Assessment of Learnership Infrastructure for Learners with Disabilities in Masvingo Urban Schools: A Mixed-Method Evaluation of Learnership Infrastructure in Zimbabwe

Margaret Machingambi[1]., Jonathan Mrewa[2]

[1]Department of Inclusive and Special Needs Education, Great Zimbabwe University

[2]Midlands State University, Department of Tugwi Mukosi Multidisciplinary Research Institute

DOI: https://doi.org/10.47772/IJRISS.2026.10100277

Received: 04 January 2026; Accepted: 09 January 2026; Published: 03 February 2026

ABSTRACT

Zimbabwe's commitment to inclusive education through the Education Amendment Act of 2020 requires systematic evaluation of infrastructure adequacy for learners with developmental disabilities. Despite policy mandates, empirical assessment of educational infrastructure remains limited, creating implementation challenges that compromise meaningful inclusion.

A concurrent mixed-methods cross-sectional study was conducted across 28 urban schools in Masvingo Province during the first quarter of 2025. Participants included 189 teachers, 56 administrators, and 112 parents of learners with developmental disabilities. Data collection employed validated instruments including the School Infrastructure Assessment Tool, Teacher Self-Efficacy Scale for Inclusive Practices, semi-structured interviews, and structured observations. Quantitative analyses included descriptive statistics, ANOVA, and multiple regression, while qualitative data underwent framework analysis using NVivo.

Significant infrastructure deficiencies were documented across all assessment domains. Only 21% of schools achieved adequate physical accessibility ratings, while 73% lacked specialized learning environments. Teacher self-efficacy for inclusive practices averaged 2.6/5, correlating significantly with infrastructure quality ($r = 0.67$, $p < 0.001$). Qualitative findings revealed systemic implementation barriers including inadequate funding mechanisms, limited technical expertise, and insufficient community engagement. Resource disparities between government and private schools were substantial, with private institutions scoring 42% higher on infrastructure adequacy measures.

Critical infrastructure deficiencies fundamentally compromise educational access and participation for learners with developmental disabilities in Masvingo urban schools. Urgent interventions addressing physical accessibility, specialized learning environments, assistive technology provision, and human resource capacity are essential for realizing inclusive education policy objectives and ensuring equitable educational opportunities.

Keywords: developmental disabilities, inclusive education, educational infrastructure, Zimbabwe, Universal Design for Learning, accessibility assessment

INTRODUCTION

The international movement toward inclusive education represents a paradigmatic transformation in educational philosophy and practice, fundamentally reconceptualizing disability from a medical deficit model to a social rights-based framework (Ainscow et al., 2024). This transformation has been codified through international legal instruments, particularly the United Nations Convention on the Rights of Persons with Disabilities (CRPD), which entered into force in 2008 and has been ratified by 187 countries including Zimbabwe, establishing inclusive education as a legally binding obligation (United Nations, 2006; Lamichhane & Kamal, 2024). Complementing the CRPD, Sustainable Development Goal 4, target 4.5, explicitly mandates eliminating

disparities and ensuring equal educational access for persons with disabilities by 2030, providing measurable implementation benchmarks (UNESCO, 2023).

Recent meta-analytical evidence demonstrates that well-implemented inclusive education yields significant academic, social, and developmental benefits for all learners, including improved academic achievement, enhanced social competence, and reduced prejudicial attitudes among typically developing students (Hehir et al., 2024; Szumski & Karwowski, 2023).

Contemporary research emphasizes that inclusive education success depends fundamentally on adequate infrastructure, appropriate pedagogical approaches, and systemic support mechanisms rather than simply placing learners with disabilities in mainstream settings (Florian & Beaton-Greenberg, 2024). The shift from integration to genuine inclusion requires comprehensive environmental modifications, specialized resources, and professionally prepared educators capable of implementing evidence-based inclusive practices (De Vroey et al., 2023).

Developmental disabilities and educational infrastructure

Developmental disabilities encompass a heterogeneous group of conditions characterized by significant limitations in intellectual functioning and adaptive behavior, manifesting during the developmental period and affecting conceptual, social, and practical adaptive skills (American Association on Intellectual and Developmental Disabilities, 2024). Global prevalence estimates indicate that 1-3% of children worldwide experience developmental disabilities, with intellectual disabilities affecting approximately 1% of the global population and autism spectrum disorders occurring in 1 in 68 children (World Health Organization, 2011; Maulik et al., 2011).

Educational infrastructure requirements for learners with developmental disabilities extend far beyond basic physical accessibility to encompass comprehensive environmental design principles that support diverse learning needs, communication modalities, and behavioral presentations (Thompson et al., 2024). Universal Design for Learning (UDL) provides the theoretical foundation for creating inherently accessible learning environments through multiple means of representation, engagement, and expression, eliminating barriers rather than retrofitting accommodations (Meyer et al., 2024).

Contemporary research emphasizes specific infrastructure elements as critical for supporting learners with developmental disabilities, including predictable physical layouts that reduce anxiety and support navigation independence, sensory-friendly environments that accommodate hyper- and hypo-sensitivities, visual support systems that enhance comprehension and communication, and flexible learning spaces that accommodate diverse physical and behavioral needs (Carnahan et al., 2024; Knight & Hutzler, 2024).

Assistive technology integration has emerged as a fundamental infrastructure component, with research demonstrating significant improvements in academic achievement, social participation, and independence when appropriate technologies are systematically implemented and supported (Bouck & Park, 2024). However, technology effectiveness depends critically on infrastructure capacity for integration, maintenance, and ongoing technical support, highlighting the interconnected nature of physical, technological, and human resource infrastructure elements (Flanagan et al., 2024).

Regional context: Inclusive education in Sub-Saharan Africa

Sub-Saharan Africa confronts unique challenges in implementing inclusive education policies, with infrastructure deficits representing a primary barrier to meaningful inclusion across the region (Majoko, 2024). Economic constraints, competing development priorities, and limited technical expertise create complex implementation challenges that require innovative, context-specific solutions rather than direct transplantation of developed-country models (Chataika, 2023).

Regional analyses reveal significant variations in inclusive education progress, with countries like South Africa, Ghana, and Botswana demonstrating measurable improvements in policy implementation and infrastructure

development, while others struggle with basic accessibility and resource provision (Singal & Salifu, 2024). Cultural and social factors, including traditional beliefs about disability, family attitudes, and community stigma, significantly influence both demand for and acceptance of inclusive education initiatives across the region (Munyi, 2024).

Recent comparative studies across Sub-Saharan Africa document persistent infrastructure gaps, with urban schools often facing overcrowding and aging facilities while rural schools lack basic amenities and connectivity (Lwazi & Mambanga, 2024). These challenges are amplified for learners with disabilities, who require additional accommodations frequently viewed as expensive add-ons rather than essential educational components (Taderera, 2024).

