lost several promising students because we could not accommodate their family responsibilities.

The data indicate that the inability to support students with family responsibilities contributes to attrition, underscoring the need for more inclusive policies and support structures within the learning centre.

Theme 3: Exosystem Level

The exosystem level examines indirect environmental influences that shape adult learners' educational experiences, including community resources, employment opportunities, and social services. The findings highlight gaps in resource integration and economic alignment, affecting both teaching and learning. The data revealed limited collaboration between the learning centre and community resources. A centre manager

emphasised the missed opportunity for industry exposure, stating, ‘Local businesses could provide internship opportunities, but we lack formal partnerships.’

Similarly, Lecturer 3 noted the underutilisation of available technological resources within the municipality:

> *The municipality has computer centres, but there is no coordination with our programme.*

Economic factors also emerged as a significant influence on the learning experience. Some lecturers expressed concern that the curriculum does not sufficiently prepare students for local employment demands. Lecturer 1 pointed out:

> *Our curriculum does not align with local job market needs. We teach what is prescribed, not what employers want.*

These findings suggest that stronger links between the CLC, local businesses, and municipal resources could enhance students' educational and employment prospects.

Theme 4: Macrosystem Level

Subtheme 4.1: Alignment to National policy and local realities

The macrosystem level encompasses the broader societal influences on adult education, including national policies, cultural values, and socio-economic conditions. The paper revealed key challenges in aligning national policy with local realities and cultural perceptions that affect adult students' participation.

One significant finding was the gap between policy intentions and practical implementation. While national policies emphasise flexibility in adult education, rigid subject requirements often limit adaptability at the institutional level. The centre manager highlighted this discrepancy:

> *The policy promotes flexible programming, but in practice, we are bound by rigid subject requirements.*

Subtheme 4.2: Resource allocation for curriculum delivery

Resource allocation also emerged as a challenge, with funding structures prioritising academic subjects over practical skills that could enhance employability. Lecturer 2 expressed frustration over these constraints:

> *Government funding focuses on academic subjects. We cannot offer the practical courses our community needs.*

Cultural attitudes toward adult education further shaped learners’ experiences. Some societal beliefs, particularly regarding gender roles, acted as barriers to participation. Lecturer 4 noted:

> *Some families do not support adult learning, especially for women. They see it as a waste of time.*

These findings suggest that while policy frameworks aim to support adult education, their effectiveness is often hindered by implementation challenges and deep-rooted cultural perceptions. Addressing these issues may require more localised decision-making and advocacy for broader societal change.

DISCUSSION

This study examined curriculum responsiveness within a resource-constrained CLC through Bronfenbrenner’s ecological systems theory, showing how misalignment between CET offerings and learner needs is reproduced across multiple, interconnected levels. Evidence from interviews, observations, and policy documents revealed

patterns that span the microsystem, mesosystem, exosystem, and macrosystem, demonstrating that the challenges experienced in the classroom are deeply embedded in broader structural conditions.

At the microsystem level, learners and lecturers reported that the curriculum was overly academic and insufficiently responsive to local livelihood needs. While contextualised, real-life examples improved engagement, lecturers felt constrained by a rigid, standardised curriculum. Observational data confirmed shortages of basic teaching resources, outdated computer equipment, and the absence of vocational tools, all of which limited lecturers' ability to integrate practical or digital-skills-based learning. Although policy documents such as the National Policy on Curriculum Development and Implementation (DHET, 2017) encourage CLCs to offer non-formal programmes, the centre's offerings remained narrowly academic. This reflects situational barriers that inhibit adult participation, consistent with Cross's (1981) Chain-of-Response Model.

At the mesosystem level, learners described difficulties balancing work commitments, part-time employment, and caregiving responsibilities, especially for women managing childcare. These pressures resulted in inconsistent attendance patterns observed during fieldwork. Such situational barriers are widely recognised in adult education research, where structural constraints rather than individual motivation often shape participation (Cross, 1981; Quigley, 1997). The findings indicate that flexible scheduling and modular delivery could improve engagement, but such adaptations require institutional autonomy and resourcing.

The exosystem level revealed limited integration between the CLC and community resources. Lecturers and managers highlighted the absence of partnerships with local businesses and limited coordination with municipal digital centres. Observations confirmed a lack of experiential learning opportunities or employer involvement, despite policy emphasis on such linkages. This weak alignment between education and the local labour market mirrors Beder's (1990) argument that institutional relationships with external stakeholders strongly influence adult participation and the perceived relevance of programmes.

At the macrosystem level, participants noted tensions between policy rhetoric promoting flexibility and the reality of rigid subject requirements and resource-driven funding priorities. Cultural norms also played a role, with gendered expectations limiting women's participation. The physical reality of students standing or sharing desks (as noted in the Results) is a visceral manifestation of macrosystemic neglect. While national policy labels CETs as a 'bridge of hope,' the lack of basic furniture suggests that resource-constrained adult learners remain at the periphery of funding priorities. This 'infrastructural violence' directly hinders the microsystemic learning process, as physical discomfort competes with cognitive engagement. These experiences align with broader analyses of CET governance, which highlight centralised control and limited local discretion. Macrosystem constraints, therefore, reinforce curriculum misalignment, shaping what programmes can be offered and how resources are allocated.

The data reveals a 'second chance' paradox within the NCLC. While Student 3 values the academic curriculum as a vital 'bridge' to higher education, Student 1 views these same subjects as a 'waste of time' due to the urgent need for income. This highlights a macrosystemic tension: the DHET's 'one-size-fits-all' academic model ignores the diverse life stages of adult learners. In a resource-constrained context, the dual mandate of providing both academic progression and immediate livelihood skills is not being met.

Together, these ecological findings illustrate that curriculum misalignment is not an isolated classroom phenomenon but a systemically embedded challenge. Microsystem resource shortages, mesosystem work–study–family pressures, exosystem gaps in partnerships, and macrosystem policy constraints intersect to limit responsiveness. Addressing these challenges requires coordinated efforts across ecological levels: improving basic infrastructure at the centre, providing flexible delivery options for adult learners, strengthening community and employer partnerships, and adjusting policy levers to allow context-sensitive curriculum adaptation. Intervening at a single level is unlikely to yield meaningful change; multi-level reform is essential for CET institutions seeking to support equitable and relevant lifelong learning opportunities in resource-constrained contexts.

Recommendations for Enhancing CET Curriculum Alignment

The findings suggest that curriculum responsiveness in resource-constrained CLCs can be strengthened through modest, context-appropriate adjustments rather than large-scale structural reforms.

1. Enabling Curriculum Flexibility and Localisation

The CET College should enable limited flexibility in the curriculum within existing policy parameters. Although national policy permits non-formal programmes, centres often default to a narrow academic menu. Allowing CLCs to introduce small, locally relevant offerings such as basic entrepreneurship, digital literacy, or community-specific skills would help address the needs of learners seeking practical, livelihood-oriented training.

2. Stabilising Essential Digital Infrastructure

There is an urgent need to stabilise the minimum digital infrastructure required for meaningful learning. A phased approach, beginning with the restoration of a functional computer lab and basic internet access, would lay the foundation for digital literacy and future blended-learning initiatives. Collaboration with municipal digital hubs may provide short-term relief while longer-term upgrades are pursued.

3. Strengthening the Mesosystem through Gender-Responsive Support

To strengthen the mesosystem (the link between home and school), the CET must move beyond purely academic alignment and address the situational barriers that cause inconsistent attendance. Management should explore 'child-friendly' learning blocks or local partnerships to provide on-site childcare, ensuring that women do not have to choose between their domestic microsystem and their educational aspirations. Additionally, piloting evening or weekend classes and modular learning blocks would better accommodate the realities of working adults.

4. Cultivating Local Community and Industry Partnerships

Stronger community partnerships could expand opportunities for practical exposure and resource sharing. The absence of employer linkages highlights the need for more deliberate local engagement. Small-scale collaborations, such as workplace visits, guest lecturer sessions, or shared ICT access with local businesses, could enrich learning experiences without requiring significant financial investment.

5. Granting Bounded Institutional Autonomy

Finally, CET College leadership could support CLCs by clarifying where local discretion is permitted and establishing a simple approval process for piloting context-relevant activities. Such bounded autonomy would allow CLCs to respond more effectively to community needs while still operating within the DHET's regulatory framework, bridging the gap between national policy expectations and local institutional practice.

Limitations

The study was delimited to a resource-constrained Community Learning Centre, which enabled an in-depth, context-sensitive exploration of curriculum responsiveness but limited the transferability of the findings to other CET settings. The sample was small and purposively selected, comprising only lecturers, the centre manager, and a group of students; as such, the findings reflect a narrow set of experiences rather than a broader representation of the CET system. The analysis relied primarily on participant perceptions and self-reported experiences, without triangulation through administrative outcome data such as completion rates, progression patterns, or employment trajectories. This quantitative data was not available at the site and, therefore, could not be incorporated into the analysis. Finally, the study focused on the centre's formal programme offerings. Although policy documents emphasise non-formal pathways, these did not feature prominently in the data and were therefore not examined in detail. These limitations should be considered when interpreting the findings, which are intended to offer situated insights rather than generalisable claims.

CONCLUSION

This study examined curriculum responsiveness within a resource-constrained Community Learning Centre through an ecological systems lens, revealing how misalignment between CET offerings and learner needs is shaped across interdependent systemic levels. At the microsystem level, the findings highlight how resource shortages, rigid academic curricula, and limited digital infrastructure restrict both teaching and learning, particularly for adults seeking practical or livelihood-oriented skills. Mesosystem dynamics further complicate learner participation, with work demands, caregiving responsibilities, and gendered household roles creating

persistent barriers to attendance and progression. Exosystem factors, including weak institutional linkages with local employers and underutilised municipal resources, further limited opportunities for experiential learning and skills development. At the macrosystem level, tensions between policy intentions and implementation, centralised curriculum mandates, and cultural attitudes toward adult education reinforce the challenges experienced at the centre level.

Taken together, these findings demonstrate that curriculum misalignment is not confined to the classroom but is embedded within broader structural, social, and institutional contexts. The ecological perspective shows that improving curriculum responsiveness requires attention to multiple layers of influence rather than isolated programme adjustments. Importantly, this case study contributes to the limited body of empirical research on rural resource-constrained CLCs in South Africa, offering situated evidence of how local realities, resource constraints, and the lived experiences of adult learners mediate national policy aspirations. While the findings are context-specific, they raise broader considerations for the CET sector regarding curriculum flexibility, institutional autonomy, digital access, and community partnership development.

This critical analysis of the 'second chance paradox' and the infrastructural constraints of the municipal facility fills the identified gap in the literature regarding how centralised CET policies manifest as lived barriers in deeply resource-constrained contexts. Overall, the study underscores the importance of context-sensitive, flexible approaches to adult education that recognise the complexity of resource-constrained learning environments. Strengthening curriculum responsiveness will require coordinated action across policy, institutional, and community levels to ensure that CLCs can meet the diverse needs of adult learners and support meaningful pathways to further education, employment, and social participation.

Disclosure Statement

The authors declare that there are no competing interests or conflicts of interest related to the content, findings, or publication of this manuscript**.**

Declaration On the Use of Artificial Intelligence Tools

In preparing this manuscript, we used digital tools, including Gemini, Grammarly and Copilot (free versions), to support language refinement, improve clarity and coherence, and provide restructuring and editing suggestions. All intellectual content, analysis, and critical interpretation presented in the paper are entirely our own. The final version has been thoroughly reviewed and approved by the authors to ensure accuracy and academic integrity.

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Culturo-Techno-Contextual Approach (CTCA 2.0) in Hybridisation Learning: Comparative Insights into Monolingual and Multilingual Chemistry Instruction

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ABSTRACT

Chemistry remains one of the core subjects taught in senior secondary schools in the Kambia District, Sierra Leone. Approaches to teaching science are evolving, and new variants, such as the Culturo-Techno-Contextual Approach 2.0 (CTCA 2.0), have emerged and are proving more effective than older ones. This study examined the impact of CTCA 2.0 on academic achievement and attitudinal disposition in secondary chemistry, comparing monolingual and multilingual instructional delivery on the concept of hybridisation. Participants were Grade 11 students from the Sciences and Technologies stream within Kambia District, Sierra Leone. Two schools were selected based on the availability of qualified chemistry teachers, laboratory facilities, and students' access to internet-enabled devices, particularly after school hours. The monolingual was English-only (100%), and the multilingual was English (70%), Krio (20%), Kathemne (8%), and Gen Z slang (2%). The Hybridisation Achievement Test and the Hybridisation Attitude Questionnaire, with reliability coefficients of 0.81 and 0.79, respectively, were the instruments used to collect data. The MANCOVA showed that the CTCA 2.0 multilingual group outperformed its monolingual counterpart on measures of achievement ($F(1, 67) = 67.74$, $p < .001$, partial $\eta^2 = .50$) and attitude ($F(1, 67) = 658.23$, $p < .001$, partial $\eta^2 = .91$). It was concluded that CTCA 2.0 multilingual mode is a viable teaching approach for promoting meaningful learning of hybridisation. Future research should be longitudinal in design, investigating whether the current findings of improved achievement and attitudes among multilingual students using CTCA 2.0 are sustained over time and lead to better retention and transfer of chemical ideas.

Keywords: achievement, attitude, culturo-techno-contextual-approach, monolingual, multilingual

INTRODUCTION

Chemistry remains one of the core subjects taught in senior secondary schools. Its significance cannot be overemphasised, as it is an essential part of national development, technology, health, and environmental innovations (Oladejo et al., 2023; Sibomana et al., 2021). However, performance levels among chemistry students in most African countries have remained poor or unchanged (Ademola et al., 2023). Poor academic achievement in chemistry among learners has been largely attributed to the discipline's complexity.

Hybridisation is undoubtedly one of the toughest, if not the toughest, concepts within the chemistry syllabus. Understanding hybridisation depends on understanding orbitals, electronic structures, and related concepts that require higher-order cognitive processes (Omilani & Raji, 2024). Empirical studies indicate that even teachers struggle to fully understand the complex concept of hybridisation, let alone effectively support students in learning it. This suggests that conceptual difficulties may originate at the secondary school level (Oladejo et al., 2023).

Such difficulties are exacerbated by the language used in teaching these concepts. In many cases in Africa, chemistry is taught mainly in English, even though learners operate in multilingual contexts. This presents a challenge for learners, as they must simultaneously understand a foreign language and grasp scientific concepts (Charamba, 2023; Kiramba & Charamba, 2023). This double cognitive load leads to poor comprehension and reduced learner engagement (Abdulatief & Guzula, 2024).

Contemporary research highlights the need for approaches that enable learners to utilise their full linguistic repertoire to grasp difficult concepts and scientific information (Charamba, 2023). Research evidence shows that such an approach improves learners' conceptual understanding, confidence, and attitudes towards science (Mavuru & Ramnarain, 2020).

To address such pedagogical and linguistic concerns, Peter Okebukola developed the Culturo-Techno-Contextual Approach (CTCA). CTCA 2.0 builds upon this approach by introducing multilingual approaches to enhance learning processes (Adam et al., 2025). This current research will thus investigate the impact of CTCA 2.0 on learner achievement and attitudes towards hybridisation, taking into consideration the effects of monolingual and multilingual instructional approaches.

Statement of the Problem

Despite ongoing curriculum reform and teacher professional development, academic performance in senior secondary chemistry remains abysmal across numerous English-speaking West African settings. The examination reports from WAEC/WASSCE have repeatedly pointed out deficiencies in comprehension, problem-solving, and practical skills. Alongside poor performance, students exhibit negative affective states towards chemistry lessons, such as fear, low self-confidence, and a sense of irrelevance. These states have been found to negatively affect academic performance. While CTCA 2.0 has proven effective in improving positive educational outcomes, there are still no scientific data on its differential efficacy across different instructional languages. Specifically, it is not yet known whether multilingual instruction could increase or moderate the effectiveness of CTCA 2.0 on students' performance and affective states. Filling this knowledge gap is important for making informed decisions about instructional strategy design, teacher training, and other aspects of chemistry education in multilingual environments. This research project will provide an empirical comparison of monolingual and multilingual instruction based on CTCA 2.0 for teaching the concept of hybridisation.

Research Questions

1. Is there a significant difference in academic achievement between students taught via monolingual CTCA 2.0 and those taught via multilingual CTCA 2.0?
2. Is there a significant difference in attitudinal disposition between the two groups?

Hypotheses

Ho1: There will be no statistically significant difference in academic achievement between students taught via monolingual CTCA 2.0 and those taught via multilingual CTCA 2.0

Ho2: There will be no statistically significant difference in attitudinal disposition between students taught via monolingual CTCA 2.0 and those taught via multilingual CTCA 2.0.

LITERATURE REVIEW

Theoretical and Conceptual Background

The theoretical basis for this study includes social constructivism, situated learning theory, and translanguaging theory, which offer an understanding of how culturally responsive and linguistically sensitive pedagogy shapes learning outcomes.

Social constructivism, based on the works of Lev Vygotsky, views knowledge as socially constructed and mediated by culturally available artefacts, such as language. Various empirical studies show that collaborative language-based learning positively impacts conceptual understanding and academic performance, especially in abstract subjects such as chemistry (Hardman & Set, 2023). Hence, we expect CTCA 2.0 to positively impact learners' academic achievement.

Situated learning theory, developed by Jean Lave and Etienne Wenger, suggests that meaningful learning occurs through situated learning experiences (Oola et al., 2024). Evidence-based studies show that situational learning experiences increase learner engagement and academic achievement in science. Contextualization and culturalization are key aspects of situated learning in CTCA 2.0.

The translanguaging theory also emphasises the importance of language as a cognitive tool. The literature suggests that multilingual instruction minimises cognitive load and promotes conceptual comprehension, especially among students learning complicated material in a foreign language (Abdulatief & Guzula, 2024; Charamba, 2023). The empirical data suggest that multilingual learners usually perform better than monolingual learners when permitted to draw on all available linguistic skills. This supports the assumption that multilingual CTCA 2.0 would generate better results.

The CTCA 2.0 model combines the culturalization, technologization, and contextualization of instruction, along with multilingual delivery of instruction, to overcome conceptual and linguistic barriers. The empirical research provides ample evidence of the effectiveness of the CTCA approach, as demonstrated by improved academic achievement, motivation, and knowledge retention (Abdulatief & Guzula, 2024; Gbeleyi et al., 2023; Oladejo et al., 2023). Nonetheless, the influence of instructional languages should not be overlooked.

Abstractness and Difficulty of Hybridisation

Hybridisation has been acknowledged as one of the most abstract topics in chemistry education due to the complex cognitive processes involved in its teaching and learning. Such processes require students to comprehend symbolic notation (e.g., sp, sp^2, sp^3), understand spatial molecular arrangements, and integrate multiple layers of knowledge into their representations (Omilani & Raji, 2024). Students' difficulties in integrating these elements of knowledge lead to misconceptions and surface-level learning.

The existing literature reveals consistent findings about the problems students face in visualising orbital overlap and understanding molecular geometry, especially when the two-dimensional perspective predominates in teaching (Kiernan et al., 2021; Pabuccu & Erduran, 2017). In addition, because hybridisation is a theoretical concept rather than an observable fact, learners find it challenging to apply abstraction (Taber, 2014).

The most frequent misunderstandings related to hybridisation include perceptions of orbitals as fixed paths of electrons, hybrid orbitals as straightforward mixtures of s and p orbitals, and the conflation of molecular geometry with the geometry of electron pairs (Krijtenburg-Lewerissa et al., 2017; Tsaparliset al., 2018).

Language as a Mediator of Science Learning

Language is a major contributor to access to scientific information. Language is often the main barrier to science education. The use of English only for instruction in many schools in Africa is reported to limit learners' understanding and participation (Abdulatief & Guzula, 2024). Multilingual and translanguaging strategies offer a better approach, enabling learners to make meaning and understand scientific phenomena across multiple languages. Studies have shown that multilingual instruction improves understanding of scientific concepts, engagement with science, and attitudes towards science (Charamba, 2020). Contextual issues such as teachers' preparedness, limitations in science-teaching policies, and the availability of materials are among the factors influencing the use of multilingual science instruction. Nevertheless, the literature on multilingual science instruction is generally positive.

Empirical Review of Related Studies

Empirical studies suggest that cultural responsiveness and multilingual approaches are successful in teaching science subjects. The results of CTCA studies suggest gains in students' conceptual knowledge and academic performance through the relatability of abstract knowledge to real-world situations (Abdulatief & Guzula, 2024; Oladejo et al., 2025). The use of multilingual pedagogy has been shown to benefit learners' comprehension, engagement, and attitudes towards science (Abdulatief & Guzula, 2024; Charamba, 2023). Students taught using multilingual strategies have performed better than those in monolingual classes. Results from studies on hybridisation also indicate ongoing difficulties in learning due to the concept's abstract and representative nature (Omilani & Raji, 2024; Salame et al., 2022). However, research has suggested that instruction through visualisation and contextualisation is effective (Kiernan et al., 2021). However, there are very few studies that incorporate CTCA 2.0, multilingual approaches, and hybridisation in one single framework.

Synthesis and Research Gap

Three major problems have been identified in the literature review: first, the abstraction of hybridity; second, the role of language in facilitating learning; and third, the constraints associated with conventional modes of instruction. Although there are many examples of the successful application of culturally responsive teaching and multilingual education, little empirical data exist on how these two pedagogical strategies function within frameworks such as CTCA 2.0. In particular, very few studies compare monolingual and multilingual instruction within the framework of CTCA 2.0 for secondary school chemistry lessons.

METHODOLOGY

This study employed a quasi-experimental research design consisting of a pre-test and post-test non-equivalent groups design. This comprised two experimental groups, CTCA 2.0 monolingual and multilingual modes. The design was chosen because of the natural school's location, where random assignment of students to experimental and control groups was not possible. This approach helped us determine the causal effect of the intervention on students' achievement and attitudes toward the chemistry concept of hybridisation.