Despite challenges, several regional success stories provide evidence of feasible progress. Ghana's inclusive education infrastructure development program achieved accessibility improvements in over 800 schools through systematic planning and resource mobilization, while Kenya's commitment to universal primary education included specific disability provisions resulting in measurable infrastructure enhancements (Agbenyega & Deku, 2024; Ngugi, 2023).

Zimbabwe's inclusive education trajectory

Zimbabwe's trajectory toward inclusive education reflects the nation's complex post-independence development challenges, recent economic recovery efforts, and evolving policy frameworks (Chimhenga, 2024). The Education Amendment Act of 2020 represents a watershed moment in Zimbabwe's inclusive education commitment, mandating accommodation of learners with disabilities across all educational institutions and establishing legal frameworks for enforcement (Government of Zimbabwe, 2020; Mubika & Bukaliya, 2024).

Current prevalence estimates for developmental disabilities in Zimbabwe remain limited due to diagnostic capacity constraints and cultural factors affecting identification and reporting (Chindimba, 2024). Available census and survey data suggest developmental disabilities affect 2-4% of the school-age population, though these figures likely underrepresent actual prevalence due to underdiagnosis, stigma, and limited access to assessment services (Zimbabwe National Statistics Agency, 2024).

The existing special needs education system operates through a hybrid model combining specialized institutions with emerging mainstream inclusion efforts (Hapanyengwi-Chemhuru & Makuvaza, 2023). While specialized schools provide concentrated expertise, they are primarily located in urban areas, creating significant access barriers for rural populations and perpetuating segregated educational experiences for many learners with disabilities (Mushoriwa, 2024).

Recent government initiatives include the establishment of the Inclusive Education Unit within the Ministry of Primary and Secondary Education, allocation of specific budget lines for disability-related educational supports, and pilot programs for teacher professional development in inclusive practices (Ministry of Primary and Secondary Education, 2024). However, implementation remains inconsistent, with significant gaps between policy intentions and operational realities across different provinces and school contexts (Jaravaza & Chitate, 2024).

Study rationale and objectives

Despite legislative commitments and international pressure for inclusive education implementation, systematic assessment of educational infrastructure adequacy for learners with developmental disabilities in Zimbabwe remains critically limited (Mutepfa et al., 2023). Existing research has predominantly focused on teacher attitudes and policy analysis, with insufficient empirical attention to the physical, technological, and resource infrastructure necessary for meaningful inclusion (Chimedza, 2024).

This study addresses this critical knowledge gap by providing comprehensive empirical data on infrastructure adequacy in Masvingo urban schools, employing rigorous mixed-methods approaches to capture both objective conditions and subjective stakeholder experiences. The research contributes essential evidence for policy

development, resource allocation decisions, and intervention planning to advance inclusive education implementation across Zimbabwe.

Primary objective: To evaluate the adequacy of learnership infrastructure for supporting learners with developmental disabilities in Masvingo urban schools through comprehensive mixed-methods assessment.

Secondary Objectives:

1. Assess physical accessibility features, safety provisions, and environmental modifications across participating schools
2. Examine availability, functionality, and appropriateness of specialized resources and assistive technologies
3. Evaluate human resource capacity, training levels, and self-efficacy for supporting learners with developmental disabilities
4. Identify systemic barriers and facilitators influencing inclusive education infrastructure development
5. Develop evidence-based recommendations for infrastructure improvement and sustainable implementation strategies

METHODS

Study design and setting

This investigation employed a concurrent mixed-methods cross-sectional design, integrating quantitative and qualitative data collection approaches to provide comprehensive assessment of learnership infrastructure adequacy (Creswell & Plano Clark, 2024). The concurrent design facilitated simultaneous data collection across multiple stakeholder perspectives, enabling triangulation of findings and enhanced validity through methodological convergence.

The study was conducted in Masvingo Province, Zimbabwe's sixth-largest province with approximately 1.7 million residents and concentrated urban development around Masvingo City (Zimbabwe National Statistics Agency, 2024). Masvingo urban area was strategically selected due to its representative characteristics of medium-sized Zimbabwean urban centers, diverse school typologies, and documented enrollment of learners with disabilities across multiple educational institutions.

Data collection occurred during the first quarter of 2025 (February-April), spanning one complete academic term to capture authentic infrastructure utilization patterns and stakeholder experiences. This timing allowed for assessment of infrastructure conditions following the 2024 academic year improvements and before mid-year resource allocation decisions, providing current baseline data for policy and planning purposes.

Ethical considerations

Ethical approval was obtained from the University of Zimbabwe College of Health Sciences Research Ethics Committee (UZCHS-REC/Protocol/2025/003) and operational clearance from the Ministry of Primary and Secondary Education, Masvingo Provincial Office (MOPSE/MPO/RES/2025/07). Additional consent was secured from participating schools, individual participants, and parents/guardians of minor participants.

Comprehensive Ethical Framework

This research adhered to rigorous ethical standards for vulnerable population research, guided by the Declaration of Helsinki principles and Zimbabwe's Medical Research Council ethical guidelines for educational research involving persons with disabilities.

Informed Consent Procedures: A three-tiered consent process was implemented: (1) institutional consent from school governing bodies and the Ministry of Primary and Secondary Education; (2) individual informed consent from adult participants (teachers, administrators) using accessible written and verbal formats; and (3) dual assent-consent procedures for minor participants, requiring both parental/guardian written consent and child assent using developmentally appropriate, multimodal communication formats including visual supports, simplified language, and assistive communication devices.

Participant Protections: Multiple safeguards protected vulnerable participants including: voluntary participation with explicit right to withdraw without consequences; confidentiality protection through secure data storage and participant de-identification; accommodation of diverse communication needs and cognitive abilities during data collection; presence of trusted support persons during interviews when requested; immediate termination of data collection if participants showed distress; and provision of referral information for support services when concerns emerged during research activities.

Data Security and Privacy: All data were stored on password-protected encrypted devices with access restricted to authorized research team members. Hard copy materials were secured in locked cabinets with institutional oversight. Participant identifiers were separated from research data through coding systems, with master lists stored separately under additional security protocols. Data will be retained for seven years per institutional requirements, after which it will be securely destroyed.

Benefits and Risk Mitigation: While no direct benefits accrued to individual participants, the research contributes to systemic improvements benefiting the broader community of learners with disabilities. Potential risks including fatigue, emotional discomfort from discussing barriers, and privacy breaches were minimized through: limited session duration (maximum 60 minutes), provision of breaks, emotional support availability, careful site selection for privacy, and rigorous confidentiality protocols.

Community Engagement: Research plans were presented to parent advocacy organizations and disability rights groups during design phases, incorporating community feedback into methodological decisions. Preliminary findings were shared with participating schools and stakeholder groups, with full results dissemination planned through accessible formats including plain-language summaries and community presentations.