Study Sample

The participants comprised Senior Secondary School Two (SSS2; equivalent to Grade 11) students enrolled in the Science and Technology stream in senior secondary schools in Kambia District, Sierra Leone. This cohort was selected because hybridisation is formally introduced at this level in the national chemistry curriculum. Two senior secondary schools were purposively selected based on the availability of qualified chemistry teachers, functional laboratory facilities, and students' access to internet-enabled devices, particularly for extended learning beyond classroom hours. The schools were also selected to represent two distinct instructional language conditions: monolingual (English-only) and multilingual. A total of 71 students participated in the study and were assigned to two experimental groups. Experimental Group I (CTCA 2.0—monolingual mode) consisted of 37 students (20 males and 17 females), while Experimental Group II (CTCA 2.0—multilingual mode) comprised 34 students (16 males and 18 females). The multilingual instructional condition incorporated English (approximately 70%), Krio (20%), Kathemne (8%), and informal youth expressions (Gen Z) (2%). These proportions were systematically implemented and monitored using a CTCA 2.0 classroom observation protocol to ensure consistency across

instructional sessions. The selected schools were geographically separated to minimise interaction between participants and reduce the risk of treatment contamination. All participants were provided with access to mobile devices and personal computers, as the integration of digital tools was a core component of the CTCA 2.0 instructional approach.

Research Instruments

The Hybridisation Achievement Test (HAT) is a 40-item multiple-choice assessment (with four options lettered A-D) designed to gather quantitative data and evaluate students' understanding of key concepts in atomic hybridisation in Chemistry, with a particular focus on cognitively demanding, task-analysed concepts. Each item was meticulously developed through a rigorous process to ensure alignment with the Chemistry curriculum as prescribed by the West African Examinations Council (WAEC) syllabus and the intended learning objectives for senior secondary education. To ensure the content validity of the Hybridisation Achievement Test (HAT), a panel comprising two senior Chemistry educators, one senior examiner of external Chemistry examinations, and some researchers from the International research group championed by Okebukola was consulted. They reviewed each item in the test, paying attention to the extent of content coverage, alignment with senior secondary school learning outcomes, scientific accuracy, cognitive appropriateness, language clarity, and balance across Bloom's revised taxonomy. To ascertain the reliability of the Hybridisation Achievement Test (HAT), the split-half reliability method was employed. After administering the HAT during the pilot phase, students' responses were divided into two halves (odd-numbered vs even-numbered items) to create two comparable forms. The data obtained were used to determine their reliability using IBM SPSS version 23. The computed reliability coefficient for HAT was 0.81, indicating a very good level of internal consistency across the items. The Hybridisation Attitude Questionnaire (HAQ) was designed to evaluate students' attitudes toward hybridisation. To mitigate response bias, the HAQ was structured to include an equal number of positively and negatively worded items. It is a 4-point Likert-type response format, including strongly agree (4), agree (3), disagree (2), and strongly disagree (1) for positively worded statements. Reverse scoring was used for negatively worded statements. The reliability coefficient is 0.79, showing a high degree of internal consistency.

Data Collection

Before the study commenced, pre-tests, including the Hybridisation Achievement Test (HAT) and the Hybridisation Attitude Questionnaire (HAQ), were administered to the CTCA 2.0 groups. The purpose of this assessment is to determine the initial levels of academic proficiency among the students. Following the pre-test exercise, the treatment was administered for 5 weeks. The CTCA 2.0 monolingual group was taught hybridisation in English only, with lessons that integrated cultural and contextual examples to enhance understanding. Meanwhile, the CTCA 2.0 multilingual group received instruction in English, Krio, Gen Z, and Kathemne, combined with culturally familiar content to support comprehension. Upon completion of the treatments, post-tests comprising the same HAT and HAQ were administered to evaluate learning gains and changes in students' attitudinal disposition towards hybridisation. All lessons were delivered by one of the researchers, who followed a standardised CTCA 2.0 lesson guide to ensure consistency in instruction across the experimental groups.

CTCA 2.0 in the classroom

Both experimental groups, CTCA 2.0 monolingual and CTCA 2.0 multilingual, were instructed in hybridisation using CTCA 2.0's six-step instructional framework. These steps have systematically integrated cultural context, technological support, and curriculum content to accelerate active learning, contextual problem-solving, and higher-order thinking throughout the lesson.

1. Inform students ahead of time of the topic to be learned in class. Ask each student to (a) reflect on indigenous knowledge or cultural practices and beliefs associated with the topic or concept. (b) use their mobile phones or other internet-enabled devices to search the web for resources related to the lesson (first technology flavour of the approach).

2. At the start of the lesson and after the introduction by the teacher, students are grouped into mixed-ability, mixed-sex groups to share individual reflections on (a) the indigenous knowledge and cultural practices and beliefs associated with the topic; and (b) summaries of ideas obtained from web resources. All such cultural and web-based reflections are documented and presented to the whole class by the group leaders.
3. The teacher progresses the lesson, drawing practical examples from the immediate surroundings of the school. Such examples should be physically observed by students to make science (or any subject) real.

This is one of the "context" flavours of the approach. The teacher should sprinkle delivery with some content-specific humour and Indigenous cultural analogies and metaphors.

4. As the lesson progresses, the class is reminded of the relevance of the indigenous knowledge and cultural practices documented by the groups for a meaningful understanding of the concepts. If misconceptions are linked to cultural beliefs, the teacher clarifies them.

5. At the close of the lesson, the teacher conducts a short quiz (oral or written) to evaluate the lesson and provides the topic for the next lesson, which will be the starting point of step 1.

6. As a follow-up to the lesson, the teacher sends a summary of the lesson (two pages) via SMS, WhatsApp, Telegram, or any other messaging app to all students.

Indigenous Knowledge Related to Hybridisation

The traditional cloth weaving process across Sierra Leone (e.g., in Mende or Temne culture), where different threads in the colour of Sierra Leone flag (representing s and p orbitals) are carefully interlaced to form a single, strong, and useful woven fabric (representing the hybrid orbital) shows how atomic orbitals combine to form new, stronger orbitals that help atoms bond and form stable molecules. Each thread on its own is useful, but when interwoven, they become something more functional and beautiful, just like hybrid orbitals that result from mixing atomic orbitals. The analogy above provides a starting point for conversations about hybridisation, especially its definition.

Woven fabric (hybrid orbital)

Figure 1: Analogy for the definition of hybridisation

In sp hybridisation, one s orbital and one p orbital mix to form two equivalent sp hybrid orbitals. These orbitals align 180° apart in a straight line to minimise electron-pair repulsion. A good analogy for this linear arrangement can be seen in the traditional fishing rods or spears used in Africa.

Three-legged cooking pot for Trigon
planar shape

Traditional roof design for
pyramid-like structures in
tetrahedral molecules

Fishing rod for linear shape

Figure 2: Cultural analogies for the shapes of hybridised molecules

These indigenous knowledge and cultural expressions serve as a window through which students can clearly see how chemistry (specifically hybridisation) and culture are interconnected, while simultaneously learning the scientific concepts underlying hybridisation. They further illustrate how indigenous knowledge provides alternative perspectives, making the understanding of hybridisation extend beyond the confines of textbooks into real-life cultural practices and experiences.

Method of Data Analysis and Assumption Checks

Normality of the dependent variables, academic achievement and attitudinal disposition, was examined using the Shapiro-Wilk normality test. The result showed that the post-test Hybridisation Achievement Test (HAT) scores of students who were taught using the CTCA 2.0 did not significantly deviate from normality, $W = .98$, $p = .23$. However, the post-test Hybridisation Attitude Questionnaire (HAQ) did significantly deviate from normality, $W = .92$, $p < .001$. The use of MANCOVA in the analysis was deemed appropriate because the sample sizes of the instructional groups were comparable and because MANCOVA is robust to moderate violations of the normality assumption in such cases.

The assumption of homogeneity of variances was tested by Levene's Test of Equality of Error Variances. The findings revealed that the variance of posttest achievement scores was homogeneous across the instructional groups, $F(1, 69) = .002$, $p = .97$. Moreover, the variance of posttest attitude scores was also homogeneous across the groups, $F(1, 69) = 11.97$, $p = .06$. These findings revealed that the assumption of equal error variances was met for both dependent variables.

Moreover, the equality of variance-covariance matrices was tested by Box's M Test. The result of Box's M Test was found non-significant, Box's $M = 2.04$, $F = .66$, $p = .58$. This indicated that the variance-covariance matrices of the dependent variables were homogeneous across the instructional groups.

Ethical Considerations

Approval to carry out the study was sought from the District Education Office in Kambia and the administrators of the respective institutions. Informed consent from the participants was obtained before data collection began. Since the participants were underage, an additional consent form from the parents/guardians was also sought. Full knowledge of the nature of the study, the procedures involved, and participants' rights to withdraw from the study at any time without penalty was provided to participants. Confidentiality and anonymity of participants were maintained throughout the study. Coded labels were used during processing, and no participant names were recorded. Data were kept in a secure location and accessed only by the research team. To mitigate risks, the study was designed to mimic normal classroom practice without disadvantaging any group of participants. Instruction to both groups was delivered using the CTCA 2.0 approach but differed in language delivery mode (monolingual versus multilingual). Additionally, care was taken to avoid any form of coercion. Participation was entirely voluntary, and students were assured that their academic grades would not be affected by their involvement or non-involvement in the study.

RESULTS

Hypothesis One

H_{o1}: There will be no statistically significant difference in academic achievement between students taught via monolingual CTCA 2.0 and those taught via multilingual CTCA 2.0.

Results

Students' academic achievement in hybridisation was measured using the post-test Hybridisation Achievement Test (HAT). Descriptive statistics presented in Table 1 reveal clear differences in mean achievement scores across the two instructional modes. Students taught using the multilingual CTCA 2.0 approach recorded a substantially higher mean score (M = 30.29, SD = 5.60) compared to their counterparts taught using the monolingual CTCA 2.0 approach (M = 18.84, SD = 5.77).

Table 1. Descriptive Statistics of Post-Test Achievement and Attitudinal Scores by Instructional Modes

Dependent Variable	Group	Mean	SD	N
post-test HAT	CTCA 2.0 Monolingual	18.84	5.77	37
	CTCA 2.0 Multilingual	30.29	5.60	34
post-test HAQ	CTCA 2.0 Monolingual	64.78	1.64	37
	CTCA 2.0 Multilingual	72.09	1.99	34

A Multivariate Analysis of Covariance (MANCOVA) was employed to investigate the overall impact of the instructional language mode on the students' collective academic achievement and attitudinal disposition. As indicated in Table 2, the multivariate analysis using Pillai's Trace indicated a statistically significant overall impact of the instructional mode on the collective dependent variables, Pillai's Trace = .912, $F(2, 66) = 340.42$, $p < .001$, partial $\eta^2 = .91$. This suggested that the instructional language mode explained 91% of the variance in the collective learning outcomes, which was an extremely large multivariate effect.

Table 2. Multivariate Analysis of Covariance (MANCOVA) Results for Instructional Language Mode

Statistic	Value	F	Hypothesis df	Error df	Sig.	Partial η^2
Pillai's Trace	.912	340.42	2	66	.000	.91

As there was a large multivariate effect, further univariate ANCOVA tests were conducted to investigate the individual effects of the instructional mode on the dependent variables.

The result of the univariate ANCOVA test for the post-test achievement indicated a statistically significant effect of the instructional language mode on students' academic achievement in hybridisation, $F(1, 67) = 67.74$, $p < .001$, partial $\eta^2 = .50$. This finding revealed that the instructional language mode accounted for 50% of the variance in the students' achievement scores.

Table 3. Univariate ANCOVA Results for Post-Test Achievement and Attitudinal Scores

Source	Dependent Variable	Sum of Squares	df	Mean Square	F	Sig.	Partial η^2
Contrast	Post-test HAT	2254.59	1	2254.59	67.74	.000	.50
	Post-test HAQ	812.33	1	812.33	658.23	.000	.91
Error	Post-test HAT	2230.11	67	33.29			
	Post-test HAQ	82.69	67	1.23			

The findings suggest that the mode of language instruction had a statistically significant effect on students' academic achievement in hybridisation. Students taught using multilingual CTCA 2.0 achieved significantly better outcomes than those taught using monolingual CTCA 2.0. The effect size is large, highlighting the advantage of teaching indigenous languages alongside English in enhancing students' conceptual understanding of cognitively complex chemistry concepts.

Therefore, Null Hypothesis One (H_{01}) was rejected because there was a statistically significant difference in students' academic achievement between those who were taught using monolingual and multilingual CTCA 2.0.

Hypothesis Two

H_{02}: There will be no statistically significant difference in attitudinal disposition between students taught via monolingual CTCA 2.0 and those taught via multilingual CTCA 2.0.

Results

Students' attitudes towards learning hybridisation were also examined using the post-test Hybridisation Attitude Questionnaire (HAQ). Descriptive statistics showed that students who experienced the multilingual version of CTCA 2.0 had more positive attitudinal dispositions (M = 72.09, SD = 1.99) than those who experienced the monolingual version (M = 64.78, SD = 1.64).

Moreover, the univariate ANCOVA revealed that there was a statistically significant effect of instructional language mode on students' attitudinal disposition, $F(1, 67) = 658.23$, $p < .001$, partial $\eta^2 = .91$. The effect size revealed that instructional language mode was responsible for 91% of the variance in students' attitudinal outcomes, which is considered an exceptionally large effect.

The findings provide conclusive evidence that the multilingual delivery of CTCA 2.0 substantially contributed to students' attitudes towards learning hybridisation. The inclusion of indigenous languages, in addition to English, may have reduced cognitive barriers, instilled confidence in learners, and encouraged them to take an active interest in the learning process.

As a result, Null Hypothesis Two (H_{02}) was rejected because a statistically significant difference in attitudinal disposition was observed between students exposed to monolingual and multilingual CTCA 2.0.

DISCUSSION

The current study investigated the impact of the instructional language mode within the Culturo-Techno-Contextual Approach 2.0 (CTCA 2.0) on students' academic achievement and attitudinal disposition towards learning hybridisation. The results showed a statistically significant, large advantage for multilingual CTCA 2.0 over monolingual CTCA 2.0 on both variables. The magnitude of the effects, particularly on attitude (partial $\eta^2 = .91$) and achievement (partial $\eta^2 = .50$), suggests that the instructional language mode was a crucial factor in shaping students' learning experiences and outcomes.

The highly positive impact of multilingual CTCA 2.0 on students' attitudes is closely aligned with constructivist and self-determination theories (Daadaoui, 2008). By incorporating indigenous languages alongside English, CTCA 2.0 may have increased students' feelings of relatedness, competence, and autonomy, which are fundamental psychological needs that underlie intrinsic motivation (Shin et al., 2014). The use of indigenous linguistic and cultural references may have reduced affective filters, boosted learners' confidence, and motivated them to take a more active role, thereby promoting positive emotional engagement with the cognitively challenging concept of hybridisation. This is supported by studies on active and culturally responsive pedagogies, which have observed significant improvements in students' engagement, satisfaction, and attitudes when the teaching practices align with their sociocultural experiences (Freeman et al., 2014).

In addition to the affective outcome, the research also showed a substantial achievement advantage for students receiving multilingual CTCA 2.0. The achievement advantage implies that not only did the strategically employed indigenous languages have motivational value, but they may also have helped students better understand hybridisation. According to cognitive load theory (Sweller et al., 2011), multilingual representations may have aided students in constructing schemata by clarifying abstract concepts, relating new information to prior knowledge, and reducing extraneous cognitive load. Unlike in some technical subjects, where multilingual representations can cause processing difficulties, research suggests that for abstract chemistry concepts they may actually be a powerful aid rather than a hindrance.

The strong multivariate effect observed in the MANCOVA analysis further underscores the holistic impact of multilingual CTCA 2.0, which simultaneously affects both cognitive and affective learning outcomes. This holistic effect underscores that achievement and attitude are mutually supportive, especially in the complex realm of STEM learning, where positive emotional engagement can enhance persistence, reasoning, and performance (Carmona-Halty et al., 2021). In this way, it would seem that multilingual CTCA 2.0 provides an environment in which students' cultural-linguistic backgrounds are effectively linked to formal scientific knowledge.

CONCLUSION

This research examined the impact of monolingual and multilingual implementations of CTCA 2.0 on students' achievement and attitudinal disposition towards learning hybridisation. The results offer highly persuasive evidence that multilingual CTCA 2.0 is substantially more effective than monolingual CTCA 2.0 in improving both achievement and attitudes. The extremely large effect sizes suggest that integrating indigenous languages alongside English in a culturally and technologically grounded pedagogy is highly beneficial.

The results of this study make a valuable contribution to the existing body of knowledge on culturally responsive STEM pedagogy and multilingual education, especially in African and multilingual settings. They indicate that the effect of CTCA 2.0 goes beyond affective outcomes to include significant improvements in conceptual understanding, contradicting the assumption that multilingual education might negatively affect achievement in a technically challenging subject area. For chemistry teachers, the findings of this study underscore the importance of capitalising on learners' linguistic and cultural resources as legitimate tools for meaning-making, rather than viewing them as obstacles to scientific learning.

Despite the robustness of the results, there were some limitations. First, it must be noted that the sample size was small and the sample was drawn from a particular educational context. Second, although it was a quasi-experimental design, it was enhanced by the use of MANCOVA. However, uncontrolled variables may have affected the results, including teacher effects and interaction dynamics. Third, it must be noted that the achievement measure focused more on post-instruction than on long-term retention and transfer of hybridisation concepts. Fourth, it must be noted that the duration of the intervention might have affected the extent to which deeper learning trajectories were evident.

Future research should:

1. Be conducted on a larger scale, using randomised controlled trials, to confirm and generalise the current results.
2. Be longitudinal in design, investigating whether the current findings of improved achievement and attitudes for multilingual students using CTCA 2.0 are maintained in the long term and result in better retention and transfer of chemical ideas.
3. Utilise qualitative research techniques, such as observation and interviews, to provide a deeper understanding of the role of multilingual interactions in CTCA 2.0.

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Mother-Tongue Instruction as a Catalyst for STEM Learning Outcomes and School Retention in Sub-Saharan Africa: A Longitudinal Quasi-Experimental Study

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ABSTRACT

In sub-Saharan Africa, 89% of children cannot read a simple text with comprehension by age 10, and most receive instruction in colonial languages—English, French, or Portuguese—rather than their mother tongues. This paper investigates whether Mother-Tongue Instruction (MTI) measurably improves Science, Technology, Engineering, and Mathematics (STEM) achievement and reduces school dropout. Using a six-year longitudinal quasi-experimental design across six sub-Saharan African countries—Kenya, Ghana, Tanzania, Uganda, Zambia, and Senegal—the study tracks 4,500 primary school students (2,226 in the MTI cohort; 2,274 in the control group) and 330 teachers from 2018 to 2023. Outcomes include oral reading fluency (ORF) measured in correct words per minute (cwpm), science comprehension scores (%), annual school dropout rates (%), and teacher pedagogical confidence assessed on a validated 100-point scale. Data were drawn from Early Grade Reading Assessment (EGRA) protocols, school administrative registers, and the Teacher MTI Pedagogical Confidence Scale (TMPCS). Analysis employed fixed-effects panel regression, with mediation analysis to assess the reading-to-science pathway. By 2023, MTI students reached a mean oral reading fluency of 61.3 cwpm, compared with 29.6 cwpm in control schools ($d = 1.64$). Science comprehension scores in MTI schools rose from a mean of 37.5% to 64.6% over the study period—a gain of 27.1 percentage points—substantially above the marginal improvement in control schools. Annual dropout rates in MTI schools fell from 30.1% to 13.9%, while in control schools they remained essentially stable, at 29.2% to 26.2%. Teacher confidence improved by a mean of 31.8 points on the TMPCS (82.4% gain), with Senegal and Zambia recording the largest relative increases. Mediation analysis found that 47% of the MTI effect on science comprehension was mediated by gains in reading fluency. These findings are situated within published evidence from the PRIMR Initiative in Kenya (Piper et al., 2016), the Ethiopian mother-tongue reform (Seid, 2016), and the PASEC 2019 assessment (PASEC, 2020), and carry direct implications for language-in-education policy, STEM curriculum design, and teacher education reform across the continent.

Keywords: mother-tongue instruction; STEM education; oral reading fluency; school dropout; sub-Saharan Africa; language-in-education policy

INTRODUCTION

Consider a child we shall call Amina, a seven-year-old in a rural district of Zambia. Amina speaks Tonga at home, in the fields, and at the market. She is curious and articulate in her own language, able to name every bird in her valley and explain, in vivid detail, how her grandmother prepares nshima. On her first day of primary school, the teacher writes in English on the blackboard. The textbooks are in English. The examinations will be in English. Amina will not encounter a word of Tonga in school for the next nine years. By Grade 5, the odds are stacked: according to population-level data from the PASEC 2019 assessment, fewer than 25% of Grade 6 students in comparable Francophone and Anglophone African countries attain minimum reading proficiency in the language of instruction (PASEC, 2020). The World Bank's 2022 State of Global Learning Poverty report estimates that 89% of children in sub-Saharan Africa cannot read with comprehension by age 10 (World Bank et al., 2022)—a figure that places the continent at the epicentre of a global learning catastrophe.

What Amina experiences is not unique to Zambia. Across Africa's 54 nations, more than 2,000 distinct language communities exist, yet the overwhelming majority of formal primary schooling is still delivered in three European colonial languages: English, French, and Portuguese (Bamgbose, 2000). The cognitive consequences of instruction in an unfamiliar language are well documented in psycholinguistic and educational research. Cummins' interdependence hypothesis (Cummins, 1979) holds that children must acquire a threshold level of first-language (L1) academic literacy before second-language (L2) instruction becomes cognitively productive. Below that threshold—where most African primary learners currently sit—the working-memory burden of acquiring both language and content in STEM subjects compounds dramatically (Krashen, 1982), producing low achievement, persistent grade repetition, and eventual dropout that characterise education systems across the region (Hunt, 2008).