Participants and Sampling

The target population comprised all primary and secondary schools in Masvingo urban area serving learners with documented developmental disabilities. Developmental disabilities were operationally defined according to contemporary international criteria, including intellectual disabilities, autism spectrum disorders, cerebral palsy, and related conditions manifesting during development and resulting in significant functional limitations (Schalock et al., 2024).

Inclusion criteria required schools to enroll at least five learners with diagnosed developmental disabilities, operate for minimum three academic years ensuring established infrastructure patterns, and provide voluntary informed consent for participation. Schools serving exclusively learners with sensory impairments were excluded to maintain focus on developmental disabilities requiring distinct infrastructure accommodations.

Sample size calculation using G*Power 3.1.9.7 was based on anticipated ANOVA comparisons across three school ownership types (government, private, mission), representing the primary quantitative analysis. A medium effect size (Cohen's $f = 0.25$, equivalent to Cohen's $d = 0.5$) was specified based on previous Sub-Saharan African inclusive education infrastructure studies reporting effect sizes ranging from 0.22 to 0.48 for school-type comparisons (Majoko, 2024; Lwazi & Mambanga, 2024). Alpha was set at 0.05 (two-tailed) following conventional social science standards, with power set at 0.80 to balance Type I and Type II error risks while maintaining feasibility within resource constraints. These parameters yielded a minimum requirement of 24 schools (8 per group). The calculation assumed: three groups of equal size, normal distribution of outcome variables, and homogeneity of variance. To account for potential 20% non-response and ensure adequate power for subgroup analyses and regression models requiring additional degrees of freedom, the target sample was

increased to 35 schools, with 28 ultimately participating (response rate = 80%), exceeding the minimum requirement and providing power > 0.85 for planned analyses (Faul et al., 2009).

Stratified random sampling was employed with stratification by school type (primary/secondary), ownership (government/private/mission), and enrollment size (small/medium/large). Within each stratum, schools were randomly selected using computer-generated random numbers. Participant recruitment within schools followed purposive sampling for administrators and parents to ensure diverse perspectives, while all teachers working with learners with disabilities were invited to participate.

Data Collection Instruments

Quantitative Measures

School Infrastructure Assessment Tool (SIAT): A comprehensive 45-item structured assessment checklist adapted from the World Bank's Educational Infrastructure Assessment Protocol and validated for Sub-Saharan African contexts (reliability $\alpha = 0.91$). The SIAT evaluates four critical domains: physical accessibility (15 items), learning environment adaptations (12 items), safety and emergency provisions (8 items), and assistive technology availability (10 items). Items utilize a 4-point rating scale (0 = absent, 1 = inadequate, 2 = adequate, 3 = excellent) with domain scores calculated as means.

Teacher Self-Efficacy Scale for Inclusive Practices (TSESIP): A 24-item validated instrument measuring educator confidence in supporting learners with disabilities across three subscales: instructional practices, behavior management, and collaboration (Sharma et al., 2024). The instrument employs a 5-point Likert scale with higher scores indicating greater self-efficacy ($\alpha = 0.94$). Recent validation studies confirm strong psychometric properties across diverse cultural contexts.

Resource Adequacy Index (RAI): A custom 20-item assessment scale developed through expert consultation and pilot testing, evaluating availability and quality of specialized resources including adaptive materials, communication aids, mobility equipment, and therapeutic supports. Items are rated for both availability (yes/no) and adequacy (5-point scale) with composite scores calculated ($\alpha = 0.87$).

Qualitative Measures

Semi-structured interview guides were developed for three stakeholder groups: teachers (focusing on daily infrastructure experiences and professional needs), administrators (emphasizing policy implementation and resource management), and parents (addressing satisfaction, advocacy concerns, and family perspectives). Interview protocols incorporated open-ended questions exploring current infrastructure conditions, perceived barriers and facilitators, support needs, and recommendations for improvement.

Focus group discussion protocols for learners with developmental disabilities incorporated multiple communication modalities including visual supports, simplified language structures, extended response time, and assistive communication devices as needed. Sessions explored school experiences, accessibility challenges, environmental preferences, and suggestions for improvement while maintaining ethical standards for vulnerable population research.

Structured observation protocols guided systematic documentation of physical spaces, resource utilization patterns, and student-environment interactions across diverse school contexts. Observations occurred during regular instructional periods, transition times, and recreational activities to capture authentic usage patterns and identify environmental barriers or facilitators.

Data Collection Procedures

Research team preparation involved intensive 48-hour training covering mixed-methods methodology, disability awareness and cultural competence, ethical research principles, and systematic data collection protocols. The multidisciplinary team included experienced educational researchers, special education professionals, and disability advocacy representatives fluent in English, Shona, and Ndebele languages.

Pilot testing with four schools (excluded from the main study) refined instruments and procedures, identifying necessary cultural adaptations and logistical modifications. Pilot results informed simplification of language for certain assessment items, enhancement of visual support materials for learner interviews, and adjustment of time allocations for data collection activities.

Systematic data collection followed standardized protocols beginning with school-level orientation meetings, comprehensive infrastructure assessments, teacher surveys, and stakeholder interviews. Multiple quality assurance measures included inter-rater reliability checks ($\kappa = 0.89$ for observations), regular team debriefing sessions, ongoing supervision by senior researchers, and systematic documentation of procedural variations or challenges.

Data Analysis Plan

Quantitative Analysis

Comprehensive descriptive statistics characterized sample demographics, infrastructure conditions, and stakeholder experiences across all assessment domains. Normality testing using Shapiro-Wilk tests and visual inspection of histograms guided selection of appropriate parametric or non-parametric procedures. Chi-square tests examined categorical variable associations, while independent t-tests and one-way ANOVA compared mean scores across groups with post-hoc analyses using Bonferroni corrections.

Multiple regression analysis explored predictors of infrastructure adequacy, employing school characteristics (enrollment size, type, ownership, student-teacher ratio, years of operation) as independent variables and SIAT domain scores as dependent variables. Model assumptions were systematically evaluated, and effect sizes were calculated and reported for all significant findings using Cohen's d for t-tests, eta-squared for ANOVA, and adjusted R^2 for regression analyses.

Qualitative Analysis

Framework analysis following Ritchie and Spencer's systematic approach provided structured organization and interpretation of qualitative data (Gale et al., 2024). The five-stage process involved familiarization through repeated transcript reading, thematic framework identification through inductive coding, systematic data indexing, charting into framework matrices, and interpretation through pattern identification and explanation development.

NVivo 14 software facilitated comprehensive data management, coding processes, and analytical retrieval procedures. Inter-rater reliability was established through independent coding of 25% of transcripts by two trained researchers, achieving Cohen's kappa = 0.85, indicating substantial agreement. Member checking with selected participants validated interpretation accuracy and completeness of thematic development.

Mixed-Methods Integration

Convergent parallel design principles guided integration through systematic joint displays comparing quantitative and qualitative findings within each research question domain (Cameron et al., 2024). Meta-inferences were developed by identifying convergence areas, divergence points, and complementary insights between quantitative and qualitative data strands, enhancing overall validity and providing comprehensive understanding of infrastructure adequacy across multiple stakeholder perspectives.

Validity and Reliability Measures

Internal consistency reliability was assessed using Cronbach's alpha coefficients for all quantitative scales, with all instruments exceeding the 0.80 threshold indicating good reliability. Test-retest reliability was established through re-administration to a subset of participants after three weeks, demonstrating stability coefficients greater than 0.85 for all measures.

Content validity was ensured through comprehensive expert panel review involving special education professionals, infrastructure specialists, disability advocates, and measurement experts from Zimbabwean and regional institutions. Face validity was confirmed through extensive stakeholder consultation during instrument development and pilot testing phases.

Qualitative research validity was enhanced through multiple strategies including data source triangulation, prolonged field engagement, comprehensive contextual description, systematic audit trail maintenance, and reflexive practice documentation throughout the research process.

RESULTS

Participant Characteristics

The study encompassed 28 schools (18 primary, 10 secondary) serving 467 learners with developmental disabilities. School enrollment ranged from 198 to 2,134 students (M = 821, SD = 456), with disability prevalence varying from 1.2% to 9.7% per institution (M = 3.8%, SD = 2.3%). Government schools comprised 57% of the sample (n = 16), private schools 29% (n = 8), and mission schools 14% (n = 4).

Teacher participants (n = 189) demonstrated teaching experience ranging from 1-38 years (M = 11.3, SD = 7.8), with 31% holding specialized qualifications in special needs education. Administrative participants (n = 56) included headteachers, deputy heads, special needs coordinators, and department heads. Parent participants (n = 112) represented families of learners with intellectual disabilities (42%), autism spectrum disorders (34%), cerebral palsy (19%), and multiple developmental disabilities (5%).

Table 1: Participant and School Characteristics

Characteristic	Primary Schools (n=18)	Secondary Schools (n=10)	Total (n=28)
School Ownership			
Government	11 (61%)	5 (50%)	16 (57%)
Private	5 (28%)	3 (30%)	8 (29%)
Mission	2 (11%)	2 (20%)	4 (14%)
Student Enrollment			
Mean (SD)	634 (347)	1,142 (512)	821 (456)
Range	198-1,456	445-2,134	198-2,134
Learners with Disabilities			
Mean per school (SD)	15.2 (9.1)	21.7 (13.4)	17.6 (11.2)
Percentage of enrollment	3.4% (2.1%)	4.5% (2.6%)	3.8% (2.3%)
Teacher Participants			
Total	121	68	189
Years experience M(SD)	10.8 (7.2)	12.1 (8.9)	11.3 (7.8)
Special needs training	35 (29%)	23 (34%)	58 (31%)

Infrastructure Assessment Findings

Physical Accessibility

Physical accessibility assessments revealed substantial deficiencies across participating institutions. Only 21% of schools (n = 6) achieved adequate accessibility ratings according to SIAT criteria. Entrance accessibility presented challenges in 75% of schools, with architectural barriers including steps without ramps, narrow doorways preventing wheelchair access, and heavy doors requiring excessive force for operation.

Internal pathway accessibility within school premises was adequate in only 32% of institutions, with common barriers including uneven surfaces, stairs without alternative routes, narrow corridors impeding mobility device navigation, and protruding obstacles creating hazards for learners with visual or cognitive impairments. Specialized toilet facilities designed for accessibility were available in 18% of schools, while 64% provided no adapted sanitary facilities.

Recreational facility accessibility represented the most deficient domain, with 89% of schools offering no accessible playground equipment, sports facilities, or recreational spaces. This deficit significantly limits social participation and physical development opportunities for learners with developmental disabilities.

Statistical analysis revealed significant differences in accessibility scores by school ownership ($F(2,25) = 11.23$, $p < 0.001$, $\eta^2 = 0.47$), with private schools achieving higher ratings ($M = 2.3$, $SD = 0.7$) than government ($M = 1.6$, $SD = 0.6$) and mission schools ($M = 1.4$, $SD = 0.8$). School enrollment size demonstrated moderate positive correlation with accessibility scores ($r = 0.43$, $p = 0.021$), suggesting resource advantages for larger institutions.

Learning Environment Adaptations

Learning environment assessments documented widespread inadequacies in classroom modifications for learners with developmental disabilities. Specialized learning spaces were present in 36% of schools, typically consisting of repurposed regular classrooms without purpose-built features. Sensory environment considerations were addressed in 27% of learning spaces, primarily through basic interventions rather than comprehensive sensory design principles.

Visual support systems and environmental organization received consistently low ratings across all participating schools, with 71% lacking structured visual scheduling systems, clear spatial organization, or visual cues supporting learner independence and comprehension. Flexible seating arrangements accommodating diverse physical and behavioral needs were implemented in 39% of classrooms, though adaptations were frequently improvised rather than systematically planned.

Lighting and acoustic conditions, critical for learners with sensory processing difficulties common in autism spectrum disorders, met adequacy standards in only 34% of learning environments. Most classrooms relied exclusively on natural lighting without glare management or supplementation, while acoustic treatments were virtually absent across all institutions.

Assistive Technology and Resources

Assistive technology availability was severely constrained across all participating schools. Basic communication aids were accessible in 31% of institutions, typically consisting of picture communication cards or simple voice output devices. Computer technology with accessibility features was present in 19% of schools, though functionality was frequently compromised by inadequate maintenance and limited technical support capacity.

Mobility aids and adaptive equipment were available through school resources in only 11% of institutions, with most learners depending entirely on family-provided equipment. Specialized learning materials adapted for diverse learning styles and communication needs were present in 44% of schools, though quality and developmental appropriateness varied considerably.

The Resource Adequacy Index revealed mean scores of 1.9/5.0 across all schools (SD = 0.8), indicating systematically inadequate resource provision. Private schools achieved significantly higher scores (M = 2.6, SD = 0.9) compared to government schools (M = 1.7, SD = 0.7, p = 0.002, d = 1.14), reflecting substantial resource allocation disparities across school ownership types.

Human Resource Capacity

Teacher self-efficacy for inclusive practices demonstrated moderate levels across all assessed domains. Overall TSESIP scores ranged from 1.6 to 4.1 (M = 2.6, SD = 0.8), indicating significant opportunities for professional development enhancement. The instructional practices subscale achieved highest ratings (M = 2.9, SD = 0.9), while behavior management (M = 2.4, SD = 1.0) and collaboration (M = 2.5, SD = 0.9) subscales scored lower.

Correlation analyses revealed significant positive relationships between teacher self-efficacy and infrastructure quality ($r = 0.67$, $p < 0.001$), specialized training completion ($r = 0.61$, $p < 0.001$), and years of experience working with learners with disabilities ($r = 0.48$, $p = 0.003$). Multiple regression analysis indicated that infrastructure adequacy and specialized training accounted for 52% of variance in teacher self-efficacy scores ($F(2,186) = 78.4$, $p < 0.001$).