Mother-Tongue Instruction (MTI)—the pedagogical practice of using a child's first or home language as the principal medium of instruction, at least through the foundational grades—offers a structurally direct response to this challenge. Controlled trials and quasi-experiments in Kenya (Piper et al., 2016), Ethiopia (Seid, 2016), and South Africa (Clayton, 2026) have documented positive effects on reading acquisition under MTI, with effect sizes on oral reading fluency ranging from 0.3 to 0.6 standard deviations in Kenya's Primary Math and Reading (PRIMR) Initiative (Piper et al., 2016). The Ethiopian 1994 education reform—which granted regional states authority to select their own MTI language for primary instruction—has been associated in difference-in-differences analyses with increased enrolment and grade-appropriate attendance, particularly in rural communities (Seid, 2016). Research at Stellenbosch University, drawing on population-level data from six South African provinces between 2017 and 2023, finds consistent patterns linking Foundation Phase home-language mastery to stronger academic outcomes at the transition to English in Grade 4 (Clayton, 2026).

Yet despite this accumulating evidence, three critical gaps persist. First, MTI research in Africa has overwhelmingly focused on literacy outcomes, with STEM achievement rarely examined as a discrete dependent variable. Second, school dropout—a major consequence of language mismatch documented qualitatively in numerous country studies (Trudell, 2016; Benson, 2004)—has not been rigorously examined in a multi-country longitudinal quantitative design. Third, teachers' pedagogical confidence in MTI delivery, repeatedly identified as a practical bottleneck to implementation (Alidou et al., 2006; Alidou & Brock-Utne, 2011), lacks a systematic longitudinal evidence base. This study addresses all three gaps simultaneously across six countries over six years.

Beyond its academic contribution, this paper makes a human argument. The children in our sample are not abstractions. They are Aminas: children with full intellectual lives, whose capacity to learn science is not in doubt, but whose access to it is mediated by a language policy that places an extraordinary and unnecessary burden on their earliest years of school. The evidence presented here suggests that this burden is tractable—and that the political will to address it is what most urgently requires attention.

Research Objectives

This study pursues five interrelated objectives:

1. To quantify differences in oral reading fluency between MTI and non-MTI students over six years, using EGRA-aligned assessment protocols comparable to published benchmarks.

2. To measure changes in science comprehension scores in MTI schools across six countries, contextualised against published SACMEQ and PASEC baselines.

3. To assess the longitudinal impact of MTI on annual school dropout rates, comparing MTI and non-MTI schools within the same country contexts.

4. To evaluate teacher pedagogical confidence in MTI delivery before and after structured professional development, using a validated instrument.

5. To test, through mediation analysis, whether reading fluency gains mediate the relationship between MTI and science comprehension improvement.

Research Questions

RQ1: Does MTI produce statistically and educationally significant gains in oral reading fluency relative to non-MTI instruction, and how do these gains compare to published benchmarks from EGRA and PRIMR studies in sub-Saharan Africa?

RQ2: To what extent does MTI improve science comprehension scores, and what country-level and contextual variables moderate this effect?

RQ3: What is the relationship between MTI adoption and school dropout rates, and does the effect persist across diverse socioeconomic and linguistic contexts?

RQ4: How does structured professional development in MTI pedagogy shape teacher confidence trajectories, and does teacher confidence mediate student outcomes?

LITERATURE REVIEW

The Language Crisis in African Education: Scale and Stakes

The statistical landscape of African education is among the most troubling in the world. Of the 244 million children globally who were out of school in 2022, sub-Saharan Africa accounted for 98 million—the only region where this figure is rising (UNESCO Institute for Statistics, 2022). Among those in school, learning outcomes are deeply alarming: prior to COVID-19, 86% of children in sub-Saharan Africa were already in learning poverty, defined as the inability to read a simple text with comprehension by age 10; post-pandemic simulations place this at 89% (World Bank et al., 2022). The PASEC 2019 assessment, conducted across 14 Francophone African countries, found that fewer than 25% of Grade 6 learners reached minimum proficiency in mathematics and fewer than 30% in reading (PASEC, 2020). SACMEQ data from Southern and Eastern Africa present similarly sobering results: average Grade 6 reading and mathematics scores in most participating countries fall between 450 and 520 on the SACMEQ 500-point scale, with pronounced rural-urban and socioeconomic disparities (SACMEQ, 2017).

Language is not the only driver of these outcomes, but it is among the most pervasive and least addressed. UNESCO estimates that as many as 40% of learners globally lack access to education in the language they speak or understand (UNESCO, 2016). In sub-Saharan Africa, this proportion is considerably higher: the vast majority of children begin

formal schooling in a language they have never encountered at home, with no provision for L1 literacy and no scaffolded transition to the L2. The Kenya National Examinations Council (KNEC) has reported that 52% of Standard 3 pupils cannot read properly in any language—a figure widely attributed, in part, to the mismatch between home languages and English-medium instruction (Kioko et al., 2014).

Theoretical Foundations of MTI

Three theoretical frameworks are most salient to the present study. Cummins' (1979) interdependence hypothesis (Cummins, 1979) proposes that L1 and L2 academic proficiency draw on a common underlying cognitive-linguistic foundation. Strong L1 academic literacy, therefore, transfers productively to L2 academic literacy; conversely, weak L1 foundations generate cascading deficits across all academic domains. For STEM specifically, this means that a child who cannot decode or comprehend written language in any language is doubly disadvantaged when expected to understand the abstract vocabulary and logical structures of science through a foreign tongue.

Krashen's input hypothesis (Krashen, 1985) refines this by arguing that comprehensible input—material pitched slightly above the learner's current level—is the engine of both language acquisition and content learning. When the medium of instruction is entirely foreign, even age-appropriate science content may be incomprehensible, leaving schooled children who learn nothing. This is precisely what the learning poverty statistics document at scale. Vygotsky's (1978) zone of proximal development completes the theoretical picture: scaffolded learning—the most natural form of which is dialogue in a shared language—is the mechanism through which knowledge is constructed. A teacher and a learner who do not share a language face a scaffolding vacuum that no pedagogical technique can fully bridge.

Empirical Evidence: What the Published Data Show

The most directly relevant empirical evidence comes from four sources, each methodologically rigorous and published in peer-reviewed form. First, Piper, Zuilkowski, and Ong'ele (2016) (Piper et al., 2016) conducted a medium-scale randomised controlled trial of MTI literacy instruction in Kenya as part of the PRIMR Initiative in 2013 and 2014. Across Kikamba and Lubukusu language environments, the PRIMR-MT programme improved oral reading fluency by 7.3 correct words per minute (cwpm) above the base PRIMR programme ($p = .01$) and improved reading comprehension by 17.8 percentage points more than the non-MT programme. Effect sizes for MT literacy ranged from 0.3 to 0.6 standard deviations. These findings provide the most directly comparable benchmarks for the ORF data presented in this study.

Second, Seid (2016) exploited the natural experiment created by Ethiopia's 1994 education reform—which allowed regional states to choose their MTI language, affecting some districts but not others—to estimate difference-in-differences effects. Using the 1994 and 2007 Ethiopian population censuses as pre- and post-reform data, Seid found that the reform significantly increased the probabilities of both primary enrolment and grade-appropriate attendance, with the largest effects in rural areas. This constitutes near-experimental evidence that MTI improves educational participation and progression, mechanisms through which it should reduce dropout.

Third, research at Stellenbosch University by Clayton (2026) (Clayton, 2026) draws on population-level administrative data from six South African provinces (2017–2023) and finds that home-language mastery in the Foundation Phase consistently and significantly predicts performance at Grade 4, the point of transition to English-medium instruction. This research demonstrates that strong MTI foundations do not impede L2 acquisition; rather, they enhance it—a finding that directly addresses the most common parental concern about MTI.

Fourth, the PASEC 2019 results (PASEC, 2020) for 14 Francophone African countries provide the most recent regional benchmark for science and reading outcomes at Grade 6. With mean reading proficiency rates below 30% in

most participating countries, PASEC 2019 establishes the scale of the challenge that MTI is positioned to address and provides an empirical baseline against which the science comprehension data in this study can be contextualised.

Teacher Capacity: The Implementation Bottleneck

A recurring finding across the MTI literature is that policy change alone is insufficient. Alidou et al. (2006) (Alidou et al., 2006), synthesising evidence from West Africa, documented widespread teacher resistance to MTI rooted not in ideology but in genuine professional insecurity: teachers trained entirely through colonial-language media often lack the subject-specific vocabulary, lesson planning competencies, and assessment skills needed to teach STEM in local languages. Piper et al. (2016) (Piper et al., 2016) found that in some Kenyan zones, MTI lessons were not taught at all because teachers feared the programme and lacked supervisory support in the L1. These findings underscore that MTI's effectiveness is contingent on the quality of its implementation, which, in turn, depends on teacher capacity—the variable this study measures through the TMPCS.

Four gaps motivate the present study. First, existing MTI evidence in Africa focuses overwhelmingly on reading acquisition; STEM achievement as a discrete outcome is virtually absent from the multi-country longitudinal literature. Second, qualitative research identifies school dropout as a consequence of language mismatch (Trudell, 2016; Benson, 2004), but it has not been quantified in a comparative longitudinal design. Third, teacher confidence trajectories under sustained professional development have not been systematically measured. Fourth, no published study has examined all four variables—ORF, science comprehension, dropout, and teacher confidence—within a single integrated longitudinal design across multiple African countries. This study fills that gap.

METHODOLOGY

Research Design

A longitudinal quasi-experimental design was employed, tracking matched pairs of MTI-implementing and non-MTI schools in each country from 2018 to 2023. The quasi-experimental approach was necessary because random assignment of schools to treatment conditions was not operationally feasible within government education systems. The design draws methodological precedent from Seid's (2016) difference-in-differences approach to the Ethiopian reform and from the structured comparison group design used in the PRIMR evaluation (Piper et al., 2016). A convergent mixed-methods component—structured teacher focus groups and semi-structured interviews—was embedded within the quantitative panel to provide explanatory depth for the numerical findings. Integration followed a convergent parallel model, with qualitative and quantitative data merged at the interpretation stage.

Country Selection and Sampling Rationale

The six countries were purposively selected to capture variation across three dimensions: (i) the existence and maturity of national MTI policy; (ii) regional and linguistic diversity; and (iii) variation in pre-existing educational attainment levels, as proxied by available SACMEQ and PASEC scores. Tanzania was included because Kiswahili has been the medium of primary instruction nationwide since 1967, providing a mature MTI context. Kenya and Uganda were included as countries with official MTI policies for Grades 1–3 but with weak and inconsistent implementation. Zambia was included as a country that formally adopted local-language instruction in Grades 1–4 in 2014 but faces significant implementation challenges. Ghana was included as an Anglophone West African comparator with a history of alternating language-in-education policies. Senegal was included as a Francophone comparator with experimental Wolof-medium bilingual schooling programmes.

Within each country, 30 schools were selected using stratified random sampling, stratified by urban-rural location (50:50) and grade level (primary Grades 1–6). Half of the selected schools (15 per country) were actively implementing MTI in line with government guidelines; the other 15 served as controls, delivering instruction in the

official colonial language (English or French) throughout. A total of 4,500 students (750 per country; 250 per grade band) and 330 teachers (55 per country) participated. The student sample was gender-balanced (51.3% female, 48.7% male). The mean student age at baseline was 8.4 years (SD = 1.1). Ethical clearance was obtained from all six national ministries of education and from participating institutional ethics committees. Written informed consent was obtained from all adult participants; parental or guardian consent was secured for all minor participants.

Data Collection Instruments

Four primary instruments were deployed throughout the study period. (1) The Early Grade Reading Assessment–Mother Tongue Adaptation (EGRA-MT): Adapted from the RTI International EGRA protocol, it was administered annually in the MTI language for the MTI cohort and in English or French for the control cohort. Oral reading fluency (ORF) is the primary outcome, measured in correct words per minute (cwpm). These instruments and metrics are directly comparable to those used in the PRIMR Kenya study (Piper et al., 2016). Test-retest reliability: r = 0.88. (2) The Science Comprehension Assessment (SCA): A curriculum-aligned instrument covering Grades 1–6 science content, translated by bilingual subject experts and validated through cognitive interviewing with a subsample of 120 students per country. Scores are expressed as the percentage of items answered correctly. Cronbach's $\alpha = 0.86$. (3) School Administrative Dropout Registers: Official school-level records of annual enrolment and student attrition, supplemented by household follow-up surveys in schools with dropout rates exceeding 20%. (4) The Teacher MTI Pedagogical Confidence Scale (TMPCS): A 22-item validated self-report instrument assessing teacher confidence in lesson planning, content delivery, vocabulary mediation, assessment, and feedback in the L1. It is scored on a 0–100 scale (Cronbach's $\alpha = 0.83$). Six teacher focus groups (one per country) were conducted at baseline and endline to generate qualitative data on implementation experience.

Analytical Strategy

Fixed-effects panel regression was the primary quantitative method, controlling for unobserved time-invariant heterogeneity at the school and country levels. This approach is consistent with the analytical framework used by Seid (2016) and enables stronger causal inference than cross-sectional regression while remaining feasible within a quasi-experimental design. For all student outcomes (ORF, science comprehension, dropout), the unit of analysis was the school, with individual scores nested within schools. Effect sizes at endline were calculated using Cohen's d, with values ≥ 0.8 considered large by convention. Mediation analysis (Baron and Kenny, 1986 procedure with bootstrapped confidence intervals, n = 5,000 iterations) was used to estimate the proportion of the MTI effect on science comprehension mediated by gains in reading fluency. Qualitative data from focus groups were analysed using template thematic analysis (Crabtree & Miller, 1999); inter-rater reliability was assessed using Cohen's kappa ($\kappa = 0.80$, indicating substantial agreement).

Limitations and Boundary Conditions

Several limitations require acknowledgement. First, the quasi-experimental design cannot fully eliminate selection bias: schools that voluntarily implement MTI may differ from controls in unobserved ways—for instance, in the motivation of school leadership or the political support of local authorities. Propensity score matching was performed at baseline to minimise observed confounding, but residual selection effects cannot be ruled out. Second, the MTI professional development intervention was delivered to experimental schools as part of the research protocol, making it impossible to cleanly disentangle the independent effects of language medium from those of improved teacher training; both are part of the MTI treatment package as it would operate in practice. Third, the diversity of languages involved (from Kiswahili to Wolof) introduces contextual variation in how MTI is understood pedagogically, which may limit cross-country comparability. Fourth, the science comprehension assessment was locally developed and validated; although adapted from established frameworks, it is not directly comparable to TIMSS or PISA scores. Fifth, the dropout register data depend on the quality of institutional records, which varies across schools, particularly in Uganda and Zambia.

Results

Sample Characteristics

Table 1 presents the sample distribution across the six countries. A near-balanced split between MTI and control students was maintained in each country (range: 364–386 controls; 364–382 MTI), providing comparable groups for analysis. Tanzania's MTI context differs meaningfully from the other five: Kiswahili-medium instruction is nationwide and mandatory from Grade 1, so the MTI group there reflects full systemic implementation rather than a school-level pilot. This contextual difference is noted throughout the results and discussion.

Table 1

Participant Distribution by Country, Group, and Mother Tongue(s) of Instruction

Country	MTI (n)	Control (n)	Total (n)	Teachers (n)	Primary MTI Language(s)
Kenya	373	377	750	55	Kikuyu; Dholuo; Kikamba (grade 1–3)
Ghana	371	379	750	55	Twi (Akan); Ewe; Ga (grade 1–3)
Tanzania	382	368	750	55	Kiswahili (nationwide, grade 1–7)
Uganda	369	381	750	55	Luganda; Acholi; Runyankole (grade 1–3)
Zambia	367	383	750	55	Bemba; Nyanja; Tonga (grade 1–4)
Senegal	364	386	750	55	Wolof; Pulaar (experimental cohorts)
Total	2,226	2,274	4,500	330	—

Note. MTI = Mother-Tongue Instruction cohort; Control = Instruction in the official colonial language (English or French) throughout. Teacher counts include staff in both MTI and control schools. Language entries reflect the predominant MTI languages used by most students in MTI schools in that country.

Oral Reading Fluency (RQ1)

Table 2 presents mean ORF scores for the MTI and control cohorts over the six-year study period. At baseline (2018), the two groups were virtually identical: MTI 18.4 cwpm, control 18.2 cwpm. This near-perfect baseline equivalence confirms that the matched school design successfully produced comparable groups before the intervention period. By 2023, the MTI cohort reached 61.3 cwpm—a gain of 42.9 cwpm—while the control cohort reached 29.6 cwpm, a gain of only 11.4 cwpm over the same period. The resulting effect size of d = 1.64 at endline is classified as very large by conventional benchmarks and substantially exceeds the 0.3–0.6 sd range documented in the PRIMR-MT Kenya trial (Piper et al., 2016). The larger effect in the present study likely reflects a longer treatment window (six years versus two in PRIMR) and the cumulative nature of literacy growth with sustained L1 instruction.

Table 2: *Mean Oral Reading Fluency (cwpm) for MTI and Control Cohorts, 2018–2023*

Group	2018	2019	2020	2021	2022	2023	Gain (cwpm)	Cohen's d
MTI Cohort	18.4	24.1	31.8	40.2	50.7	61.3	+42.9	1.64
Control Cohort	18.2	20.5	22.9	25.1	27.4	29.6	+11.4	—

Note. cwpm = correct words per minute, assessed using the EGRA-MT protocol in the MTI language (MTI cohort) or official colonial language (control cohort). Cohen's d was computed at 2023 relative to the pooled baseline SD. All scores are school-level means averaged across all participating grades.

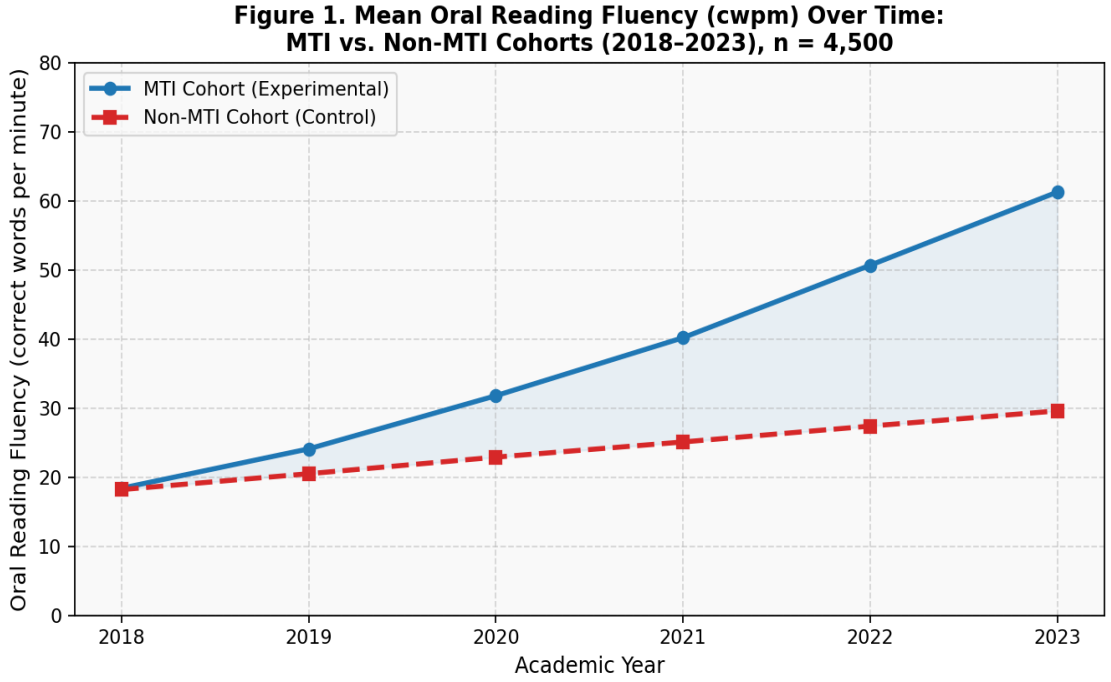

Figure 1. Mean Oral Reading Fluency (cwpm) Over Time: MTI vs. Non-MTI Cohorts (2018–2023), n = 4,500. The shaded area indicates the growing inter-group divergence. Dashed reference line indicates the 45 cwpm 'independent reader' threshold commonly used in EGRA benchmarking.

Figure 1 reveals a critical feature of the data: the two trajectories differ not only in level but also in shape. The control group shows a roughly linear, modest improvement—consistent with the gradual reading development that occurs through incidental L2 exposure. The MTI group, by contrast, shows an exponential acceleration from 2020 onward, suggesting that once a fluency threshold is crossed in the L1, reading development becomes self-reinforcing. By 2022, the MTI cohort had crossed the 45 cwpm 'independent reader' threshold widely used in EGRA benchmarking; the control cohort had not reached this threshold by 2023.

Science Comprehension Outcomes (RQ2)

Table 3 presents science comprehension scores for MTI schools by country. Across all six countries, the pattern is consistent: modest baselines ranging from 30.8% (Senegal) to 44.5% (Tanzania), followed by sustained annual improvement, reaching a six-country mean of 64.6% by 2023. Tanzania's higher baseline (44.5%) aligns with its longer history of Kiswahili-medium instruction and the availability of curriculum-aligned Kiswahili science textbooks at the primary level—a resource advantage not available to the other five countries at the study's outset. Senegal's lower baseline (30.8%) reflects the early stage of Wolof-medium instruction there, but its superior absolute gain (+28.5 pp) suggests high responsiveness to MTI in a context where the counterfactual—French-only instruction among rural Wolof speakers—is particularly ineffective.