Administrative capacity for inclusive education coordination was limited, with 61% of schools lacking designated special needs coordinators and 78% reporting insufficient administrative time allocation for inclusion support activities. Professional development opportunities were inconsistent and inadequate, with 69% of teachers reporting no disability-specific training within the preceding three years.

Table 2: Infrastructure Assessment Scores by Domain and School Type

SIAT Domain	Government Schools M(SD)	Private Schools M(SD)	Mission Schools M(SD)	F-statistic	p-value	η^2
Physical Accessibility	1.3 (0.6)	2.3 (0.7)	1.2 (0.8)	11.23	<0.001	0.47
Learning Environment	1.5 (0.5)	2.4 (0.6)	1.4 (0.7)	14.67	<0.001	0.54
Safety Provisions	1.7 (0.7)	2.5 (0.5)	1.6 (0.6)	8.94	0.001	0.42
Assistive Technology	1.1 (0.4)	2.1 (0.8)	1.0 (0.3)	18.45	<0.001	0.60
Overall SIAT Score	1.4 (0.5)	2.3 (0.6)	1.3 (0.6)	15.78	<0.001	0.56

Note: Scores range from 0-3, with higher scores indicating better infrastructure adequacy. $p < 0.05$

Table 3: Multiple Regression Analysis Predicting Infrastructure Adequacy

Predictor Variable	B	SE B	β	t	P	95% CI
School Type (Private vs Gov)	0.74	0.16	0.58	4.63	<0.001	[0.41, 1.07]
School Type (Mission vs Gov)	-0.08	0.19	-0.05	-0.42	0.681	[-0.47, 0.31]
School Size (enrollment)	0.0004	0.0001	0.34	3.21	0.004	[0.0001, 0.0007]
Student-Teacher Ratio	-0.03	0.01	-0.27	-2.45	0.022	[-0.05, -0.004]

Years Established	0.01	0.005	0.22	2.15	0.042	[0.0003, 0.019]

Note: $R^2 = 0.76$, Adjusted $R^2 = 0.71$, $F(5,22) = 13.94$, $p < 0.001$.

Table 4: Correlation Matrix for Key Infrastructure and Capacity Variables

Variable	1	2	3	4	5	6
1. Physical Accessibility	-					
2. Learning Environment	0.71***	-				
3. Assistive Technology	0.64***	0.69***	-			
4. Teacher Self-Efficacy	0.67***	0.72***	0.58***	-		
5. School Enrollment	0.43*	0.39*	0.51**	0.34	-	
6. Years Established	0.38*	0.41*	0.29	0.45**	0.52**	-

*Note: *p < .05, **p < .01, ***p < .001. N = 28 schools.*

Table 5: Hierarchical Regression Analysis - Teacher Self-Efficacy Predictors

Step	Predictor Variables	B	SE B	B	ΔR^2	F Change
Step 1: Teacher Characteristics					0.24***	F(2,186) = 29.4***
	Years of experience	0.03	0.01	0.28**		
	Specialized training (yes/no)	0.45	0.12	0.31***		
Step 2: Infrastructure Quality					0.28***	F(1,185) = 76.8***
	Overall SIAT Score	0.82	0.09	0.59***		
Step 3: School Context					0.04*	F(2,183) = 5.2*
	School type (private vs. gov)	0.28	0.13	0.18*		
	School enrollment	0.0002	0.0001	0.15*		

*Note: Final model: $R^2 = 0.56$, Adjusted $R^2 = 0.52$, $F(5,183) = 46.3$, $p < .001$ *p < .05, **p < .01, ***p < .001*

Qualitative Themes

Stakeholder Perspectives on Infrastructure

Stakeholder Perspectives on Infrastructure Needs

Theme 1: Pervasive Infrastructure Deficiencies

Teachers universally identified physical accessibility as the most urgent infrastructure priority, describing daily challenges supporting learners with mobility limitations. A secondary school teacher articulated: "Every morning we face the same struggle helping students navigate stairs, narrow doorways, and inaccessible facilities. It undermines their dignity and independence while creating safety risks we cannot adequately address." Parents consistently emphasized how environmental barriers restricted their children's educational participation and social integration.

A parent of a child with cerebral palsy described: "My son has the intellectual ability to succeed, but the physical environment defeats him before learning even begins. No ramps, no accessible toilets, no appropriate seating. We carry him everywhere, and he feels the shame of that dependency every single day."

Theme 2: Creative Adaptation and Resource Improvisation

Across all participating schools, educators demonstrated remarkable creativity in addressing infrastructure limitations through improvised solutions. Innovations included teacher-created visual supports, modified furniture arrangements, peer buddy systems, and environmental modifications using locally available materials. While these adaptations reflected educator commitment and resourcefulness, they often lacked sustainability, consistency, and evidence-based design principles necessary for optimal learning support.

One primary school teacher explained: "We use cardboard boxes to create quiet corners, painted old tires for sensory activities, and hand-draw communication boards. It works somewhat, but we know these children deserve professionally designed materials and proper spaces."

Theme 3: Systemic Implementation Barriers

School administrators highlighted persistent challenges including inadequate funding allocations, complex procurement procedures, limited technical expertise for infrastructure planning, and competing budget priorities. Government school principals particularly emphasized resource constraints and bureaucratic barriers hindering infrastructure development, while private school administrators reported greater flexibility but limited specialized knowledge for inclusive design implementation.

A government school headteacher stated: "The policy says we must be inclusive, but where are the resources? We submit requests and wait months, sometimes years. Meanwhile, children with disabilities arrive, and we improvise with what we have, which is almost nothing."

Systemic Barriers and Facilitators

Theme 4: Policy-Implementation Disconnection

Despite legislative mandates for inclusive education, implementation remained fragmented and under-resourced across all school contexts. Administrators described policy documents providing general principles without practical guidance for infrastructure development, specific funding mechanisms, or realistic implementation timelines. The substantial gap between policy aspirations and operational realities created frustration and limited meaningful progress toward infrastructure improvement.

A district education officer observed: "The Education Amendment Act is beautiful on paper—full of rights and requirements. But it came with no implementation manual, no budget allocation formula, no technical support system. Schools are expected to transform overnight without the tools to do so."

Theme 5: Community and Family Influence

Family engagement emerged as both a significant barrier and powerful facilitator for infrastructure development. Highly engaged families effectively advocated for specific accommodations and drove school-level improvements, while families with limited awareness of rights and available supports struggled to access appropriate services. Community attitudes toward disability significantly influenced school receptiveness to

infrastructure investments, with stigma and misconceptions limiting demand for improvements in certain contexts.

A parent advocate explained: "When parents know their rights and push collectively, schools respond. But many families don't know what's possible or feel intimidated by the system. And in communities where disability is still seen as curse or punishment, there's no pressure for schools to change."

Theme 6: Professional Agency and Collaborative Innovation

Despite systemic constraints, educators demonstrated remarkable professional agency through collaborative problem-solving, informal mentoring networks, and grassroots advocacy for infrastructure improvements. Teacher-led initiatives included peer support groups, resource sharing networks, and collective advocacy for administrative support, partially compensating for formal system limitations.

Teachers across multiple schools described informal WhatsApp groups where they shared adaptation ideas, homemade materials, and behavioral strategies. One teacher noted: "Administration may not provide what we need, but we provide for each other. We've built our own support system because the official one doesn't exist."

Mixed-Methods Integration Results

Integration of quantitative and qualitative findings revealed convergent evidence of systematic infrastructure inadequacy across all assessment domains. Quantitative documentation of low accessibility ratings aligned closely with qualitative descriptions of daily challenges faced by learners with disabilities and their support networks. Similarly, Resource Adequacy Index scores correlated strongly with detailed qualitative accounts of improvisation and adaptation necessitated by resource shortages.

Areas of methodological divergence emerged regarding teacher capacity and institutional support. While quantitative self-efficacy scores suggested moderate confidence levels, qualitative interviews revealed deeper professional concerns about competence, support adequacy, and system capacity that standardized measures failed to capture fully. This divergence highlighted the complexity of educator experiences and the importance of mixed-methods approaches for comprehensive understanding.

Qualitative data provided essential contextualization for quantitative findings, revealing systemic factors influencing infrastructure conditions including policy implementation challenges, resource allocation processes, community dynamics, and cultural considerations. This integration enhanced understanding of both infrastructure adequacy extent and complex factors perpetuating current conditions.

The 42% infrastructure gap between private and government schools, while quantitatively significant, gained deeper meaning through qualitative exploration of underlying socioeconomic dynamics, differential access to technical expertise, and systemic inequities in resource distribution mechanisms.

DISCUSSION

Key Findings in Context

This comprehensive mixed-methods assessment documents critical infrastructure deficiencies that fundamentally compromise educational access, participation, and outcomes for learners with developmental disabilities in Masvingo urban schools. With only 21% of institutions meeting basic accessibility standards and systematic shortages across specialized resources, learning environment adaptations, and support systems, current conditions represent a profound barrier to meaningful inclusive education implementation.

The severity of documented infrastructure inadequacies reflects broader systemic challenges within Zimbabwe's education system, compounded by the additional requirements necessary for supporting learners with developmental disabilities (Chimhenga, 2024). The finding that 89% of schools provide no accessible recreational facilities and 82% lack adapted sanitary accommodations represents a fundamental failure to recognize the basic dignity and participation rights of learners with disabilities.

Universal Design for Learning principles are largely absent from current infrastructure planning and implementation processes, with learning environments designed for narrow ability ranges rather than diverse learner needs (Meyer et al., 2024). The documented absence of flexible learning spaces, comprehensive sensory considerations, and systematic visual supports indicates limited understanding of environmental factors' critical influence on learning outcomes for students with developmental disabilities.

Resource disparities between school ownership types, with private institutions scoring 42% higher on infrastructure adequacy measures, highlight systemic inequities that potentially violate constitutional principles of equal educational access and contravene Zimbabwe's CRPD obligations (United Nations, 2006). These disparities suggest that meaningful inclusive education remains a privilege of economic advantage rather than a fundamental right accessible to all learners with disabilities.

Novel Theoretical Integration: The Infrastructure-Capacity-Equity (ICE) Framework

This research advances inclusive education theory by proposing the Infrastructure-Capacity-Equity (ICE) Framework, which conceptualizes inclusive education implementation as an interconnected system where three dimensions mutually reinforce or constrain one another:

Infrastructure Dimension: Physical, technological, and material resources that create enabling or disabling environments, extending beyond traditional accessibility to encompass Universal Design for Learning principles, sensory accommodations, and assistive technology integration.

Capacity Dimension: Human resources including educator self-efficacy, specialized knowledge, collaborative competencies, and institutional leadership commitment that transform infrastructure into effective inclusive practices.

Equity Dimension: Socioeconomic factors, policy mechanisms, resource allocation systems, and power dynamics that determine who accesses quality infrastructure and capacity development, recognizing that inclusion cannot be achieved without addressing systemic inequities.

The documented 0.67 correlation between infrastructure adequacy and teacher self-efficacy empirically supports the framework's premise that these dimensions are interdependent rather than independent intervention targets. Infrastructure investments without concurrent capacity development yield underutilized resources, while capacity building without adequate infrastructure creates professional frustration and limited effectiveness—patterns clearly evident in this study's mixed-methods findings.

Most critically, the 42% private-public infrastructure gap demonstrates how the equity dimension fundamentally shapes access to the other two dimensions, creating stratified inclusion where disability rights realization depends on socioeconomic privilege rather than universal entitlement. This framework suggests that effective inclusive education policy must simultaneously address all three dimensions through integrated, equity-focused interventions rather than piecemeal approaches targeting isolated elements.

The ICE Framework provides analytical tools for understanding persistent implementation challenges in resource-constrained contexts and designing comprehensive interventions that recognize interdependencies between infrastructure, capacity, and equity dimensions. Future research should test this framework's applicability across diverse geographic and cultural contexts while refining measurement approaches for capturing complex interactions between dimensions.

Implications for Learners with Developmental Disabilities

The documented infrastructure deficits carry profound implications extending beyond immediate educational access to encompass long-term developmental outcomes, social inclusion prospects, and human rights realization for learners with developmental disabilities. Physical inaccessibility creates systematic dependence on others for basic mobility and facility access, fundamentally undermining autonomy development and self-

determination that constitute essential foundations for healthy development and future independence (Shogren et al., 2024).

The absence of appropriate learning environment adaptations particularly impacts learners with autism spectrum disorders and intellectual disabilities, populations requiring structured, predictable environments with clear visual supports and sensory accommodations (Carnahan et al., 2024). Current classroom conditions may exacerbate behavioral challenges, increase anxiety and stress responses, and significantly limit learning potential for students already facing cognitive and adaptive challenges.

Severely limited assistive technology and communication aid availability restricts meaningful participation in learning activities and social interactions, potentially contributing to academic underachievement, social isolation, and reduced post-school employment and independence outcomes (Bouck & Park, 2024). Research demonstrates that appropriate assistive technology support significantly improves not only academic achievement but also social participation, communication effectiveness, and overall quality of life for individuals with developmental disabilities.

The moderate teacher self-efficacy levels documented in this study, while concerning, likely represent realistic professional assessments given inadequate infrastructure and resource support contexts. Educators cannot effectively implement evidence-based inclusive practices without appropriate environmental conditions, specialized materials, and technological supports, creating cycles of limited confidence, reduced expectations, and diminished outcomes for learners with disabilities (De Vroey et al., 2023).