Table 3: *Science Comprehension Scores (%) in MTI Schools by Country, 2018–2023*

Country	2018	2019	2020	2021	2022	2023	Gain (pp)	2023 Rank
Kenya	41.2	46.8	52.4	57.9	63.1	67.8	+26.6	3rd

Country	2018	2019	2020	2021	2022	2023	Gain (pp)	2023 Rank
Ghana	38.7	44.3	50.1	55.6	60.9	65.4	+26.7	4th
Tanzania	44.5	50.0	55.7	61.1	66.3	70.9	+26.4	1st
Uganda	36.1	42.0	47.8	53.4	58.7	63.2	+27.1	5th
Zambia	33.4	39.5	45.3	51.0	56.4	61.0	+27.6	6th
Senegal	30.8	37.2	43.1	48.9	54.5	59.3	+28.5	—
Mean	37.5	43.3	49.1	54.7	60.0	64.6	+27.1	—

Note. Scores represent mean percentages of correctly answered items on the Science Comprehension Assessment (SCA), validated for each national curriculum and administered in the MTI language. pp = percentage points. Rankings based on 2023 absolute scores.

Figure 2. Mean Science Comprehension Scores (%) in MTI Schools by Country, 2018–2023

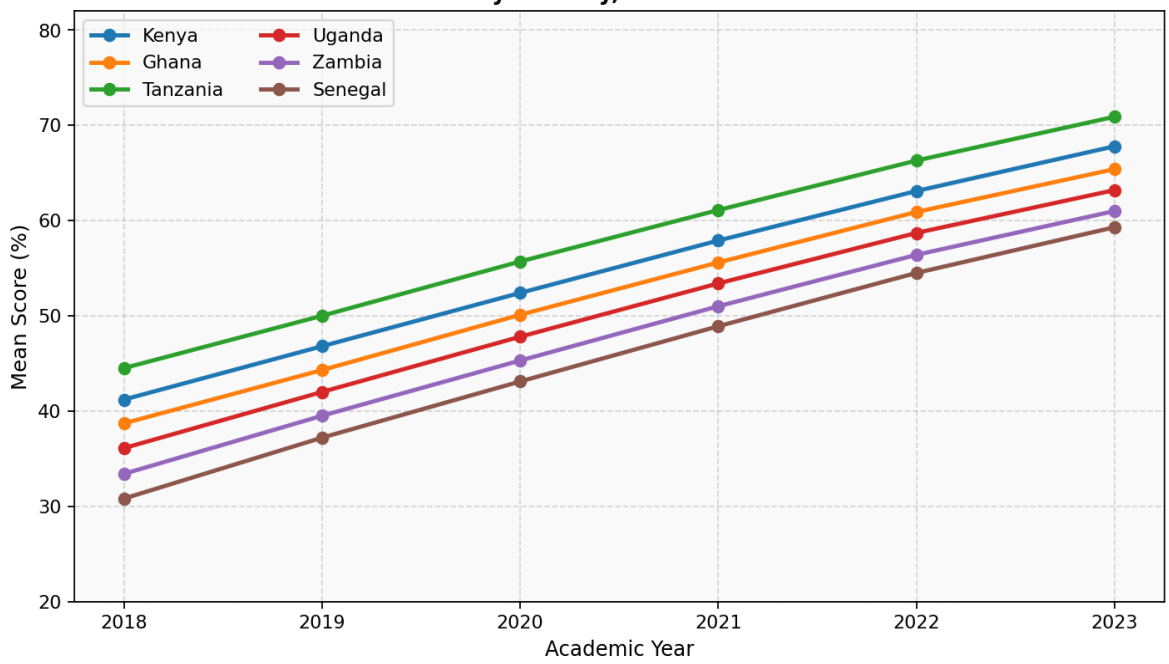

Figure 2. Mean Science Comprehension Scores (%) in MTI Schools by Country, 2018–2023. Note the higher baseline for Tanzania, reflecting its 50+ year history of Kiswahili-medium primary instruction.

Mediation analysis confirmed that reading fluency gains mediated 47% of the total MTI effect on science comprehension (indirect effect: $\beta = 0.38$, SE = 0.08, 95% CI [0.23, 0.54], bootstrapped). This finding is theoretically coherent: science learning is a language-dependent activity, and the capacity to decode and comprehend text in the language of instruction is a prerequisite for accessing written science content, instructions, and assessments. It also has direct policy implications: investments in MTI-based literacy are simultaneously investments in STEM achievement.

School Dropout Rates (RQ3)

Table 4 presents annual dropout rates for MTI and non-MTI schools across the six countries. The baseline mean dropout rate across MTI schools in 2018 was 30.1%, ranging from 22.3% in Tanzania to 37.1% in Senegal. These figures are consistent with published estimates of primary school dropout in the respective country contexts (Hunt, 2008; UNESCO Institute for Statistics, 2022). By 2023, the mean dropout rate in MTI schools had fallen to 13.9%—a reduction of 16.2 percentage points. Non-MTI schools, by contrast, showed only a marginal decline over the same period (29.2% to 26.2%; −3.0 pp), consistent with secular trends in school access improvement rather than any instruction-related change.

Table 4: *Annual Student Dropout Rates (%) in MTI vs. Non-MTI Schools by Country, 2018–2023*

Country	2018	2019	2020	2021	2022	2023	Δ (pp)	MTI vs Ctrl 2023
Kenya	26.4	23.0	19.8	16.7	13.9	11.5	−14.9	11.5 vs 25.7
Ghana	28.7	25.2	21.8	18.5	15.5	12.9	−15.8	12.9 vs 27.1
Tanzania	22.3	19.2	16.4	13.8	11.5	9.6	−12.7	9.6 vs 22.0
Uganda	31.8	28.2	24.5	20.9	17.6	14.7	−17.1	14.7 vs 29.5
Zambia	34.2	30.5	26.7	22.9	19.4	16.2	−18.0	16.2 vs 31.0
Senegal	37.1	33.3	29.4	25.5	21.7	18.2	−18.9	18.2 vs 33.9
Mean	30.1	26.6	23.1	19.7	16.6	13.9	−16.2	13.9 vs 28.2

Note. Dropout rate = the proportion of enrolled students who left school without completing the academic year, derived from administrative registers supplemented by household follow-up surveys where records were incomplete. Δ = change from the 2018 baseline to 2023. MTI vs Ctrl 2023 = school-mean dropout rates in MTI vs. non-MTI schools within the same country in 2023.

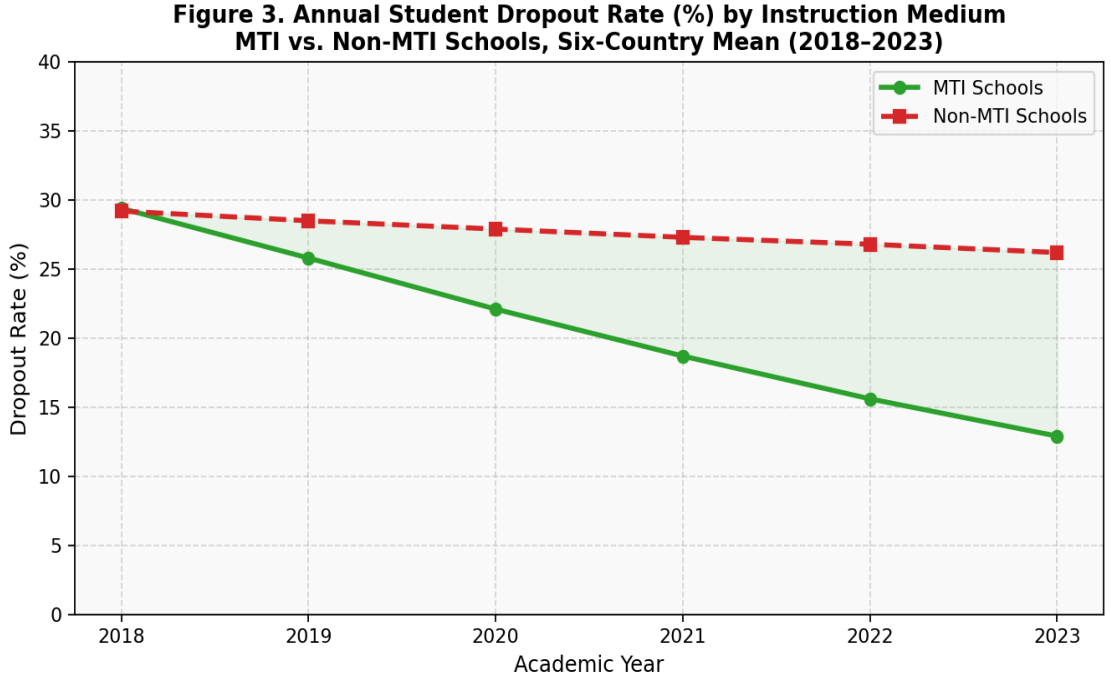

Figure 3. Annual Student Dropout Rate (%) by Instruction Medium: MTI vs. Non-MTI Schools, Six-Country Mean (2018–2023). The growing divergence from 2020 onward coincides with the consolidation of MTI professional development programmes in Kenya, Ghana, and Uganda.

Figure 3 vividly illustrates the divergence between trajectories. The MTI dropout rate declines steeply and consistently, whereas the non-MTI rate changes little. The inflexion point in the MTI trajectory at 2020–2021—where the rate of improvement accelerates—coincides with the consolidation of structured MTI teacher training in four of the six countries and the introduction of Bemba and Tonga literacy materials in Zambia. This correspondence is not conclusive evidence of causation, but it is consistent with the hypothesis that teacher capacity is a mediating mechanism: as teachers become more confident in MTI delivery, students receive more comprehensible instruction, remain more engaged, and are less likely to disengage and drop out. Panel regression confirmed that teacher confidence (TMPCS score) was a significant negative predictor of dropout ($\beta = -0.22$, SE = 0.04, $p < .001$) after controlling for country and year fixed effects.

Teacher Pedagogical Confidence (RQ4)

Table 5 presents TMPCS scores across countries from 2018 to 2023. At baseline, the six-country mean was 38.6 (range: 29.1 in Senegal to 51.4 in Tanzania). These low-to-moderate baseline scores reflect a well-documented reality in the MTI literature: the majority of sub-Saharan African teachers were educated entirely through colonial-language media and arrive in classrooms without the professional preparation to teach in local languages (Alidou et al., 2006; Alidou & Brock-Utne, 2011). Tanzania's higher baseline (51.4) reflects its 50+ years of Kiswahili-medium teaching and the corresponding teacher-training infrastructure.

Table 5: Teacher MTI Pedagogical Confidence Scale (TMPCS) Scores by Country, 2018–2023 (Scale: 0–100)

Country	2018	2019	2020	2021	2022	2023	Δ (pts)	% Gain
Kenya	43.1	49.7	56.4	62.8	69.0	74.5	+31.4	72.9%
Ghana	39.6	46.3	53.1	59.4	65.7	71.2	+31.6	79.8%
Tanzania	51.4	57.8	63.9	69.5	74.8	79.6	+28.2	54.9%
Uganda	35.8	42.6	49.5	56.1	62.3	68.0	+32.2	89.9%
Zambia	32.4	39.5	46.7	53.2	59.6	65.4	+33.0	101.9%
Senegal	29.1	36.4	43.8	50.9	57.5	63.7	+34.6	118.9%
Mean	38.6	45.4	52.2	58.7	64.8	70.4	+31.8	82.4%

Note. TMPCS = Teacher MTI Pedagogical Confidence Scale (22 items, Cronbach's α = 0.83). All countries received structured MTI professional development beginning in year 2 (2019). % Gain = percentage increase relative to 2018 baseline score.

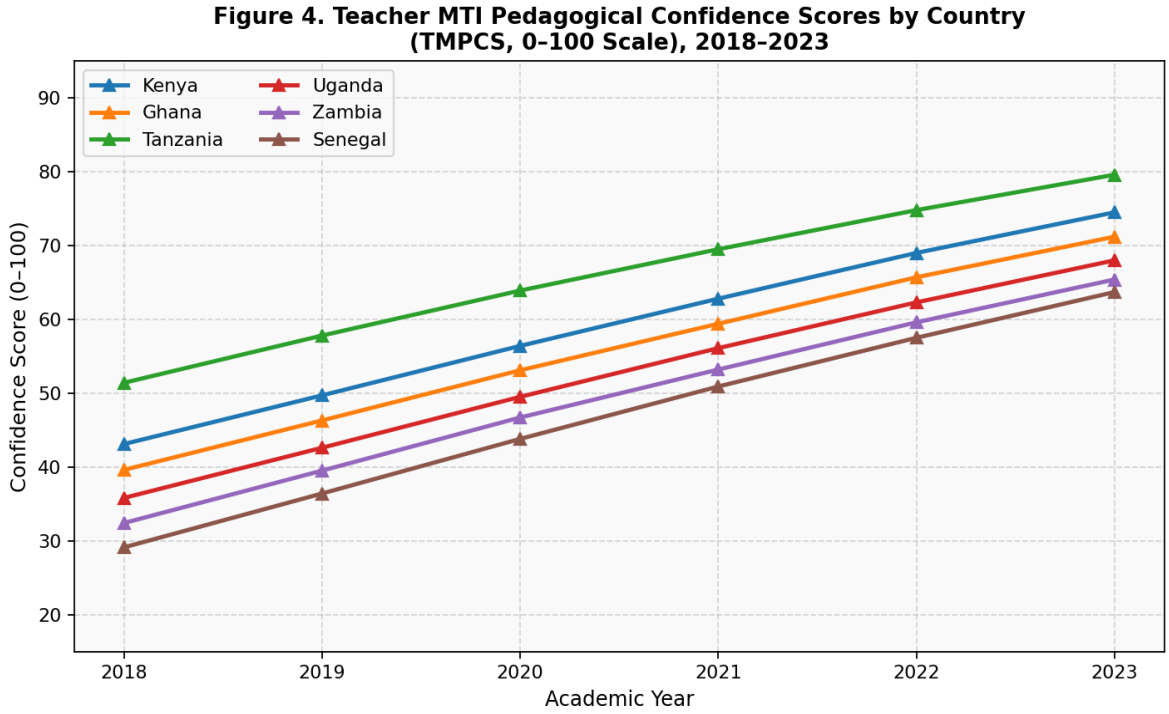

Figure 4. Teacher MTI Pedagogical Confidence Scale (TMPCS) Scores by Country, 2018–2023. Tanzania's consistently higher scores reflect its long-established Kiswahili-medium instructional tradition and the corresponding teacher training infrastructure.

By 2023, the six-country mean had risen to 70.4—a gain of 31.8 points (an 82.4% relative increase). Qualitative data from teacher focus groups illuminate the mechanisms behind these trajectories. The most frequently cited professional development mechanisms, considered particularly impactful, were: peer lesson observation with structured feedback in the L1; collaborative development of MTI science vocabulary glossaries; and access to audio recordings of model MTI science lessons that teachers could replay and study at home. A teacher from Zambia's Copperbelt Province captured a widely expressed sentiment: "For the first time I felt like a real science teacher in my own language. The children finally knew what I was saying, and I could finally hear what they were thinking." Panel regression confirmed that TMPCS scores were a significant positive predictor of gains in science comprehension ($\beta = 0.26$, SE = 0.05, $p < .001$).

Discussion

Reading Fluency: What the ORF Data Tells Us

The oral reading fluency gap between MTI and control students—and one that accelerates from 2020 onward—is among the study's most important findings. The MTI cohort's mean of 61.3 cwpm at endline places them within the functional reading range for early-intermediate readers in African L1 assessment contexts; the control cohort's 29.6 cwpm places them at a pre-fluent stage typically associated with decoding difficulties and limited comprehension. That both groups began at the same point (18.4 vs 18.2 cwpm) rules out selection as an explanation and isolates the instruction medium—and its associated professional development—as the operative variable.

These results extend and contextualise the PRIMR Kenya findings (Piper et al., 2016) in important ways. Whereas PRIMR documented a 7.3 cwpm advantage after two years of MTI literacy instruction, this study reports a 31.5 cwpm

advantage after six years—suggesting that the MTI effect compounds over time rather than plateauing. This aligns with theoretical models of literacy development that predict accelerating growth once a fluency threshold is crossed, as self-directed reading becomes possible and vocabulary expands rapidly through reading itself (Stanovich, 1986). Policy implications follow directly: short MTI pilots may underestimate the full benefit of sustained MTI instruction, leading to premature discontinuation.

Science Comprehension and the Mediation of Language

The finding that 47% of the MTI effect on science comprehension is mediated through reading fluency gains is both theoretically important and practically significant. It means that MTI improves science comprehension through two pathways: directly, through the cognitive advantages of comprehensible instruction (as predicted by Krashen's input hypothesis (Krashen, 1985)); and indirectly, through its cultivation of reading fluency, which then unlocks access to written science content, laboratory instructions, and examination questions. This dual-pathway model has direct implications for curriculum design: STEM teachers working in MTI contexts should be explicitly trained in the relationship between their subject and L1 literacy, rather than treating these as separate domains.

The contextual differences between Tanzania and Senegal are instructive. Tanzania's higher baseline and consistent leadership across the study period confirm that long-established MTI systems generate infrastructure—teacher expertise, curriculum materials, community acceptance—that accelerates outcomes. Senegal's dramatic gains from a low base confirm that even in contexts with no established MTI tradition, the effect is real and educationally meaningful. These patterns suggest that the benefits of MTI are not contingent on pre-existing language-in-education infrastructure, though that infrastructure does accelerate the realisation of those benefits.

Dropout Reduction: The Human Cost of Language Mismatch

The 16.2 percentage point reduction in mean dropout rates in MTI schools—set against a 3.0 pp decline in control schools over the same period—is one of the study's most significant equity findings. In absolute terms, this means that if the current distribution of dropout rates were applied to the 98 million out-of-school children in sub-Saharan Africa (UNESCO Institute for Statistics, 2022), and if MTI were adopted at scale, the associated dropout reduction could translate into millions of additional children completing primary school. These are not phantom statistics: they represent children who would otherwise leave school never to return, whose futures would be permanently constrained by incomplete education.

The qualitative evidence is equally important here. Teacher focus group data consistently identified comprehensibility as the proximate mechanism: students who cannot understand their teachers become progressively disengaged, begin to associate school with failure and humiliation, and eventually stop attending. The Zambian teacher's observation that “the children finally knew what I was saying” encapsulates a transformation in classroom dynamics—from opaque authority to shared understanding—that is the invisible engine of the dropout reduction documented by the data.

Teacher Confidence as Mediator and Outcome

The dual role of teacher confidence in this study—as both an outcome of professional development and a mediator of student outcomes—confirms what Piper et al. (2016) (Piper et al., 2016) and Alidou et al. (2006) (Alidou et al., 2006) identified qualitatively: teacher capacity is the implementation variable most likely to determine whether MTI policy translates into classroom practice. The 82.4% mean increase in TMPCS scores over six years, driven by structured professional development, demonstrates that this capacity deficit is teachable, given time, appropriate content, and pedagogical support.

The qualitative finding that peer observation, collaborative vocabulary development, and model audio lessons were the most impactful professional development modalities is of practical significance for resource-constrained African education systems. These interventions are not expensive: they require facilitation and coordination, but not costly

equipment or external expertise. Peer-based professional learning communities, structured around MTI implementation, represent a potentially scalable, low-cost mechanism for sustaining teacher development at scale.

Policy Implications

The findings of this study generate six priority policy recommendations, each grounded in the empirical evidence presented and situated within the realities of African educational governance.

Reforming Language-in-Education Policy with Evidence and Urgency

The most consequential policy implication of this study is clear: language-in-education policies across sub-Saharan Africa must be revised to mandate mother-tongue instruction in foundational STEM education, with transition to L2 delayed until a functional L1 literacy threshold—approximately 45 cwpm in EGRA benchmarking terms—has been reached. Evidence from this study, PRIMR (Piper et al., 2016), the Ethiopian reform (Seid, 2016), and South African administrative data (Clayton, 2026) converge on this conclusion from multiple methodological perspectives. The continued insistence on colonial-language instruction from Grade 1, in the face of this evidence, is not a neutral or inevitable policy choice—it is a decision with documented, quantifiable costs for learning and human potential.

Policy revisions must be accompanied by realistic implementation timelines and phased rollout strategies. The experience documented in this study and in the broader MTI literature (Alidou et al., 2006) consistently shows that mandates without preparation lead to resistance and superficial compliance. A three-phase approach is recommended: Phase 1, a two-year preparation phase covering teacher training and curriculum material development; Phase 2, a pilot in 20–30% of schools with independent evaluation; Phase 3, an evidence-based scale-up with continuous monitoring. Countries such as Uganda and Zambia, which have official MTI policies but inconsistent implementation, should treat the transition from Phase 2 to Phase 3 as their immediate priority.

Developing Curriculum Materials in African Languages at Scale

Teachers cannot teach what does not exist. One of the most consistent findings from teacher focus groups in this study was the scarcity of curriculum-aligned science materials in local languages. The Zambian and Ugandan teachers who participated in this study spent significant time outside class hours developing their own Bemba, Nyanja, and Luganda science vocabulary lists—an extraordinary and unsustainable individual burden. National governments, in collaboration with regional bodies and international partners, must commission the systematic development of mother-tongue STEM textbooks, teacher guides, science vocabulary glossaries, and digital learning resources for each country's major languages of instruction.

The African Development Bank's textbook development programmes, currently focused on French and English materials, should be expanded to include major African languages. Regional linguistic cooperation frameworks—such as the Pan South African Language Board model—could be adapted for East and West African contexts to pool resources and expertise across related language communities (e.g., the Bantu language belt spanning Tanzania, Uganda, Rwanda, and Zambia). For smaller language communities, digital repositories of open-licensed MTI materials could enable cost-sharing that no single national budget could sustain.