Comparison with International Evidence

Infrastructure conditions documented in Masvingo schools compare unfavorably with international benchmarks and best practice examples from both developed and developing country contexts. While acknowledging economic constraints and development priorities, the extent of infrastructure inadequacy exceeds patterns reported in comparable Sub-Saharan African countries with similar resource profiles (Majoko, 2024).

Regional success stories demonstrate feasible progress despite resource limitations. Ghana's systematic inclusive education infrastructure development achieved accessibility improvements across 800 schools within five years through strategic planning, international partnership, and phased implementation approaches (Agbenyega & Deku, 2024). Kenya's universal primary education initiative incorporated specific disability provisions, resulting in measurable infrastructure enhancements and increased enrollment of learners with disabilities despite economic constraints (Ngugi, 2023).

Developed country examples, while resource-intensive, provide aspirational models and demonstrate long-term benefits of comprehensive infrastructure investment. Research from the United States, Canada, and Australia illustrates how systematic UDL implementation and comprehensive accessibility modifications yield improved outcomes for all learners while reducing long-term special education costs (Thompson et al., 2024).

However, direct transplantation of developed-country models proves neither feasible nor appropriate for Zimbabwean contexts, necessitating innovative, culturally responsive approaches that balance international standards with local resource realities and cultural considerations (Chataika, 2023).

Policy and Practice Implications

These findings demand immediate policy attention and coordinated intervention to address documented infrastructure deficits. Current policy frameworks, while establishing important legal foundations, lack specificity regarding infrastructure standards, implementation timelines, and resource allocation mechanisms necessary for systematic improvement (Mubika & Bukaliya, 2024).

Infrastructure Standards Development: Zimbabwe requires comprehensive, contextually appropriate accessibility standards that address physical accessibility, learning environment design, resource requirements,

and technology integration while remaining feasible within local resource constraints. These standards should provide clear benchmarks for assessment, improvement planning, and quality assurance processes.

Resource Allocation Reform: Current funding mechanisms inadequately address additional costs associated with inclusive education infrastructure development. Dedicated budget allocations for disability-related accommodations, streamlined procurement processes, and technical support systems are essential for systematic, sustainable improvement.

Teacher Preparation Enhancement: The documented correlation between teacher self-efficacy and infrastructure quality highlights the critical importance of integrated approaches combining infrastructure development with comprehensive professional preparation. Teacher education programs must incorporate practical experience with accessible environments and specialized resources to build authentic competence and confidence for inclusive practice implementation.

Community Engagement Strategies: Given family and community influence on infrastructure development documented in this study, systematic engagement and advocacy capacity building initiatives are essential. Parent education programs, disability awareness campaigns, and community partnership development should accompany infrastructure interventions to ensure sustainability and social acceptance.

Study Limitations

Several methodological limitations require acknowledgment in interpreting these findings. The cross-sectional design provides infrastructure condition snapshots without capturing temporal changes, seasonal variations, or long-term sustainability patterns that may influence accessibility and resource availability across different time periods.

Rural-Urban Disparities and Socioeconomic Considerations

The urban focus creates significant generalizability constraints given that approximately 67% of Zimbabwe's population resides in rural areas (Zimbabwe National Statistics Agency, 2024), where infrastructure challenges are substantially more severe. Rural schools face compounded disadvantages including: limited electricity access (available in only 15% of rural schools nationally compared to 89% in urban areas); inadequate water and sanitation facilities; geographic isolation from specialized services and technical expertise; poor road infrastructure limiting transportation of equipment and materials; and reduced access to internet connectivity essential for modern assistive technologies (Ministry of Primary and Secondary Education, 2024).

The documented 42% infrastructure adequacy gap between private and government schools reflects broader socioeconomic stratification within Zimbabwe's education system and warrants deeper analysis. Private school advantages stem from multiple intersecting factors: higher per-pupil expenditures (approximately USD $800-2,400 annually versus USD $180-250 in government schools); greater autonomy in resource allocation decisions; access to international partnerships and donor funding; ability to recruit specialized personnel through competitive compensation; and enrollment of families with higher socioeconomic status who provide additional advocacy pressure and supplementary resources.

This disparity raises critical equity concerns. If meaningful inclusive education requires infrastructure investments achievable primarily in private institutions serving economically advantaged families, disability inclusion becomes effectively stratified by socioeconomic status, fundamentally contradicting principles of inclusive education as a universal right (United Nations, 2006). Government schools serving 89% of Zimbabwe's learners with disabilities cannot reasonably achieve inclusive education mandates without substantially increased resource allocation and technical support systems.

Future research should employ mixed urban-rural sampling designs with stratification by geographic location, systematic comparison of infrastructure patterns and implementation challenges across contexts, examination of innovative low-cost adaptations emerging in resource-constrained rural settings, and comprehensive cost-benefit analyses exploring economically feasible intervention models scalable across diverse socioeconomic contexts.

Additionally, critical policy analysis examining resource allocation mechanisms, funding formulas, and structural factors perpetuating disparities would inform equity-focused reform initiatives.

Potential selection bias may influence findings, as schools consenting to participate might differ systematically from those declining involvement. Institutions with more severe infrastructure deficits might be less willing to participate due to concerns about negative assessment outcomes, potentially leading to underestimation of infrastructure inadequacy severity across the broader school population.

Response bias represents another methodological limitation, as stakeholders might provide socially desirable responses regarding infrastructure adequacy and inclusive practices implementation. While the mixed-methods approach partially addresses this concern through triangulation across data sources and methods, systematic bias toward positive reporting remains possible, particularly in contexts where participants perceive assessment as evaluative rather than developmental.

Measurement limitations include reliance on adapted rather than indigenously developed instruments, which may not fully capture contextual factors unique to Zimbabwe's educational and cultural environment. Although comprehensive validation procedures were conducted, ongoing cultural adaptation challenges remain inherent in cross-cultural research applications.

Finally, the focus on developmental disabilities specifically may limit applicability to broader disability categories, as learners with sensory impairments, physical disabilities, or other conditions may require different infrastructure accommodations and support systems not fully addressed in this assessment framework.

Dissemination Strategy and Pilot Intervention Framework

Targeted Academic Dissemination

To maximize research impact, findings should be disseminated through multiple specialized forums:

African Education Journals: Submit to *African Educational Research Journal*, *Journal of Education in Developing Areas*, *African Journal of Disability*, and *Zimbabwe Journal of Educational Research* to reach regional scholars and policymakers.

International Disability Studies Venues: Present at the African Network on Evidence-to-Action in Disability Conference, International Society for Augmentative and Alternative Communication Conference, and Division of International Special Education and Services (DISES) symposia.

Policy Forums: Engage with Southern African Development Community (SADC) education ministers' meetings, African Union Continental Education Strategy Technical Working Groups, and UNESCO regional inclusive education initiatives.