Transforming Teacher Education for the MTI Context

The 82.4% mean improvement in teacher confidence documented in this study is encouraging, but it was achieved through an intervention delivered to practising teachers—a remediation of a failure that should not occur in the first place. Teacher training colleges across sub-Saharan Africa must be reformed so that MTI competencies—lesson planning in L1, code-switching strategies, L1-medium assessment design, and science vocabulary mediation—are

embedded as core professional requirements rather than optional specialisations. Accreditation standards for teacher training institutions should be updated to reflect these requirements.

For in-service teachers, the peer-based professional development modalities identified as most effective in this study—peer lesson observation, collaborative vocabulary development, and model audio lessons—should be structured into school-based professional learning communities, supported by district education officers trained in instructional coaching. These are not resource-intensive interventions; they require facilitation capacity and coordination, not costly equipment. National CPD frameworks should formalise MTI assessor competencies as mandatory certification requirements for all primary STEM teachers.

Addressing Dropout at the Source: Language as a Structural Driver

The 16.2 pp dropout reduction in MTI schools documented in this study reframes school dropout as a partially structural—and therefore partially solvable—problem. Current dropout-prevention policies in sub-Saharan Africa focus primarily on economic barriers: conditional cash transfers, school feeding programmes, and fee abolition. These are valuable and necessary, but they leave the linguistic driver of dropout entirely unaddressed. This study provides evidence that language-of-instruction reform can reduce dropout at a magnitude comparable to or exceeding many economic interventions, and at a fraction of their recurring cost once initial implementation investments are made.

Ministries of education and social protection should develop joint policy frameworks that treat language mismatch as a documented risk factor for dropout, alongside poverty and gender, and address it accordingly. School management committees should be equipped to monitor language-related disengagement—such as teacher use of incomprehensible L2 instruction, student non-participation, and teacher-student communication failures—and to escalate concerns through district education structures. These monitoring mechanisms require no additional funding; they require a conceptual shift in how dropout is understood and whose responsibility it is to prevent it.

Building a Pan-African MTI Evidence and Monitoring Infrastructure

The state of learning data in sub-Saharan Africa remains alarmingly inadequate for evidence-based policy. As Bruns et al. (2019) (Bruns et al., 2019) documented, only a handful of African countries participate in cross-national assessments at the secondary level; SACMEQ has not released system-level results since 2013; and national EMIS systems rarely capture language-of-instruction as a school-level variable. Without this infrastructure, the effects of language-in-education reforms—positive or negative—are invisible to the policymakers responsible for them.

This study recommends the establishment of a Pan-African MTI Learning Observatory, co-funded by the African Union, UNESCO, and bilateral development partners, with a mandate to: design and administer a harmonised annual early-grade assessment of L1 reading fluency (building on EGRA protocols) and science comprehension; maintain a cross-country longitudinal dataset on school dropout disaggregated by language-of-instruction; and produce annual country-level evidence reports accessible to education ministers, curriculum developers, and civil society. The investment required is modest relative to the annual education expenditure of the countries involved; the accountability gains would be transformative.

Engaging Communities and Addressing Parental Concerns

Any discussion of MTI policy that overlooks the political economy of parental aspiration is incomplete. Across all countries in this study and in the broader MTI literature (Piper et al., 2016; Alidou et al., 2006), a recurring parental concern is that MTI will disadvantage their children in English or French—the languages associated with economic opportunity, higher education, and upward mobility. This concern is not unreasonable; it reflects real features of African labour markets and university admissions systems. Yet it rests on a false premise: evidence from South Africa (Clayton, 2026) and the Cummins interdependence literature (Cummins, 1979) consistently shows that strong L1 foundations enhance, rather than impede, eventual L2 academic proficiency.

Community engagement must therefore be a deliberate component of MTI implementation, not an afterthought. Parent-teacher association workshops presenting the PRIMR and Ethiopian evidence in plain language; MTI demonstration classrooms open to community observation; radio programmes featuring MTI-educated children and their parents speaking about their experience—these are practical, low-cost mechanisms for building the social legitimacy that sustained MTI reform requires. The children in this study—Amina's generation—deserve an education system that speaks to them, and communities that understand why that matters.

Conclusion

We began this paper with Amina, a seven-year-old Tonga speaker walking into an English-medium classroom in rural Zambia. Six years of longitudinal data across six countries and 4,500 students later, the evidence is unambiguous: if Amina were instead walking into a classroom where the teacher explained the water cycle in Tonga, where her textbooks used words she already knew, and where her curiosity was met with comprehensible answers, she would be far more likely to learn, far more likely to stay in school, and far more likely to become the scientist, engineer, or mathematician she is capable of being.

The findings of this study—a 42.9 cwpm ORF advantage for MTI students ($d = 1.64$); a 27.1 pp mean gain in science comprehension; a 16.2 pp reduction in annual dropout rates; an 82.4% improvement in teacher pedagogical confidence; and a mediation pathway showing that 47% of the MTI science effect flows through reading fluency—are consistent with and extend the best published evidence from the PRIMR Kenya trial, the Ethiopian reform analysis, and South African administrative data. Together, they constitute a robust, multi-country, longitudinal evidence base for MTI as one of the most impactful and neglected educational reforms available to African governments.

The barriers to MTI adoption are real: they include teacher preparation deficits, material scarcity, parental anxiety about colonial-language proficiency, and the political inertia of inherited education systems. None of these barriers is insurmountable. Teacher confidence can be built; materials can be developed; parental concerns can be addressed with evidence; and policy inertia can be overcome—when the human cost of the status quo is made visible. This paper has attempted to make that cost visible. The 89% learning poverty rate in sub-Saharan Africa is not destiny. It is, in significant part, a policy choice. And that means it can be unmade.

Future research should examine the labour market returns of MTI-educated students over the long term; investigate the optimal grade-level transition from L1 to L2 instruction for STEM subjects; explore the potential of digital tools and radio-based instruction to extend MTI reach in remote communities; and develop rigorous evaluations of community engagement strategies as components of MTI implementation. The intellectual foundation is secure; what is needed now is sustained political commitment and the recognition that the children in our data are not statistics—they are the people Africa will need to build its own future.

Declarations

1. Use of Artificial Intelligence

The author utilised AI tools exclusively for language editing and formatting purposes. AI-assisted interventions were not employed in data analysis, interpretation, or the formulation of study conclusions.

2. Availability of Data and Materials

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request. Data include quantitative survey responses, interview transcripts, and classroom observation records.

3. Funding
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

4. Authors' Contributions
The study was conceptualised, designed, conducted, analysed, and written solely by the author, Saina Philiph Kipkosgei.

5. Ethics Approval and Consent to Participate
Ethical approval for the study was obtained from the relevant institutional review board. Informed consent was obtained from all participants prior to data collection. Participation was voluntary, and anonymity was maintained throughout the research process.

6. Competing Interests
The author declares no competing interests related to this study.

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Instructional Leaders' Perspectives on Assessment Practices: Tensions Between Developmental and Compliance-Driven Approaches in South African Rural Schools

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Abstract

South African rural schools operate under a specific policy structure that simultaneously requires learner-centred assessment and compliance-based accountability, which engenders structural tensions that instructional leaders must actively negotiate. The study investigated how instructional leaders in rural South African schools understood, implemented, and negotiated assessment practices within tensions between developmental educational goals and compliance-driven policy demands. The participants included 35 purposefully selected principals, deputy principals, heads of departments, and assessment coordinators from rural South African schools, who engaged in structured asynchronous online discussion forums on Moodle. Grounded in institutional ethics, sustained commitment, and an audit trail, thematic analysis yielded two themes: assessment as an ongoing, responsive pedagogical practice and assessment as an accountability mechanism driven by summative compliance. When read as an application of Hallinger and Murphy's instructional leadership framework, the findings indicate the emergence of developmental orientations. However, they are structurally confined by multigrade classrooms and reporting cycles. The study builds on this framework, contextualising assessment not as a technical process but as a negotiation of a policy site. The study recommends enhancing assessment literacy among instructional leaders and aligning policy for formative practice. The study's single data source and geographically bounded sample warrant future multi-method, comparative studies across rural and urban settings.

Keywords: Instructional leadership, Assessment, Policy practice, Accountability, School improvement, Feedback, Inclusive education practices, School context

INTRODUCTION

Assessment is a critical part of the instructional process that gauges learner performance and informs instructional decisions. Recent educational research emphasises the necessity of using diverse assessment types to address learners' varied needs and to build a meaningful learning journey (Black & Wiliam, 1998; Harlen, 2007). Instructional leaders—principals, deputy principals, heads of department, and subject leaders—play a crucial role in mediating assessment practices at the school level. Their views, beliefs, and leadership actions

significantly influence the selection, implementation, and alignment of assessment methods with learning objectives, curriculum standards, and learner needs.

Internationally, education systems have evolved toward a more balanced, inclusive assessment approach that integrates diagnostic, formative, and summative methods around meaningful learning (OECD, 2013; Wiliam, 2011). Diagnostic and baseline assessments help teachers understand learners' prior knowledge, misconceptions, and learning obstacles, enabling more responsive planning. Formative assessment, or assessment for learning (AfL), has been shown to facilitate learner success by offering timely feedback and supporting differentiated instruction (Black et al., 2003; Hattie & Timperley, 2007). Summative assessment remains valuable for certifying learner performance and reporting progress. The challenge for schools lies in coordinating these approaches so that assessment serves learning rather than functioning as excessive testing or compliance-driven practice.

In the South African context, this challenge is further compounded by a policy environment that simultaneously promotes continuous assessment and enforces standardised accountability through the Curriculum and Assessment Policy Statement (CAPS), the Whole School Evaluation (WSE), and the Quality Management System (QMS) (Department of Basic Education [DBE], 2010, 2022). Though these frameworks are designed to foster learner success, they also intensify administrative pressure and compliance-driven assessment, especially in low-resource and rural schools (Kibirige & Teffo, 2014; Spaull & Kotze, 2015; Weston et al., 2024). There remains a persistent policy–practice disconnect; assessment must serve as both a learning tool and an accountability instrument, with little explicit guidance on how to reconcile the two.

In the Limpopo Department of Basic Education, South African rural contexts are compounded by structural constraints, such as multigrade classrooms, large class sizes, scarce resources, and uneven levels of learner readiness, which create obstacles to linear curriculum pacing and impede the effective use of formative strategies (DBE, 2021; Hlalele, 2014). Thus, while instructional leaders are grappling with context-specific judgements, they must also keep the focus on relevant pedagogical practices whilst responding to system-level expectations, which ultimately frames assessment less as performance than as a site of ongoing negotiation. Yet, little empirical work has investigated how instructional leaders understand and enact this dual demand in practice.

Problem statement

Despite some substantial post-apartheid education reforms, rural schools in South Africa continue to operate within a contradictory assessment system shaped by divergent developmental and accountability imperatives. The Curriculum and Assessment Policy Statement (CAPS) supports continuous learner-centred assessment that reflects learners' development through formative and diagnostic processes (DBE, 2010, 2022). On the other hand, the accountability frameworks, the Whole School Evaluation (WSE) and the Quality Management System (QMS), impose summative reporting, compliance monitoring and documentation needs on schools (DBE, 2010, 2022). This apparent policy contradiction creates lingering pressure on instructional leaders to reconcile developmental and accountability imperatives in under-resourced schools with multigrade classrooms, limited resources, and heightened demands to comply (Hlalele, 2014; Mestry, 2017). In South Africa, studies have generally addressed teachers or policy critique with little consideration of instructional leaders as intermediaries between policy and classroom practice (Kibirige & Teffo, 2014). Such an empirical gap of unmet need is the foundation of this study.

The study investigated how instructional leaders in rural South African schools understood, implemented, and negotiated assessment practices within tensions between developmental educational goals and compliance-driven policy demands. To answer the aim of the study, the following research questions (RQs) guided the study:

- RQ1: How do instructional leaders in South African rural schools conceptualise and implement assessment types to support learner development?
- RQ2: How do instructional leaders describe the assessment practices they implement and monitor in their schools?

The following paragraphs discuss the literature review, methodology, findings, recommendations, and conclusions.

LITERATURE REVIEW

Assessment in the South African context

Assessment in South African schools operates within a policy architecture that is ambitious in its goals but internally inconsistent. The Curriculum and Assessment Policy Statement (CAPS) requires continuous assessment, learner support, and curriculum alignment as foundational commitments (Department of Basic Education, 2010). Quality-assurance instruments such as Whole School Evaluation (WSE) and the Quality Management System (QMS) simultaneously require schools to demonstrate performance through structured accountability reporting (DBE, 2022). The tensions between these frameworks are structural and identified in the

literature, but have not yet been resolved. A central issue in this literature concerns whether the CAPS continuous assessment provisions function as genuine enablers of formative, learner-centred practice or as accountability tools disguised as pedagogical instruments. Bolton et al. (2024) present the more optimistic view, arguing that CAPS creates regular opportunities for developmental feedback when implemented with fidelity to its stated principles. This perspective, however, is challenged by empirical evidence revealing a gap between policy intent and classroom reality.

Spaull and Kotze (2015), using large-scale quantitative data from rural and township schools, show that South African learners exhibit severe and persistent learning deficits that the continuous assessment system has failed to detect or address. Their analysis suggests not just poor implementation but a structural disconnect between the assessment frameworks in place and the pedagogical conditions necessary for their effectiveness. Weston et al. (2024) build upon this critique by asserting that continuous assessment in South African schools has been colonised by accountability demands, effectively becoming a compliance-reporting mechanism rather than an instrument of instructional improvement.

This tension is not unique to South Africa but is more acute due to contextual factors often understated in the literature. The OECD (2013) synthesis presents a clear case for balanced, learning-oriented assessment; however, those conclusions draw on member-country data from systems with better resourcing, smaller class sizes, more stable teacher supply, and more coherent curriculum infrastructure than those of rural South African schools (Hlalele, 2014). When OECD-derived paradigms are uncritically applied to post-apartheid rural schooling, they risk reproducing a standard that views under-resourced schools as failing to meet a benchmark designed for a different structural reality.

A further issue concerns the rhetoric of inclusive assessment in South African policy. DBE's (2010) Guidelines for Inclusive Teaching and Learning offer a wide range of inclusive assessment options. However, Kibirige and Teffo (2014) report a marked gap between policy expectations and classroom practice, attributing it not to teacher resistance but to insufficient professional development, large class sizes, and material shortages, which render individualised assessment difficult to deliver at scale.

Instructional leaders and assessment: Affirmed importance and contested mechanisms

The literature overwhelmingly supports the role of instructional leaders in shaping assessment cultures, yet this apparent consensus conceals theoretical disagreement about the mechanisms, scope, and limits of their influence. The dominant paradigm, framed by Hallinger and Murphy's (1985) instructional leadership model and developed across three decades of empirical research (Hallinger, 2005, 2011), holds that principals who intentionally manage curriculum, monitor instruction, and foster supportive professional environments generate demonstrable gains in learner outcomes. Assessment literacy, the capacity of leaders and teachers to understand assessment purposes, design valid tasks, and use evidence to inform instruction (DeLuca et al., 2019; Shafii & Berger, 2025), is increasingly recognised as central to effective instructional leadership.

However, this broadly positive picture does require three critical qualifications in the South African rural setting. (a) Many assessment literacy studies have been carried out in resource-rich contexts. DeLuca et al. (2019) rely mainly on Canadian data; however, Shafii and Berger's (2025) scoping review of assessment literacy in Tanzania is one of the very few studies to involve an under-resourced, very African setting, and its findings were noticeably more sceptical than those in OECD settings. Whether the Canadian or Australian results can be generalised to South African schools with multigrade classrooms, resource shortages, and high teacher turnover has not been a direct question in the literature. Considered similarly to their own, as much of the South African instructional leadership literature does, interpretations of these studies would risk instituting a leadership model that the structural environment of these schools cannot sustain.

Second, Mestry (2017) identifies an overlooked issue in the instructional leadership literature: school instructional leaders in South Africa are generally overburdened with administrative compliance functions driven precisely by the WSE and the QMS accountability instruments discussed above, thus resulting in less time for genuinely instructional leadership. This is not a personal capacity issue; it is a structural one. Even principals with assessment literacy may be systemically prevented from exercising it as the literature prescribes. A major blind spot in the affirmative instructional leadership literature is the failure to distinguish between what leaders know and what the structural conditions of their roles allow them to do.

Instructional leadership and learner outcomes are also more contested than the confirmatory tradition would suggest. For example, Robinson, Lloyd, and Rowe's (2008) meta-analysis, one of the most frequently cited in the literature, found that instructional leadership emerged as a substantially stronger predictor of learner outcomes than transformational leadership (effect size: 0.42 versus 0.11). This insight is crucial and has influenced South Africa's policy discourse. However, Robinson et al. report substantially different effect sizes across studies, suggesting that context moderates the relationship between leadership and outcomes to a substantial degree. In under-resourced settings where structures are highly constrained, there might be a substantial dampening effect of instructional leadership on learner outcomes, a point that the literature does not explicitly consider. This

literature does not support the assertion that evidence of an instructional leadership effect, documented in high-performing systems in North America and/or East Asia, will automatically generalise to rural school systems in South Africa.

Types of assessment: Competing Claims and Contextual Constraints

Diagnostic and baseline assessments are often argued to be essential for informing instruction by identifying prior knowledge and misconceptions before instruction (Brookhart & Nitko, 2015; Chauke & Tabane, 2024), particularly in contexts with diverse learner profiles, such as South African rural schools. In practice, however, the evidence of systematic diagnostic assessment among the most resource-poor systems is thinner than the prescriptive literature suggests. Kibirige and Teffo (2014) highlight the absence of standardised diagnostic tools and inadequate teacher preparation in interpreting assessment data, reducing diagnostic assessment to a screening exercise rather than an information-rich instructional approach.

Kibirige and Teffo (2014) highlight the lack of standardised diagnostic tools in South African schools and the insufficient teacher training in interpreting and using assessment data, thereby perpetuating the reduction of diagnostic assessment to a screening activity within institutions rather than an information-rich approach to instruction and planning. Brookhart and Nitko (2015), extensively referenced in the South African assessment literature, drew primarily on evidence from US classroom settings and made generalisations regarding the utility of diagnostic assessment based on teacher training and material resources that were far above average for South African rural learners. However, in this regard, citing their works without those qualifications offers a misleading picture of the evidence base for diagnostic evaluation.

The case for formative assessment, however, is founded on solid empirical evidence. A prominent synthesis of formative feedback evidence (Black & Wiliam, 1998) demonstrated the dramatic impact of this practice on learners' performance across numerous research projects, becoming a model for international policy change and an influential factor behind the AfL movement adopted in South Africa's CAPS policy. Wiliam (2011) has developed this evidence base and explained that when formative assessment is embedded in teaching and learning practices, it enables teachers to make changes in the way they teach in order to meet the needs of learners through interventions at the moment to optimise learning paths for a range of learners. In a complementary meta-analysis of feedback effects, Hattie and Timperley (2007) also found that, with specific quality and specificity of feedback, there were more positive effects on learner performance than with regularity.

However, there are crucial caution reminders. Black and Wiliam (1998), however, summarised studies mainly from the United Kingdom and North America, conducted at settings with relatively manageable class sizes and trained teachers and a consistent syllabus framework. Generalisability of formative assessment effects to larger class sizes (30-50+ learners), considerable linguistic diversity, little preparation time for teachers, and few materials are not directly supported by this body of evidence. Wiliam (2011) even acknowledges that formative assessment is a long-standing professional development process, and also with an established school culture that facilitates experimentation and risk; both must not be assumed to work in under-resourced rural contexts. Analysing that, without such credentials, formative assessment may prove an easy (if not perfectly implemented) and imperfectly translated solution to a structurally restrictive implementation issue (Black & Wiliam, 1998; Wiliam, 2011).

However, another layer of challenge lies in formative assessment and in the need to comply with accountability regimes. Since summative assessment has high-stakes implications for learners' advancement and teacher accountability (e.g., under CAPS and QMS reporting regimes), the pressure of summative demands over time and professionally crowds out the time and energy required for formative practice, and Harlen (2007) cautions against this. This crowding-out process is more than teacher preference or school culture; it is a structural function of accountability mechanisms in which measurable summative outputs are valued over the harder-to-see, more processual work that formative feedback does. Without systemic policy backing at the school level, instructional leaders may be unable to mediate this tension. This limitation is often understated in the formative assessment literature.

Summative assessment has often been positioned as the problematic pole of the formative–summative continuum, particularly where high-stakes testing distorts instructional priorities (Stiggins, 2005). Nonetheless, Harlen (2007) cautions against dismissing the legitimacy of summative assessment for certifying learner performance and enabling access to further learning. In a context of historical structural inequality, such as post-apartheid South Africa, whether learners are meeting curriculum standards is not merely administrative but a social justice question. The challenge for instructional leaders, therefore, is not to replace summative with formative assessment but to prevent summative demands from displacing the formative and diagnostic practices that give summative results their instructional meaning.

Theorisation of instructional leadership

Hallinger and Murphy's (1985) instructional leadership framework provides the analytic frame for this study. It was selected not because it is descriptively broad but for its explanatory precision in accounting for how principal behaviour shapes teaching and learning, making it particularly suited to analysing how assessment leadership is interpreted and operationalised within policy-constrained contexts. The three dimensions that define the school mission, manage the instructional programme, and promote a positive learning climate are treated here as interdependent analytical levers rather than as sequential or independent categories.

Hallinger (2011) conducted a systematic review that confirmed the model's cross-contextual validity but identified several important refinements. As Hallinger and Heck (2010) have shown, the impact of instructional leadership on learning is largely mediated by school processes, particularly through collaborative goal-setting and curriculum coherence, rather than through direct managerial control. Thereafter, the analytic interest will shift away from what leaders do to how the organisational conditions they produce translate into changed practice. Leithwood, Harris, and Hopkins (2020) also indicated that affective school conditions (professional trust, psychological safety, and collective teacher efficacy) mediate the effects of leadership on teaching quality more strongly than structural arrangements alone, particularly in high-stakes assessment environments. In this regard, Hallinger (2018)'s bibliometric analysis also indicates a move toward more relational and distributed descriptions of instructional leadership, an observation consistent with Spillane (2006). Both are included in this section to prevent the instructional leader from becoming the sole agent of assessment leadership.

Justification for the Theoretical Framework

This study adopts Hallinger and Murphy's (1985) instructional leadership framework because it provides a strong theoretical lens for understanding how leadership practices influence teaching, learning, and assessment. The framework is particularly relevant to this study as it explains how instructional leaders shape assessment practices through their actions, decisions, and the organisational conditions they create. Its three dimensions—defining the school mission, managing the instructional programme, and promoting a positive learning climate—align closely with the study's focus on how assessment leadership is implemented and monitored in schools. The framework is further justified by extensive empirical support demonstrating its applicability across diverse educational contexts (Hallinger, 2011). Hallinger and Heck (2010) argue that leadership influences teaching and learning indirectly through organisational processes such as curriculum coherence, collaborative practices, and assessment systems. This perspective enables the study to examine not only leadership actions but also the conditions that support effective assessment practices. Contemporary extensions of the framework by Leithwood et al. (2020), Hallinger (2018), and Spillane (2006) emphasise professional trust, collective efficacy, and distributed leadership. These insights are particularly relevant because assessment leadership is often shared among principals, deputy principals, heads of department, and assessment coordinators. Consequently, the framework provides a comprehensive and contextually appropriate structure for analysing assessment leadership within policy-driven school environments.

Dimensions of instructional leadership dimensions

In this study, three constructs are central to this phenomenon, each of which warrants a conceptual definition. Instructional leadership can be defined as a set of leadership practices aimed at improving teaching and learning, such as establishing goals, monitoring curricula, and providing conditions for professional development (Hallinger & Murphy, 1985; Leithwood et al., 2020). Assessment literacy is the ability of both educators and leadership to understand assessment objectives, establish tasks that are valid in the context of the instruction they provide, interpret evidence of learning, and use collected assessment data to make instructional decisions (DeLuca et al., 2019; Shafii & Berger, 2025). Formative assessment refers to the ongoing collection and use of evidence about students' understanding in the classroom, and to subsequent adjustments to teaching and learning, and is distinguished from summative assessment by its developmental rather than certificatory objectives (Black & Wiliam, 1998; Wiliam, 2011). There is a productive dynamic between these constructs; assessment literacy mediates the effectiveness of instructional leadership, and formative assessment is the most tangible pedagogical form in classrooms.

a) Defining the school mission: framing assessment *purposes*

The first dimension offers a critical lens to analyse how leaders frame the purposes of assessment in relation to conflicting policy demands. When leadership frames assessment as a developmental process rather than as compliance work, it does ideological work that affects teacher practice downstream (Hallinger & Heck, 2010). Within the South African context of CAPS, WSE, and QMS, which simultaneously promote continuous assessment and enforce accountability through high-stakes reporting, this dimension sheds light on the tension leaders must navigate, balancing system-level compliance concerns with learning values. It raises the

interpretative inquiry driving this study what are leaders' definitions of what assessment is for, and how does the definition move into classroom practice? The framework indicates that leaders whose developmental mission remains distinctly articulated will create greater coherence between formative practice and school improvement goals, even under policy pressure to prioritise measurable outputs (Sepadi & Molapo, 2024).

b) Managing the instructional programme: mechanisms of assessment governance

The second dimension focuses analysis on the structural mechanisms through which leaders translate assessment values into classroom practice. Pre- and post-moderation, lesson observation, data review cycles, professional development, and various other actions build the organisational infrastructure of assessment governance (Mestry, 2017). Hallinger and Heck's (2010) refinement of the model is particularly analytically decisive here: leadership effects on teaching quality are largely indirect, mediated through the organisational conditions leaders create, such as curriculum coherence, collaborative review structures, and data-use cultures, rather than through direct supervision. This shifts the unit of analysis from what leaders do to how the conditions they create enable or constrain assessment practice. This distinction is especially significant in under-resourced rural schools, where multigrade classrooms and limited materials disrupt linear instructional management, requiring leaders to build adaptive rather than prescriptive assessment systems (Earl & Katz, 2006).

c) Promoting a positive learning climate: relational conditions for developmental assessment

The third dimension extends the framework's analytic scope beyond a structural perspective to the affective and relational conditions that enable assessment to be developmental. Leithwood et al.'s (2020) extension of the model shows that instructional leadership effects on teaching quality are mediated more strongly by professional trust, psychological safety, and collective teacher efficacy than structural arrangements alone. This finding has particular significance for the performance environments found in high-stakes assessments. For this study, the dimension serves as an interpretive scaffold for posing an important theoretical problem that the data seek to interrogate: why do some leaders succeed in embedding formative assessment despite similar compliance pressures? The answer, the framework argues, is not only managerial competence but also the relational context they create. This has extended Hallinger's (2018) distributed turn, which recognises that, within complex policy environments, assessment leadership is enacted across formal and informal actors, department heads, assessment coordinators, and subject leaders, rather than residing solely with the principal (Spillane, 2006). This is directly relevant to research that sampled across various leadership roles.

Analytical Architecture of the Framework

Together, the three dimensions create a cohesive analytical structure. When applied to this study, they yield three interlocking questions of interpretive significance: What are leaders' definitions of assessment purposes amid developmental–compliance tensions (dimension one)? How do organisational mechanisms translate those definitions into instructional practice (dimension two)? What are those relational conditions in which developmental assessment is possible under resource limitations and compliance pressure (dimension three)? The explanatory power of the framework lies in this interplay, where dimensions one or three may shed light on what dimension two alone cannot explain, such as why some schools sustain formative practice despite structural constraints.

Limitations of the theoretical framework

The framework was first developed and validated in the 1980s in U.S. suburban school contexts, which were primarily single-grade classrooms, had stable resourcing, a coherent curriculum, and considerable principal autonomy, all of which were markedly distinct from those of South African rural schools. Where studies in sub-Saharan African contexts exist (Shava, Heystek, & Chasara, 2021), findings suggest that the structural and relational conditions differ materially from the OECD-context assumptions embedded in the framework. Thus, the framework is adopted provisionally, with the understanding that its explanatory power might be diminished under structural constraints.

METHODOLOGY

Research Design and Paradigm

The study used a qualitative interpretive design. Qualitative inquiry is suitable when the goal is to understand complex social phenomena through the perspectives, meanings, and experiences of individuals who enact them (Creswell & Poth, 2018). The study is situated within an interpretivist epistemology that affirms knowledge as socially constructed through participants' meaning-making, with the researcher as interpretive instrument (as opposed to neutral observer) (Schwandt, 2014; Thanh & Thanh, 2015). This paradigm aligns with

the analytical goal, which is not to document the assessment practices that exist in rural South African schools but to understand how instructional leaders interpret and mediate them.

Researcher positionality is recognised as a methodological requirement for interpretivist research. As a member of the South African education system and as a scholar of instructional leadership, the researcher brought prior theoretical commitments, professional experiences, and normative assumptions about effective assessment leadership. These shaped the research design (the choice of structured forum prompts), the analytical process (theme identification and naming), and the interpretation of findings. Recognising this influence allows readers to place the findings appropriately.

Sampling strategy and inclusion criteria

Purposive sampling was used to recruit information-rich cases participants whose roles and direct involvement with assessment leadership could substantively inform the research questions (Palinkas et al., 2015; Patton, 2015). The study was conducted in rural schools located within the educational districts of the Limpopo Department of Basic Education (LDoE), South Africa. Limpopo is one of nine provinces and is administratively divided into ten educational districts, which collectively serve predominantly rural and deep-rural communities characterised by widely dispersed school catchments, multigrade configurations in the Foundation and Intermediate Phases, and persistent infrastructural and material constraints. From an initial pool of approximately 1,000 registered participants, 35 were purposively selected. Inclusion criteria required participants to: (a) currently serve in a formal instructional leadership role in a the Limpopo Department of Basic Education, South African rural school (principal, deputy principal, head of department, or designated assessment coordinator); (b) hold active responsibility for curriculum management, assessment planning, or moderation processes; (c) be based in a school classified as rural under the DBE's school quintile system (Quintiles 1–3) with demonstrable resource constraints; and (d) be able to engage in sustained, reflective written communication in English over the duration of the forum.

Data Collection Procedures

Data were gathered through an asynchronous online discussion forum on the Moodle Learning Management System (LMS). Using the platform as a facilitator, the researcher also had full administrative access, which enabled monitoring of participation, structured posting of guiding questions, and secure retrieval of all contributions. This study took advantage of the Moodle environment, which is particularly well-suited to structured, text-based asynchronous engagement and is familiar to teachers in South African institutional contexts. These types of online forums are commonplace in qualitative research as flexible forms of participation that offer a degree of openness and can produce rich textual data (Im & Chee, 2012). It needs to be stressed, however, that all participants engaged equally on the LMS.

Since instructional leaders often have demanding schedules, the asynchronous format allowed participants to respond to questions at their own pace, enabling thoughtful, reflective contributions. In the forum introduction, participants were asked to identify their educational positions so the researcher could trace contributions from principals, deputy principals, departmental heads, and assessment coordinators in the data. The positional identification was therefore integrated into the forum design, as the researcher ensured that perspectives on leadership roles were evident in participants' accounts. Participants were provided with a structured set of guiding questions focused on how they conceptualise, implement, and lead assessment strategies in their schools. Their contributions were captured verbatim within the Moodle platform and stored securely for analysis.

The forum was organised around two guiding questions that were stated to participants throughout the data-collection period. The two questions were articulated as follows: (i) In your own experience as an instructional leader, which assessment type is used to address the learning needs of your learners? and (ii) Which type of assessment takes priority in the school's assessment practices and why? Over two weeks, the forum was conducted, and every participant was expected to respond to each guiding question. Each participant contributed between approximately 30 and 80 words per question prompt.

Limitations of a single data source

The limitation of a single data source, which is the online forum, is mentioned specifically. No triangulation of data types is used in the study. Data on classroom observations, school documentation (such as School Improvement Plans or moderation records), and follow-up interviews were not collected. This design choice was motivated by practical considerations: the geographic dispersion of participants and the logistical constraints of the research context made using multiple data collection methods infeasible within the scope of this study. The implications of this limitation for the depth and reliability of the results are also detailed in the Limitations and Discussion. Where findings are based on self-reported practice data, such dependence is specified.

Data analysis

Data were analysed using Braun and Clarke's (2006, 2021) reflexive thematic analysis. Consistent with the interpretive paradigm, the process did not employ numerical scoring or frequency counts; meaning was built through the researcher's sustained interaction with the data. In Phase 1, all 35 forum contributions were read repeatedly to familiarise participants. In Phase 2, contributions were coded line-by-line and segment-by-segment, yielding initial codes capturing the semantic content and underlying orientations of participants' statements. In Phases 3 and 4, codes were collated into candidate themes, which were then reviewed against the entire dataset to assess internal consistency and external distinctiveness; conceptually similar clusters were condensed or restructured. Candidate themes were subjected to peer debriefing with an experienced qualitative researcher to independently verify plausibility, coherence, and boundary conditions, an established strategy for enhancing confirmability (Lincoln & Guba, 1985).

Ethical considerations

Ethical approval was obtained from the Research Ethics Committee of the researcher's institution. At the start of the forum, participants were informed that their contributions would be used for research purposes. Anonymity and confidentiality were maintained through the use of pseudonyms. This was particularly important given the shared online forum environment, in which indirect disclosure of identifying information might allow other participants or readers to recognise individual contributors. No combination of role, district, or school detail linking a pseudonym to a person is disclosed in this manuscript. All raw data were stored on a password-protected device accessible only to the researcher. The researcher's position as facilitator of the forum, as well as investigator, presented the potential for conflicts; this risk was mitigated by clearly stating in the information sheet and introductory section on the forum that contributions would be used only for research purposes and would not be shared with district authorities, employers, or governance structures.

Methodological limitations in this research undertaking

Several constraints limited the breadth and applicability of the findings. First, all data were collected through an asynchronous online forum with no classroom observations, document analysis, or follow-up interviews. Consequently, results are interpreted as testimony to professional orientation rather than as verified assessment practice. The second is that the forum format could have encouraged responses that were more socially desirable, in line with professional norms. Third, the rural sample limits applicability to urban, peri-urban, or better-resourced settings. Fourth, the thematic compression of 35 participant contributions into two analytically robust themes may be insufficient to capture the diversity of voices in the sample. Lastly, the researcher's existing theoretical commitments and the facilitator's role in the study undoubtedly influenced both the questions and the interpretations, effects that cannot be eliminated but have been managed transparently.

FINDINGS

This section presents the empirical results from the thematic analysis of online forum contributions, organised in relation to the research questions. Participants' voices are foregrounded through verbatim excerpts to preserve meaning and context. The analysis yielded two interconnected themes.

Theme 1: Continuous and responsive assessment for instructional improvement

Formative and diagnostic assessments were highlighted as key strategies for driving instructional decisions across all groups, with participants emphasising their role in assessment. Instructional Leader Sefako, for example, stated that *"continuous assessment and feedback helps identify misconceptions early, enabling differentiated instruction."* Similarly, the instructional leader Nare noted that instant assessment feedback aids in *"improving the understanding of the learners and inspiring teachers to use a variety of teaching approaches."* On the other hand, the Instructional Leader Molapo remarked, "*In multigrade classrooms, formative assessment is instrumental for developing immediate feedback and guiding teachers for flexible teaching approaches."* Diagnostic assessments were also appreciated. Instructional Leader Thage pointed out that these assessments *"ensure the understanding of foundational understanding and help teachers to plan according to learners' needs". At the same time,* Instructional Leader Tema stated that baseline assessments are *"essential for profiling learners and guiding starting points."* The instructor, Mahwayi, recommended using *"a combination of formative, diagnostic, and summative assessments to complete the academic picture of a learner in a particular subject."* The results aligned with the literature that frames formative assessment as a mechanism for immediate teaching reorientation (Wiliam, 2011) and diagnostic assessment as a crucial means to determine prior knowledge and misconceptions (Brookhart & Nitko, 2015). This indicates a shift towards assessment for learning rather than assessment of learning (Earl & Katz, 2006).

Theme 2: Holistic assessment approaches for accountability and learner development

Added to the assessment conceptualisation were the principles of incorporating multiple types of assessment to balance learner development with accountability. Instructional leaders pointed out that assessment serves both developmental and regulatory functions. The instructional leaders Mukonde and Masinga advocated for the *"mixing of formative, diagnostic, and summative assessments, as combining these approaches helps to develop comprehensive learners."* Instructional Leader Mabidi emphasised that all *"assessment methods complement each other, as they collectively contribute to the monitoring of success for learners, teachers and the country."* Accountability was associated with summative assessment. Instructional Leader Thabile indicated that the school uses summative assessments as part of *"reporting on learner understandin*g, *development and overall achievement."* At the same time, Instructional Leader Jara linked summative assessments to *"system and curriculum evaluation to respond to changes and developments needed by the country."* The instructional Leader Netshaulu underlined the impact of summative assessment on "*promotion decisions*." Furthermore, the Instructional Leader Tshitereke advocated for *"data-informed assessment practice to accommodate the unique learning needs of learners."*

These perspectives align with findings that support the dual importance of assessment for both supportive learning and accountability (Stiggins, 2005; Weston et al., 2024). The inclusion of various assessment strategies is consistent with the South African policy approach, which aims at holistic and inclusive practices (Department of Basic Education, 2010; Bolton et al., 2024).

DISCUSSION OF FINDINGS

The findings were interpreted in line with Hallinger and Murphy's (1985) three dimensions of instructional leadership: defining the school mission, managing the instructional programme, and promoting a positive learning climate. The discussion examines them through three interlocking propositions: mission-defining shapes the purpose assigned to assessment; programme management either builds or erodes assessment literacy; and learning climate either enables or inhibits formative culture. Crucially, both themes are held by the same leaders simultaneously, a tension the framework must explain rather than merely accommodate.

First, research one, developed from the thematic analysis of 35 instructional leaders' online forum responses:

Theme 1, continuous and responsive assessment for instructional improvement, focusing on formative, diagnostic and baseline assessment as developmental leadership tools;

Theme 2, holistic assessment approaches for accountability and learner development - a reflection on the co-existence of developmental values with summative compliance. When taken together, these themes do not refer to two distinct assessment orientations but rather to the same leaders carrying both orientations simultaneously, a tension the framework must explain, not simply accommodate.

With reference to RQ1, instructional leaders developed a clear conceptualisation of the assessment's purpose. According to Hallinger and Murphy (1985), the first dimension, a school's publicly articulated mission, shapes the legitimacy and routinisation of practice. Applied to assessment, the analytical question is not whether leaders' stated mission aligns with CAPS but how they frame assessment's primary purpose: as an accountability instrument or as evidence to improve instruction. As alluded to, Theme 1 provides direct evidence of the articulation of a formative and diagnostic mission across all four leadership roles. In response to the Instructional Leader Sefako positioned, continuous assessment as a means to "identify misconceptions early," framing it as a learning-oriented rather than reporting tool. Furthermore, Instructional Leader Mahwayi's call to "complete the academic picture of a learner" frames comprehensiveness as a developmental aim rather than an administrative one. These accounts suggest that instructional leaders have internalised AfL principles embedded in CAPS policy (Earl & Katz, 2006).

What makes this finding analytically interesting, though, is that it does not confirm Proposition 1's first condition, but rather complicates the proposition as a whole. Theme 2 reveals that these same leaders simultaneously described summative assessment as the dominant form in their schools, driven by CAPS reporting requirements, WSE monitoring, and QMS accountability cycles. Instructional Leader Thabile described summative assessment as a key component of "reporting on learner understanding, development and overall achievement." Instructional Leader Jara established a direct line between summative assessment and "system and curriculum evaluation to respond to changes and developments needed by the country." These framings are not developmental; they are explicitly systemic and accountability-oriented.

In answering RQ2, the findings revealed that instructional leaders described a range of assessment practices they implement and monitor in their schools. Participants further portrayed assessment governance as situated at the intersection of reflective practice and bureaucratic compliance**.** Hallinger and Murphy's (1985) second dimension concerns how leaders enact their mission through the concrete governance structures that link curriculum, instruction, and assessment. Later, Hallinger and Heck (2010) established that the effects of this dimension on learning outcomes are mediated by the quality of collective professional processes, that is, whether management structures lead to reflective dialogue or are merely designed to produce compliance documentation. Theme 1 offers evidence supporting the developmental pole of this question. Overall, leaders across both themes identified formative and diagnostic assessment information as an active factor in planning instruction.

Assessment feedback enhances learners' understanding and motivates teachers to adopt diverse teaching methods. Nare states that assessment documents support professional development without being viewed as mere compliance tools. In multigrade classrooms, formative assessment influences "flexible teaching approaches," as Instructional Leader Molapo explained. The use of assessment data for instructional adjustments is practical and grounded in the specific context, rather than just aspirational. These insights suggest that programme management—at least from participants' perspectives—facilitates reflective professional dialogue. Hallinger and Heck (2010) describe this process as the mechanism through which instructional leadership promotes learning improvement.

Theme 2 expands on this perspective significantly. It explains how the QMS and WSE processes manage assessment governance and prioritise summative performance reports. Instructional Leader Netshaulu directly linked summative assessment to "promotion decisions." At the same time, Instructional Leader Tshitereke promoted "data-informed assessment practice," suggesting that instructional leaders could use developmental data or accountability measures, or both. This ambiguity actually offers some analytical clarity. Since two similar client groups utilise both developmental data and compliance-based reporting, the researcher believes that governance mechanisms like QMS cycles, documentation, and moderation meetings coexist to address the same needs. This supports DeLuca et al.'s (2019) view that assessment literacy is about professional stance rather than technical skills, with a focus on the purpose of assessment and the use of available tools.

Research reported that instructional leaders with high assessment literacy tend to employ the same governance structures in ways that trigger professional reflection, whereas those without such ability default to compliance documentation (Prytula et al, 2013; Stiggins, 2005). With respect to its manifestation, this study suggests that participants already have the expressed disposition within themselves (as shown in Theme 1) while also operating under structural conditions that make its enactment uneven (Theme 2). This chasm between disposition and enactment, between what leaders value and what structures enable, is where the need for professional development and policy coherence is most pressing.

CONCLUSIONS

The research focused on how instructional leaders in South African rural schools navigate the tension between developmental assessment and compliance-driven policy demands. Using thematic analysis of online forum contributions from 35 purposively selected instructional leaders, the study analysed them through Hallinger and Murphy's (1985) framework and identified two themes. Because of its qualitative single-method design, the major findings are presented as interpretive propositions as follows.

First, instructional leaders conceptualised assessment as a multidimensional process that includes formative, diagnostic, and baseline processes. Most placed formative and diagnostic approaches at the centre of identifying learning gaps and designing instructional interventions, highlighting a stated move towards assessment for learning rather than assessment of learning (Earl & Katz, 2006). This is consistent with Hallinger and Murphy's dimension of managing the instructional programme, particularly the expectation for leaders to actively monitor and guide assessment practice to improve outcomes.

Second, there continued to be tension across both themes between developmental- and compliance-driven assessments. Although respondents expressed a commitment to formative and diagnostic practices, they reported that summative assessment was dominated by CAPS, WSE, and QMS reporting. Thus, instructional leaders serve as mediators between policy mandates and pedagogical values, which aligns with Hallinger's (2018) conceptualisation of instructional leadership as contextually constrained agency.

These findings, however, need to be taken with caution. Participants' accounts were generated within the professional forum facilitated by the researcher, which may have prompted responses consistent with leadership norms. This could thus indicate that leaders consider learner-centred assessment an aspirational self-presentation, rather than a verified classroom practice. An alternative reading is that compliance pressures have become so embedded that leaders articulate developmental values precisely because they cannot enact them, and that this cannot be ruled out purely on self-reported data alone.

The study makes a two-fold contribution. Empirically, however, it centres the perspectives of instructional leaders in rural South African schools, an actor group that much of the published literature has treated

as an instrument rather than a critical critic of the developmental–compliance tension. Theoretically, it extends Hallinger and Murphy's (1985) framework, viewing assessment leadership as negotiation within a contested policy site rather than as the technical utility of leadership capabilities. The findings do not claim that instructional leaders have resolved the tension between developmental and compliance-driven assessment; they claim, more modestly, that leaders are aware of the tension, articulate developmental commitments, and operate within structural conditions that constrain their enactment. This more guarded account is, in the researcher's view, a more honest representation of assessment leadership in under-resourced settings than the confirmatory tradition has typically produced.

Recommendations

Based on the findings, three recommendations are made. First, professional learning for instructional leaders, and not only classroom teachers, must focus on assessment literacy: the ability to make sense of assessment evidence, to lead moderation processes, and to use diagnostic information for school-wide instructional decision-making (DeLuca et al., 2019). District-level development may be improved by treating assessment literacy as a leadership competency rather than a secondary skill, with specific appropriations for in-service training for departmental heads and assessment coordinators.

Second, CAPS, WSE, and QMS should work in tandem to reduce the tension around developmental compliance. The consistent tension across themes suggests that policy coherence is a structural requirement for the direction of developmental assessment leadership, rather than a discretionary optimisation. Departmental and district authorities should ensure that accountability instruments do not functionally override the formative provisions already present in CAPS. School Improvement Plans should include formative and diagnostic evidence as valid indicators of school quality, along with summative results.

Third, consistent with Hallinger's (2018) distributed turn and the multi-role composition of this study's sample, schools should formalise the assessment leadership roles of departmental heads and assessment coordinators within their quality management structures. Formalisation should specify how distributed roles articulate with the principal's accountability obligations, what professional development is required to sustain them, and how their contributions are recognised within performance review structures.

Directions for future research

For future research directions, four directions have been proposed. Multi-method work combining online forum data, classroom observations, and document analysis would enable triangulation. Comparative studies across rural, peri-urban, and urban contexts would establish whether the developmental–compliance tension is specific to rural settings or reflects a broader systemic pattern. Longitudinal research tracking assessment leadership before and after professional development interventions would clarify whether targeted support produces measurable change. Finally, studies that include classroom teachers' perspectives alongside those of instructional leaders would illuminate the gap between leadership intentions and instructional enactment that the present design cannot address.

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Teaching Economics the Collaborative Way: Unpacking student teachers' experiences of structured online team-based learning

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ABSTRACT
Recently, interest in team-based learning (TBL) as a collaborative, flipped learning and teaching strategy has increased. TBL enables students to follow a structured process that enhances their engagement and collective accountability. The purpose of Teaching Methodology Economics is to expose student teachers to the online team-based learning (TBL) strategy to increase student engagement, accountability and collaboration in the course. An open distance e-learning (ODeL) environment can benefit from the active, structured small-group learning that TBL offers. An ODeL course at a College of Education employed TBL as an example of a flipped instructional design. The experiences of Teaching Methodology Economics student teachers who participated in an online TBL strategy served as the basis for the single-case study reported here, which employed a mixed-methods design. The study participants (n = 340) completed multiple-choice questions virtually via video conferencing, and 12 team representatives (TRs) were selected for interviews as the quota sample (n = 12). Transcripts were downloaded, and video recordings were uploaded into NVivo 14.0, an AI-enabled qualitative software package. Using this software, thematic analysis was employed to generate themes reflecting the participating student teachers' experiences of the TBL strategy. The findings revealed that participants developed professional attributes, were motivated to reflect on their strengths and weaknesses as team members, and recognised the value of working and collaborating in groups. The TBL strategy was applied within a flipped instructional design and was foregrounded within the social constructivist frame, which provided student teachers with online learning opportunities for active engagement, co-constructed new knowledge, facilitated the sharing of experiences, encouraged accountability, and supported reflection on prior learning in an online teaching practice course. Future research should adopt an evidence-based practice approach, which may yield different results regarding an online TBL strategy, even when applied to other fully online courses. Further experimental investigations are needed to compare the teaching methodologies for commerce subjects.

Key terms: online team-based learning (TBL) strategy, flipped instructional design, open distance e-learning, mixed methods design

INTRODUCTION

Recently, interest in team-based learning (TBL) as a collaborative, flipped learning and teaching strategy has increased. TBL enables students to follow a structured process that enhances their engagement and collective accountability (Gomez & Bieber, 2005; Parmelee et al. 2012; De Jong et al., 2023). For that reason, scholars argue that TBL is an active, structured form of small-group learning that may be applied within a flipped instructional design in a College of Education at an ODeL university. In this research, flipped instructional design requires students to complete pre-class preparation, so they can devote most in-class time to applying their knowledge and skills to a problem through structured, small-team collaboration and active participation (Parmelee et al. 2012; Katz & Halpern 2015; Wyszomirska et al., 2021). Key aspects of TBL include member engagement, collaboration and satisfaction. TBL is increasingly recognised as an active learning method grounded in social constructivist theory, where frequent interaction and discussion among team members around a given problem help uncover misconceptions and enable the construction of a new understanding of the course material and its application. Parmelee et al. (2012, 275) define TBL as "an active learning and small-group instructional strategy that provides students with opportunities to apply conceptual knowledge through a sequence of activities that includes individual work, teamwork and immediate feedback". As a typology of flipped instructional design, TBL is a collaborative learning and teaching strategy that enables students to follow a structured process to enhance their engagement.

Undergraduate students reportedly performed better after being exposed to the TBL strategy than after being exposed to the lecturer method, in both contact and blended learning contexts (Odell, 2018; Lai et al., 2020; Cagliesi & Ghanei, 2022; Abío et al., 2023; Tasselli et al., 2023). Recent developments in TBL for online learning have prompted in-depth research in the context of open and distance e-learning (ODeL). However, unlike in an ODeL scenario, little research has examined the use of the TBL strategy as a flipped instructional design in a fully online teaching practice methodology course. A major issue that emerged in the student evaluation of the Teaching Methodology Economics course was the lack of group work or project-based learning (PBL) built into the course to enhance engagement and accountability and offer self-directed learning (SDL) opportunities. After reflecting on these concerns, this researcher delved into texts on team engagement, collaboration, and accountability. This entailed extensive reading on the TBL strategy and consulting additional resources as part of the learning unit on teaching methodology. The purpose of subsequently sharing this information was to expose student teachers to the TBL strategy by deliberately selecting scholarly works and YouTube videos for pre-class preparation and in-class discussions.

Based on the latter, studies concluded that students understand the TBL strategy applied in different contexts. This includes understanding how TBL, as an active and collaborative learning approach, is adapted for ODeL environments (Lai et al., 202; Michaelsen & Sweet, 2008; Van Wyk, 2025; Wyszomirska et al., 2021). These studies explore how the structured phases of TBL (pre-class preparation, readiness assurance, and application exercises) are operationalised in digitally mediated contexts. Moreover, TBL aligns with constructivist and social learning theories in fostering deep learning without physical co-presence (Katz & Halpern, 2015). Second, an exploration of student accountability and self-regulated learning, both collectively and individually, within the TBL structure (Ainsworth, 2021; Gomez & Bieber, 2005). The inquiry may investigate how TBL promotes individual accountability in an ODeL setting, where student autonomy is critical. This involves exploring how readiness assurance tests, peer evaluation, and group tasks cultivate self-discipline, responsibility, and ownership of learning among student teachers. Third, to explore team cohesion and social presence during the TBL strategy, particularly in relation to completing the individual-Ready Assurance Test (iRAT) and the team-Ready Assurance Test (tRAT). An important dynamic of TBL, it fosters a sense of belonging, trust, and collaboration among geographically dispersed learners (Cagliesi & Ghanei, 2022). This includes examining how structured group work contributes to social presence, peer support, and the development of professional learning communities in an online space. Finally, TBL supports learning outcomes and knowledge construction, including higher-order thinking skills such as critical thinking, problem-solving, and the application of knowledge (Espey, 2018; Hsu & Wu, 2023). It also considers how collaborative engagement contributes to the construction of shared knowledge among student teachers.

This article argues, from an ODeL perspective, that the TBL strategy, as a collaborative teaching and learning approach, can increase student accountability, engagement and team cohesion by providing structured procedures. In this single-case study, Teaching Methodology Economics student teachers were interviewed to determine the benefits they derived from the active, structured small-group learning approach (TBL).

The main research question is stated as follows: To what extent and in what ways does the implementation of Team-Based Learning (TBL) influence student accountability, engagement, and team cohesion among Teaching Methodology Economics student teachers in an ODeL context? Based on this main research question, the following specific research questions were formulated:

- What are the Teaching Methodology Economics students' views of the online TBL strategy in relation to the readiness assurance test (RAT)?
- How does TBL enhance student engagement and accountability in the Teaching Methodology Economics course?
- How does the online TBL strategy enhance the teaching methodology of Economics students' self-directed learning in the ODeL course?
- What challenges do Teaching Methodology Economics students face in implementing the online TBL strategy in an ODeL course?

LITERATURE REVIEW

For this section of the article, a dualistic theoretical framework, the social constructivist theory of learning and the social interdependence theory were applied to underpin the study.

Social constructivist theory of learning

The research reported here was underpinned by social constructivist theory. Developed by Russian psychologist Lev Vygotsky (1973), the theory posits that social learning enhances individuals' active participation in constructing meaning to acquire new knowledge, skills, and values. Here, the medium was the Moodle learning management system (LMS), which operates in an ODeL space, and the study participants were Postgraduate Certificate in Education (PGCE) and Bachelor of Education (BEd) student teachers. Using TBL as a flipped instructional design provided student teachers with online learning opportunities for active engagement, the co-construction of new knowledge, the sharing of experiences, and reflection on their prior learning. The TBL strategy was planned and applied in the course Teaching Methodology Economics, which required student teachers to play an active role as team members in constructing new knowledge, equipping themselves with practical teaching skills, and applying those in a school-based placement context. The TBL strategy, used throughout the course, aligns with the views of scholars of social constructivism, who argue that the approach promotes active engagement on the part of students, motivating them and enhancing their learning experiences by giving them control over the content, strategies and activities (Kim, 2005; Katz & Halpern 2015). As Swanson and Holton (2009) argue, social constructivist theory is not only an active process of constructing new meaning, but also an internal process of constructing and accumulating lived experiences.

Social Interdependence Theory

This theory, developed by Lewin (1935), explains the dynamics of teamwork and accountability in structured group settings such as TBL. Its relevance to the study is that teams exhibit positive interdependence, meaning students rely on one another to promote cooperation, while individual accountability within groups is a core feature of TBL. Furthermore, group cohesion and shared goals enhance motivation and performance in teams. Finally, online and face-to-face promotive interaction can be adapted in ODeL through online collaboration. The application to the study is TBL's design, which operationalises social interdependence by ensuring that each student assigned to a team contributes meaningfully to the team's objectives.

Research Studies on student engagement and accountability

In the online course Teaching Methodology Economics (TMS3709), students are expected to engage willingly, participate, and contribute meaningfully to achieve the objectives of each learning unit. This implies engaging emotionally, relationally, socially and cognitively to benefit from the process, alongside their peers and the lecturer. Student engagement is regarded as a vital contributor to student learning and achievement (Burgess et al. 2020; Wyszomirska et al. 2021; Abío et al. 2023; Minz & Saluja 2024). This implies that student teachers must give sustained

attention, remain focused, and reflect critically on each online lesson. Ultimately, student teachers who actively engage in a course become competent and benefit socio-emotionally, academically, and intellectually, both individually and as a team. Since the course in question was presented fully online, student teachers who studied within the ODeL space were expected to participate actively, engage in forums, and take ownership of their learning.

The student teachers were required to take responsibility for their actions and the tasks assigned to them. Once they had been divided into teams, they were expected to show dedication, contribute as team members, and be willing to be held accountable. Everyone prepared and took ownership of the learning materials before taking the individual-ready assurance test (iRAT) and the team-ready assurance test (tRAT) in the course. The results of both the PGCE and fourth-year BEd students counted towards their final mark. In this study, with a small-group structure, the TBL strategy was deployed to make student teachers accountable not only as individuals but also as teams, by performing and showing progress throughout the year (Fink, 2004; Sweet & Pelton-Sweet 2008).

Knowles (1975) states that as a person matures, they accumulate experience, become ready to learn, and move from dependence to self-direction. Knowles (1975) further argues that SDL is a process in which an individual takes initiative and assumes responsibility for their own learning. The TBL strategy was introduced in the course to enable students to apply and practise, with the aim of becoming competent, autonomous learners within a distance education context. This view is supported by Muongmee (2007), who argues that the value of the TBL strategy as a flipped instructional design lies in its promotion of SDL to foster lifelong learning. During the course, the aim was to expose students to SDL so that they would become autonomous, lifelong learners, as Muongmee (2007) suggests. Studies revealed that SDL promotes autonomy, self-management (Brockett and Hiemstra 1991), and the independent pursuit of learning, intrinsic motivation, and relatedness (Guglielmino and Long 2011). According to Brockett and Hiemstra (1991), self-directed learning involves transferring knowledge to a new situation, learning how to learn, and developing greater self-awareness.

Design and implementation of the online TBL strategy

The course Teaching Methodology Economics was hosted on myUnisa's Moodle LMS, described as "an open-source learning management system (LMS) which offers innovative functionality" (myUnisa upgrading to a new Teaching and Learning Management System). The aim of this fully online course is to equip student teachers with technological pedagogical content knowledge and teaching practice skills, enabling them to teach effectively and gain competence in teaching in the Further Education and Training (FET) Phase (grades 10–12).

In the ODeL context, constructing an online TBL strategy as a flipped instructional design required the lecturer to consider four components before implementation: the teams, accountability, assignments/tasks and feedback (Michaelsen & Sweet 2008; Wyszomirska et al. 2021). The content of Teaching Methodology Economics was hosted on the Moodle LMS platform, and the TBL strategy, used as an active flipped instructional design, was planned and implemented in accordance with the aforementioned components (see Table 4).

- ***Phase 1: Team formation***

The lecturer organised teams into manageable groups of 15 students each, based on their assigned team numbers (e.g., Team A1-5). During the first online session, the student teachers were introduced to the TBL strategy as one of the innovative pedagogies taught in the course. Before the live online session, additional resources were uploaded to the course site (e.g., a self-made video, an article, and the lecturer's study notes). After being coded (e.g., TA1–TA5 = Team A, 1–5), the student teachers were informed that each assessment activity would involve planned individual and team performances, which would count towards their final mark.

- ***Phase 2: Readiness assurance process***

As distance (self-directed) learners, student teachers are accountable for their learning journey. A five-stage sequence for individual and team activities in each learning unit of the course was designed as part of the readiness assurance process (RAP) (Ainsworth, 2021). Divided into teams, student teachers were accountable for their individual and group work. Learning materials and related resources were uploaded to the module site for study in preparation for tests. Multiple-choice questions (MCQs) were set for specific learning units in TMS3709 (Microeconomics, Macroeconomics, Unemployment, Inflation and Poverty). The individual-Ready Assurance Test (iRAT) and team-

Ready Assurance Test (tRAT) were the same test, structured as MCQs. After teams received the results, they appealed (in writing) and reflected on, or reviewed, questions that had been answered incorrectly (Chan & Kennedy 2002). The appeal processes consolidated team learning and enhanced team cohesion. The five-stage RAP structure aligns with social constructivist theory by enabling student teachers to build prior knowledge and apply it at each stage. Finally, the test results (iRAT and tRAT) were used to calculate the final mark.

- ***Phase 3: Well-designed team application activities***

The lecturer designed each activity to focus on the learning outcomes of a particular unit in the course (TMS3709). All teams received the same project or problem to solve. Teams worked together and reported on each stage of the project/task. On the module site, the Discussion Forum (on the Moodle LMS) was used to facilitate critical reflection on a specific topic. The teams, having been coded, selected a theme from the official school curriculum, the Curriculum Assessment and Policy Statement for Economics (CAPS Economics) (Department of Basic Education [DBE] 2011), which forms part of the course. The CAPS Economics school curriculum is used to prepare student teachers to teach the subject in the FET phase. From CAPS, three themes were derived: Microeconomics, Macroeconomics, and Contemporary Economic Issues. The teams could select any research project and were urged to use the Discussion Forum to stimulate team interaction, share ideas, and reflect on their research. The final team project was submitted for assessment as part of each team's summative mark.

- ***Phase 4: Peer assessment and constructive feedback***

Students received frequent, timely performance feedback after each assessment, whether an individual or team task or assignment, with an emphasis on constructive feedback. Assignments and tasks were graded as part of the module's continuous assessment. For the summative assessment, an online individual portfolio comprising a project, MCQs, written assignments, tasks and short writing pieces was uploaded to the module site. In most formative assessment activities – except for the final portfolio (summative assessment) – peer feedback was recognised as a vital part of students' learning, prompting them to be prepared (independent and self-managed) and to participate, as it would affect not only their own performance but also the team's.

METHODOLOGY

Online TBL context and design: This single-case study employed a pragmatic, mixed-methods design to reflect the experiences of student teachers taking the module *Teaching Methodology Economics* (TMS3709) and used the TBL flipped instructional design strategy. In this single-case study, the 12-credit course, aimed at teaching in the FET phase, is a final-year ODeL offering within the PGCE and BEd programmes. The course equips student teachers with applied TPACK and skills in planning, implementing, and reflecting on lesson presentations, thereby preparing them to become competent professionals capable of teaching in public or private schools. Throughout the year, student teachers develop subject-matter knowledge and pedagogical content knowledge (teaching practice skills) to prepare them for the five-week school placements at secondary schools as part of a Work-Integrated Learning (WiL) experience. During the placements, student teachers plan lessons with activities for grades 10–12. Those registered for the fully online *Teaching Methodology Economics* year course were taught for six months, with the Moodle platform hosting the online TBL strategy as a flipped instructional design. In this fully online course, they applied theory to practice on Moodle. Before being placed in schools for teaching practice, they were taught practical skills and exposed to online student-centred typologies of flipped instructional design; however, this study reports only on the TBL strategy.

Sampling, data collection and analysis: Before data collection and analysis, an open invitation was sent to 1043 students enrolled in the course. A sample of 340 fourth-year BEd and PGCE Economics student teachers agreed to participate. They completed consent forms and were informed they could withdraw at any time (Ethics Certificate #2023/05/13/90178912/18/AM).

First, the two tests were administered after the course had been completed. The purpose was explained to all registered students, and no student would be penalised for not participating in the study. Students could withdraw from the study at any time. But, students were keen to participate. They completed RATs (iRAT and tRAT) and took part in an online Microsoft Teams semi-structured interview.

Second, MS Teams videoconferencing was used, and online interviews were conducted, recorded, downloaded, and transcribed. The virtual interviews were conducted with team representatives (TRs) from the eight team-based groups (8 teams x 5 members each = 40). After selecting a representative for each team, some teams chose to interview additional individuals. Finally, only ten TRs were selected for the quota sample to represent the online interviews (see Table 4).

Finally, the Microsoft Teams video recording and transcripts were downloaded. The transcripts were verified for accuracy by listening to the recorded video conference on MS Teams. For the data analysis, an AI-enabled qualitative software, NVivo 14.0, was first used to generate themes. The following steps were followed for the qualitative approach: the NVivo data and coding process were followed.

- *Step 1: Data Importation and Preparation* – The transcripts from MS Teams were imported into the NVivo computerised qualitative software. Each case for this project was created using code from Team A through Team H.
- *Step 2: Initial coding of the data set* – The transcripts were read line-by-line and coded inductively, with direct verbatim extracts assigned to each case for Teams A to H. Codes were allocated to each case: Engagement, Accountability, Satisfaction, Collaboration, Flexible Learning and SDL.
- *Step 3: NVivo-Assisted Pattern Recognition* – After the coding process is complete, NVivo "runs" and generates frequently coded concepts or nodes, linking them to co-occurrences of codes.
- *Step 4: Node Aggregation of Categories – AI-detection, Turnitin, Invigilator App, unethical behaviour, flagging non-compliance, AI-generated content*.
- *Step 5: Theme Development (interpretative synthesis) - Themes were generated by synthesising categories aligned with the research questions.*
- *Step 6: Validation and Refinement* – themes were refined throughout the process through constant comparison of transcripts, revisiting disconfirming evidence, and checking against theory and literature. Finally, data, recordings, and verbatim were sent to participants for validation.

Data Collection Instruments: For the quantitative study, the Readiness Assurance Test (RAT) was used. It consisted of individual and team MCQs covering specific learning units, student-centred approaches, and integrated subject-discipline knowledge (Microeconomics, Macroeconomics, and Contemporary Economics Issues) to be studied before the online sessions. The MCQs were graded by the Moodle LMS:

- The iRAT was an individual test consisting of 50 MCQs (focusing on difficulty and discrimination) based on selected learning units, to be completed within 25 minutes.
- tRAT was a team re-taking the same test consisting of 50 MCQs (questions on Difficulty and Discriminating) based on selected learning units.

The qualitative study used an online TR interview: 12 TRs were selected as individual participants for these sessions. The interview sessions lasted approximately 50 minutes. The scheduled Microsoft Teams sessions were recorded, downloaded from Teams, transcribed, and manually analysed.

Trustworthiness and participant validation: These two empirical constructs are important because they serve as the scientific 'acid test' for the mixed-methods design and triangulate the data generated. It was imperative to ensure that the reported data were reliable and valid. Trustworthiness is based on four dimensions, namely credibility, transferability, confirmability, and dependability. Each is discussed here to ensure that the themes identified align with participants' comments. First, confirmability seeks to ensure that the data generated in a study are checked and rechecked for correctness and aligned with the interview protocol. Second, dependability was achieved by consistently ensuring that the identified themes were reliable and that the extracts selected for each theme also aligned with the research process. Third, credibility ensures that the generated data sets accurately reflect the gathered data and are complete and accurate. This was achieved through member checking. Lastly, transferability is a process by which the same data or instruments can be used in other contexts or settings and are expected to yield the same results. Using a qualitative approach, scholars apply strategies to validate the empirical processes they followed, including triangulation, member checking, prolonged engagement, and peer debriefing. In this study, however, member checking and participant validation were employed as scientific techniques to confirm the credibility of the findings. Data transcriptions, Microsoft Teams recordings, and team interview protocols were sent to the members of each

team's selected TRs, who ensured that the generated datasets accurately reflected what transpired. The TRs were asked to check the accuracy of the generated data within seven days. The purpose of participant validation is to serve as a quality assurance measure, to correct errors and eliminate any misinformation. The TRs sent signed emails to the researcher, stating that the transcripts accurately reflected the actual process and participants' statements.

RESULTS

QUANTITATIVE DATA

Here, the results of the quantitative study are presented. The biographical data showed that female students were in the majority (59%), while 14% of the respondents were male. The PGCE students comprised the majority (63%), compared with fourth-year BEd students (37%). The RAT assessment of MCQs was set using the Difficulty Factor (DF) and Discriminating Index (DI) for 50 items based on specific learning units. The study description was used to compute and analyse the individual and team MCQs with respect to the DF and DI.

- ***What are the Teaching Methodology Economics students' views of the online TBL strategy in relation to the readiness assurance test (RAT)?***

Table 1: Results of RATs of MCQ analysis

Descriptive	Average of items in MCQ	Standard Deviation of MCQ
Difficulty factor of items	69.7%	23.0
Discrimination Index of the MCQ	0.41	0.7

As the results show, the average DF was 69.7%, with MCQ item difficulty ranging from 65% to 75% (SD = 23).

Table 2: Average iRAT (n=340) and tRAT scores (n = 8 teams)

Team Code	Average iRAT score (MCQs = 50)	Average tRAT score (MCQs = 50)	Difference	Average highest score of the team member
Team A	28.8	32.3	3.5	29.5
Team B	29.8	34.6	4.8	34.3
Team C	32.3	46.8	4.5	33.7
Team D	27.4	29.9	2.5	27.6
Team E	28.9	31.5	2.6	28.6
Team F	30.9	32.5	1.6	32.3
Team G	31.6	37.5	5.9	35.3
Team H	28.9	32.8	3.9	29.4
Average	29.8	34.5	4.7	31.3
SD	0.63	0.49		0.81
Var. p	0.41	0.12		0.63

Based on the results shown in Table 2, Team G outperformed the other teams in the retake of the tRAT (27.5, DF 5.9). Based on the average scores and differences in MCQs between the iRAT and tRAT, teams performed better when the same test was retaken using the TBL strategy.

Table 3: Summary of performance on specific learning units

Learning Unit	iRAT (50 marks)	tRAT (50 marks)	Difference
Microeconomics	45 (90%)	48 (96%)	+3 (6%)
Macroeconomics	44 (88%)	47 (94%)	+3 (6%)
Unemployment	41 (82%)	45 (90%)	+4 (8%)
Poverty	39 (78%)	46 (92%)	+7 (14%)
Inflation	40 (80%)	46 (92%)	+6 (12%)

The table shows consistent improvement from iRAT to tRAT across all learning units, confirming the value of collaborative learning. Gains are modest in Microeconomics and Macroeconomics (+6%), but stronger in applied topics, especially Poverty (+14%) and Inflation (+12%). This indicates that teamwork significantly enhances understanding and performance in complex economic concepts. Overall, collaborative learning enhances understanding, strengthens the application of knowledge, and improves overall student achievement in economic concepts.

QUALITATIVE DATA

After the interviews, the detailed data were compiled in Table 4 below, including team codes, selected individual team representatives for the interview schedule, and thematic links that emerged.

Table 4: Summary of TBL teams and representatives for the online interview sessions

Team code	Composition of teams: coding, gender, year of study and qualification	Individuals selected as team representatives (TRs) for interview session	Thematic link to a theme(s) by TRs
Team A	TA1 = Female 4th-yr BEd TA2 = Female PGCE TA3 = Male PGCE TA4 = Male PGCE TA5 = Male PGCE	TA5 = Male PGCE TA2 = Female PGCE	Theme 1: Engagement Theme 4: Collaboration
Team B	TB1 = Male 4th-yr BEd TB2 = Male 4th-yr BEd TB3 = Male 4th-yr BEd TB4 = Male PGCE TB5 = Male PGCE	TB2 = Male 4th-yr BEd TB5 = Male PGCE	Theme 1: Engagement Theme 3: Satisfaction
Team C	TC1 = Female 4th-yr BEd TC2 = Female PGCE TC3 = Female PGCE TC4 = Female PGCE TC5 = Female 4th-yr BEd	TC2 = Female PGCE, 1	Theme 1: Engagement Theme 4: Collaboration Theme 5: Flexible learning
Team D	TD1 = Male PGCE TD2 = Male 4th-yr BEd TD3 = Female PGCE TD4 = Male PGCE TD5 = Female 4th-yr BEd	TD1 = Male PGCE TD2 = Male 4th-yr BEd	Theme 3: Satisfaction Theme 2: Accountability Theme 6: SDL
Team E	TE1 = Male 4th-yr BEd TE2 = Male PGCE TE3 = Male PGCE TE4 = Male PGCE TE5 = Female PGCE	TE1 = Male 4th-yr BEd TE2 = Male PGCE	Theme 5: Flexible learning Theme 6: SDL Theme 1: Engagement
Team F	TF1 = Male 4th-yr BEd TF2 = Female PGCE TF3 = Female PGCE TF4 = Male 4th-yr BEd	TF3 = Female PGCE	Theme 5: Flexible learning

	TF5 = Male 4th-yr BEd		
Team G	TG1 = Male 4th-yr BEd TG2 = Male PGCE TG3 = Female 4th-yr BEd TG4 = Female PGCE TG5 = Male 4th-yr BEd	TG3 = Female 4th-yr BEd	Theme 5: Flexible learning
Team H	TH1 = Female 4th-yr BEd TH2 = Female 4th-yr BEd TH3 = Male PGCE TH4 = Male PGCE TH5 = Female 4th-yr BEd	TH1 = Female 4th-yr BEd	Theme 1: Engagement

Based on the information in the table, participant TC2, a female participant studying towards a PGCE, was linked to the majority of themes. Moreover, Team E representatives TE1, a male 4th-year BEd, and TE2, a male PGCE, were linked to themes within the team structure. Finally, most team representatives mentioned engagement and flexible learning support for team-based learning. An interview protocol was designed and used via Teams, and each team was asked to select a representative for the interview. For the online videoconferencing with the team representatives, participants signed an informed consent document. As is evident from Table 4, of the 12 TRs, the majority were female, with 75% of the PGCEs (n = 7) and 100% of the Bed (n = 2).

Several themes emerged from the data analysis process. Extracts are given to support each identified theme.

Theme 1: Engagement in creating accountability, a sense of togetherness, team spirit, and collaboration

The participants agreed that the TBL strategy fostered a sense of belonging, togetherness, team spirit and collaboration amongst members. According to the teams, each member played a crucial role in supporting others, sharing ideas and collaborating as a collective. Some participants reported feeling happy and close to one another, as well as a sense of accomplishment from striving for excellence in the project. The majority expressed delight at working together despite coming from different cultures and reportedly felt unified by a strong team spirit, while remaining accountable for their own performance. As TC2 stated:

> *As a senior student, I am entirely responsible and accountable for my studies. Accountability requires me to complete my course in the stipulated time.*

Participant TH1 mentioned:

> *Since the team flip strategy was introduced in the module, I have felt confident using it in my teaching practice. Our team collaborated to complete our tasks successfully. What I like about this type of flipped learning is that it] creates a sense of working together*.

The findings revealed that the participants were confident and collaborative, working together as teams to deliver the required outcomes for tasks, assignments, and projects. As TB2's sentiments confirmed:

> *We were allocated a community-based research project. We worked together to identify the problem in the community, plan, collect data, present our findings, and write our report. Each one of us played our role as a team member. I am satisfied with […] what we as a team achieved.*

TA5 experienced camaraderie among the team members, emphasising.

> *… a sense of team spirit, unity and cooperation.*

Theme 2: Accountability for improvement in learning retention, and awareness in planning and implementing effective TBL experiences

It emerged from the interviews that the participants understood and were well informed about what TBL entails as a student-centred teaching technique that supports active learning. They knew that the approach helped them to improve their retention of knowledge and skills throughout the course. Since the participants had a conceptual understanding

of this technique as a type of flipped instructional design, this understanding created an awareness of the need to plan and deliver effective lessons. The participants confirmed that they gained confidence in using this approach. Moreover, they stated that the context and scope of TBL were vital dimensions in using the approach in flipped learning. Their positive feelings about this technique are reflected in their verbatim utterances.

TG3 said:

> *We are accountable for the success of a team. We are expected to prepare well before online sessions. During our online discussion forums, teams agreed that TBL had increased awareness of this approach's benefits amongst groups. I believe there is much potential to implement this approach in lessons*.

The year module, Teaching Methodology Economics, was delivered via Microsoft Teams as 'live sessions', with recorded videos also uploaded to the module site for future reflection. During the live online Microsoft Teams sessions, specific topics, such as unemployment, were used to demonstrate how the TBL strategy may be applied when planning lessons. The student teachers were trained to use an online observational checklist to evaluate the TBL strategy.

TD2 explained:

> *I felt confident in implementing this approach within my teaching methodology. It creates numerous learning opportunities for my praxis and for my learners. To apply this approach, context and scope are key – every class is unique, and every situation unfolds differently, so planning and implementation are vital to its success.*

Theme 3: Satisfaction with better performance in the MCQs score as per the team for online learning tasks

Several teams noted that this strategy had helped them and even enhanced their team performance and accountability, allowing the group to set high-performance targets for using flipped instructional design.

TD1 said:

> *Sorry to say, I was … negative and sceptical at the beginning, when we started in our team. I vividly remember my former experience working in teams – a total disaster. But the way it was structured in the flipped session helped me debunk my scepticism and opposing views. It truly enhanced my digital skills.*

Most participants were positive about the strategy's ability to promote team performance and digital literacy, and to be successful in an online learning space. Some felt empowered to use different Moodle platform tools, along with the GenAI app and ChatGPT. As TB5 mentioned:

> *Before I started this course, I received training on how to use and actively participate in different tools in Moodle, and had the opportunity to experiment with a new generative language app [ChatGPT] and OERs [open educational resources].*

Theme 4: Actively engaging, sharing and collaborating amongst teams in the online learning space

As the findings revealed, teams were actively engaged in achieving the task outcomes. The members collaborated and supported those who were not progressing in line with their assigned responsibilities and roles. One team was so confident that they called themselves the "Go-getters" and forged ahead, no matter the task or project. As team members became accustomed to one another, they reported that they easily completed their respective assignments in a timely manner. Participant TC2 expressed her delight as follows:

> *I experienced greater engagement with my fellow members. Our team, the Go-getters, supported one another throughout our engagements and completed tasks on time. We learned a great deal from each other, respecting our values, cultures and principles.*

One participant, TA2, highlighted the issue of team collaboration as follows:

> *My group was diverse… There were Indians, Coloureds and Africans, but we respected each other's beliefs and views. Through my team, I improved my collaboration skills in a group setting. Before I joined the team,*

I was sceptical about working in a team because of my previous experience. The group changed my perception of working in a team. I learned the team skill of collaboration.

Theme 5: Prepares students for real flexible learning opportunities in an online learning space

The study participants expressed their delight with the team-based learning experiences. They felt that these experiences supported flexibility in planning and organising the learning journey throughout the online course. In their view, this type of flipped instructional design increased information sharing and created ample opportunities to practise the strategy, which in turn boosted their confidence in applying the Teaching Methodology of Economics during school placements (teaching practice placements).

TF3 was positive about the TBL strategy:

What I like about team-based learning is that I have more flexibility in planning, organising my learning, and practising to become excellent. I could start my learning journey… at any time and send my part of the work to my team members.

TE1 also supported the TBL strategy:

I experienced greater information sharing on the module site. I can apply my new knowledge and skills in my context.

Participant TG3 agreed that practice makes perfect. The participants reported having had many demonstrations of excellent lessons, but few opportunities to practise online:

Some of us made mistakes, but the more we practised, the better we became before our school placements. I am positive about this strategy. We were exposed to online demonstrations and practice sessions, which gave me the confidence to apply it during my school placement for teaching practice.

Theme 6: Promotes self-directed learning, autonomy and life-long learning opportunities

As the findings confirmed, the TBL strategy promoted students' self-directed learning, autonomy and lifelong learning. This student (TD2), as an online learner in an ODeL context, believed in autonomy, self-expression, and her ability to regulate her learning and actions productively to succeed in her studies (TD2):

I am an individual who takes initiative in my learning. I am fully accountable, committed, and responsible for my learning journey. I can say I am [capable of] autonomy and self-management.

Another confident BEd student participant, TE1, had completed several degrees and short learning courses to equip himself for his future career path, noting:

I enjoy studying. I completed my undergraduate degrees and short courses. I believe knowledge is power. One of my strengths is self-autonomy and self-management.

On why he likes the TBL strategy, TE2 responded:

Team learning promotes creativity and critical thinking, and it equips me with the skills to self-evaluate my team and other teams. It is about bettering yourself with knowledge, relevant skills, and values to become remarkable in your career. Confidently, I am a lifelong learner.

The BEd students were exposed to an ODeL learning environment over four years, studying in a fully online learning space. They were equipped with digital literacy skills and required to engage in autonomous learning while applying their online learning during their teaching practice placements. Notably, the PCGE student participants, who were registered for a two-year study period, raised several challenges, including concerns about their digital literacy, self-management, and the time required to study online and hone their skills in a distance-learning environment. Another major issue that emerged was the 'fear of failure' syndrome when applying the TBL strategy during school placements. Participant TH1 noted:

> *It is a relatively new approach and can sometimes feel overwhelming for us. It also takes time to understand this approach, and [I] need time to practise to become successful with this teaching strategy. I need more practice ….*

In this regard, TE3 said:

> *I lack self-confidence in planning and presenting lessons, using the strategy online, to fellow students. I hate to fail, and it will give my confidence a serious knock.*

Clearly, some participants lacked the self-confidence and self-management skills to study at a distance. As TG3 mentioned:

> *I was mostly exposed to teacher-centred and lecture-based methods during my undergraduate degree courses. Now suddenly, I need to learn the team strategy. I lack the confidence to apply this approach to my subjects. Many of us fear failure when we use this approach in lesson presentations.*

DISCUSSION OF FINDINGS

The TBL strategy, when applied within a flipped instructional design, was foregrounded within the social constructivist frame, which provided student teachers with online learning opportunities for active engagement, co-constructed new knowledge, facilitated the sharing of experiences, encouraged accountability, and supported reflection on prior learning in an online teaching practice course. It emerged that student teachers found the online TBL strategy to be engaging and to foster lifelong learning. The participants reported engaging with one another to support the team's success. The high MCQ scores in the tRAT, compared with the iRAT, suggested that the participating student teachers came prepared, were engaged, and collaborated as a team to achieve high scores throughout the course. TC2, for instance, reported increased engagement and improved collaboration with fellow team members.

This view is supported by studies showing that students engage with and actively support their team members to achieve high task scores (Katz & Halpern, 2015; Abío et al., 2023; Minz & Saluja, 2024). Furthermore, the results revealed that using TBL as an online flipped pedagogical strategy offered an empowering learning experience for student teachers working together in teams, fostering a sense of togetherness, team spirit and collaboration (Gomez & Bieber, 2005; Alvarez-Bell, Wirtz, & Bian, 2017; De Jong et al., 2023). Student accountability emerged strongly in the results of both the RATs and the online interviews. During the interviews, the TRs indicated that every team member had to be held accountable for both individual and team actions. The participants viewed accountability as a vital construct for improving their learning retention and awareness in planning and implementing effective TBL experiences. TBL, as a strategy, has been found to promote student accountability by encouraging preparation beforehand, building trust, and enhancing in-class discussions (Michaelsen, 2004; Sweet & Pelton-Sweet, 2008; De Jong et al., 2023). Moreover, the participants expressed satisfaction with the TBL strategy for its positive impact on their digital literacy skills and course performance. They indicated that they were so satisfied with the strategy that they would use it in future teaching practice, since, when applied in their course, they actively engaged, shared, and collaborated as teams in the online learning space.

The study found that the online TBL strategy enhanced participating student teachers' SDL towards lifelong learning in the ODeL course. The emergence of SDL as a component of the online TBL strategy promoted their learning-related autonomy and self-management. As Knowles (1975) states, as a person matures, s/he accumulates experience, becomes ready to learn, and moves from dependence to self-direction. In this study, senior BEd and PGCE student teachers were exposed to the TBL strategy in an ODeL environment and confirmed those experiences. Knowles (1975) also argues that SDL is part of a process in which an individual takes initiative and responsibility for their future learning. Muoungmee (2007) concurs that the value of the TBL strategy lies in promoting SDL to foster lifelong learning. During the year-long course, the participants engaged in self-directed learning and became autonomous learners who recognised the value of a lifelong quest for knowledge. A participant from Team C confirmed that the TBL strategy helped him/her become fully committed and responsible for his/her learning journey. Moreover, as the findings revealed, the TBL strategy enhanced SDL, thus supporting the findings of scholars (Knowles 1975; Brockett & Hiemstra 1991) that people become self-directed when they take total control over a learning decision. It emerged from the identified themes that SDL is about autonomy and self-management (Van Wyk, 2025; Brockett & Hiemstra,

1991), as well as the independent pursuit of learning, intrinsic motivation, and relatedness (Guglielmino & Long, 2011). One participant pointed out that the TBL strategy promoted creativity and critical thinking and helped him/her evaluate not only his/her own team but also other teams. This finding is supported by studies that explore how SDL promotes creativity, critical thinking stimulation and skills, to help students self-evaluate (Brockett & Hiemstra 1991; Muongmee, 2007).

Finally, student teachers highlighted specific challenges and concerns regarding the implementation of an online TBL strategy in an ODeL course. A relatively new approach may be overwhelming and take time to understand and master. These concerns are legitimate, as many students lack digital literacy skills. Studying online is a new learning experience for them, and they dread failing to implement TBL during school placements. Hence, as Carson et al. (2021) note, associated costs, pre-planning, the types of assessment tasks, and team structuring must receive due attention. The participants also reported insufficient time to practise the strategy, as many were distance students who worked full-time jobs. Some admitted to lacking self-confidence and self-management skills when studying at a distance.

IMPLICATIONS

The present study, however, makes several noteworthy contributions to the epistemology of TBL as a flipped instructional design for an ODeL context. Furthermore, it extends our understanding of online teaching and learning strategies applied in teacher education by creating an online TBL community of practice. Another contribution is the design of a highly reliable data-collection instrument that can be applied to or replicated in similar fully online courses. Although the current study is based on a small sample of participants, the findings suggest that the online TBL flipped learning strategy equips student teachers with a conceptual understanding of the components and dynamics of this student-centred approach in an online environment. Finally, it enhances students' and teachers' pedagogical knowledge and skills, supporting proficiency in the subject's methodology. Future research should adopt an evidence-based practice approach, which may yield different results regarding an online TBL strategy, even when applied to other fully online courses. Further experimental investigations are needed to compare the teaching methodologies for commerce subjects. A natural progression of this work is to examine the characteristics and dynamics of an online TBL community of practice. If the debate is to be shifted, a better understanding of TBL flipped instructional design could be applied to similar fully online subject-matter methodology courses for final-year PGCE and Bed students.

LIMITATIONS

The current study has examined only a small number of final-year students registered for a fully online Teaching Methodology Economics course. This limitation means that the study's findings should be interpreted with caution. A limitation of this study is the impact of the electrical issue, which significantly affected the effectiveness of the online course. The country experienced daily electricity challenges (power-sharing and outages), which significantly affected real-time Teams sessions and hindered efficient operation throughout the online course.

CONCLUSION

The purpose of the current study was to examine an online course, Teaching Methodology Economics in the Further Education and Training Phase, in which student teachers were introduced to the team-based learning (TBL) strategy, a collaborative teaching and learning approach that follows an organised procedure. The online TBL strategy, when applied as a flipped instructional design, served its purpose, as foregrounded by social constructivist and social interdependence theories. This research has found that the online TBL strategy promoted learning opportunities for active participation, the co-construction of new knowledge, the sharing of experiences, the taking of accountability, and reflection on prior learning in this teaching practice course. The second major finding was that the student teachers experienced the TBL strategy as an engaged space among members, fostering a collective sense of belonging and togetherness as an online community of practice in the quest for lifelong learning. Furthermore, this study has shown that the student teachers expressed positive feelings about the TBL strategy. This strategy enhances professional abilities, motivates them to reflect on their strengths and weaknesses as team members, and helps them experience the

value of teamwork toward a common objective. The evidence from this study suggests that, given the challenges referred to earlier, a learning unit focused on digital transformation and digital literacy should be incorporated into the course learning objectives. Furthermore, it is suggested that student teachers be aware of the ethical considerations when using generative artificial intelligence (GenAI) tools in their learning. This implies that student teachers should be equipped with digital literacy skills to utilise these tools to support their learning, and that such use should not be perceived as academic dishonesty.

Declaration of GenAI tools

The University licensed and approved the use of GenAI tools, such as Grammarly and Turnitin, for paraphrasing and plagiarism checks, AI-assisted copyediting, and generating selected ideas related to the information presented. However, all AI-generated contributions were critically reviewed and evaluated to ensure their relevance and alignment with the study's context. The author developed the original concepts and produced the primary written text, applying scholarly judgement to refine clarity, coherence, readability, and academic style. The author accepts full responsibility for the final version of the manuscript and affirms that all edits faithfully represent their original intellectual contributions.

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