Practitioner Channels: Publish accessible summaries in *Teaching Exceptional Children Global*, disseminate through Special Olympics Africa networks, and partner with disability rights organizations for community-level dissemination.

Proposed Pilot Intervention: Masvingo Inclusive Infrastructure Initiative (MI^3)

Building on study findings, we propose a three-year phased pilot intervention targeting 10 participating schools (stratified by type) with comprehensive evaluation:

Phase 1 (Months 1-6): Foundation Building

- Conduct participatory infrastructure planning workshops with school stakeholders
- Establish school-level inclusive education committees with parent and disability advocate representation

- Deliver intensive professional development (40 hours) combining inclusive pedagogy theory with practical accommodation strategies
- Develop school-specific infrastructure improvement plans with costed timelines

Phase 2 (Months 7-18): Infrastructure Modernization

- Implement priority physical accessibility modifications using standardized design protocols
- Establish school-based assistive technology resource centers with maintenance systems
- Create sensory-friendly learning spaces incorporating UDL principles
- Deploy visual support systems and environmental organization throughout schools
- Initiate monthly collaborative consultation sessions for ongoing problem-solving

Phase 3 (Months 19-36): Sustainability and Expansion

- Transition infrastructure maintenance to school-based systems with technical support
- Implement peer mentoring networks connecting pilot schools with expansion sites
- Document innovative low-cost adaptations for knowledge transfer
- Conduct rigorous outcome evaluation examining academic achievement, social participation, behavioral indicators, and stakeholder satisfaction

Evaluation Framework:

- Pre-post infrastructure assessments using SIAT with six-month intervals
- Longitudinal learner outcome tracking (academic, behavioral, social domains)
- Quarterly teacher self-efficacy measurements with qualitative implementation logs
- Cost-effectiveness analysis comparing investment to outcomes across school types
- Comparative analysis with matched non-intervention control schools
- Mixed-methods process evaluation documenting implementation facilitators, barriers, and adaptations

Evaluation results will inform evidence-based scaling strategies, refined cost models, and policy recommendations for national-level implementation. Partnership with University of Zimbabwe and international disability organizations will ensure methodological rigor and sustainable capacity development beyond intervention period.

CONCLUSIONS

Summary of Main Findings

This comprehensive mixed-methods investigation reveals critical infrastructure deficiencies that fundamentally undermine inclusive education implementation for learners with developmental disabilities across Masvingo urban schools. With fewer than one in four institutions meeting basic accessibility standards and systematic shortages across specialized learning environments, assistive technologies, and support resources, current conditions represent a significant barrier to meaningful educational inclusion and human rights realization.

Convergent evidence from quantitative assessments and qualitative stakeholder perspectives confirms that infrastructure inadequacy operates systemically rather than in isolated instances, affecting physical accessibility, learning environment design, resource provision, and human capacity across all participating schools. These deficiencies carry profound implications extending beyond immediate educational access to encompass long-term developmental outcomes, social inclusion prospects, and post-school independence for learners with disabilities.

Systemic factors perpetuating these conditions include policy implementation gaps, inadequate resource allocation mechanisms, limited technical expertise, insufficient community engagement, and substantial disparities between school ownership types. The complex interaction between infrastructure limitations and educator capacity constraints creates reinforcing cycles of reduced confidence, lowered expectations, and diminished outcomes for learners with developmental disabilities.

However, the study also documents remarkable creativity, commitment, and collaborative innovation among educators, families, and administrators working within constrained systems. These strengths provide important foundations for improvement efforts while highlighting the urgent need for systematic support to realize existing potential and commitment across the education system.

RECOMMENDATIONS

Immediate Actions (0-12 months)

Basic Accessibility Enhancement: Prioritize fundamental accessibility modifications including ramp installation at school entrances and between levels, doorway widening to accommodate mobility devices, accessible toilet facility development, and pathway improvement to ensure safe navigation. These modifications can be implemented cost-effectively using local materials and labor while providing immediate participation benefits for learners with mobility impairments.

Emergency Safety Protocol Development: Establish comprehensive emergency evacuation and safety procedures specifically addressing needs of learners with mobility limitations, cognitive impairments, and communication challenges. Install basic safety equipment, develop clear evacuation routes with visual supports, and implement staff training protocols for disability-inclusive emergency response procedures.

Intensive Teacher Professional Development: Launch systematic professional development programs emphasizing practical skills for supporting learners with developmental disabilities within existing infrastructure constraints. Programs should focus on environmental modification techniques, visual support system development, behavioral intervention strategies, and collaborative teaming approaches that can be implemented immediately while long-term infrastructure improvements proceed.

Medium-term Strategies

Systematic Infrastructure Upgrade Implementation: Develop and execute comprehensive school-by-school infrastructure improvement plans based on standardized assessment protocols and evidence-based design principles. Prioritize interventions with greatest impact on learner participation and implement phased upgrade schedules with dedicated funding allocations and technical support systems.

Specialized Resource Procurement and Distribution: Establish centralized procurement systems for assistive technologies, adaptive materials, communication aids, and specialized equipment. Develop regional resource centers providing equipment loans, maintenance services, training support, and technical assistance to ensure optimal utilization and sustainability of investments.

Comprehensive Professional Development Programming: Implement systematic teacher preparation and continuing education initiatives addressing inclusive education theory, evidence-based instructional strategies, disability-specific interventions, and collaborative consultation approaches. Include mentorship components, peer support networks, and ongoing coaching to enhance learning transfer and sustained implementation.

Community Engagement and Advocacy Development: Launch comprehensive community awareness and engagement programs involving parent education, disability rights advocacy training, and community partnership development. Establish parent support networks, community advisory committees, and stakeholder collaboration mechanisms to ensure sustainable infrastructure improvements and social acceptance.

Long-term Vision

Comprehensive Policy Framework Development: Develop integrated policy frameworks establishing specific infrastructure standards, implementation timelines, funding mechanisms, and accountability systems for inclusive education. Incorporate these standards into broader education quality assurance processes, teacher preparation requirements, and school accreditation systems to ensure systematic compliance and continuous improvement.

Sustainable Financing Mechanism Establishment: Create dedicated, sustainable funding streams for inclusive education infrastructure through government budget allocation, international development partnerships, innovative financing mechanisms, and public-private collaborations. Develop transparent resource allocation processes, cost-sharing arrangements, and performance-based funding systems to ensure efficient resource utilization and accountability.

Regional Center of Excellence Development: Establish Masvingo Province as a regional center of excellence for inclusive education infrastructure, providing technical assistance, training resources, and model demonstration sites for other provinces and regional countries. Develop research capacity, policy analysis expertise, and international collaboration networks to advance inclusive education knowledge and practice across the Southern African Development Community region.

Innovation and Technology Integration: Invest in appropriate technology solutions adapted for resource-constrained environments, including low-cost assistive devices, mobile technology applications, distance learning capabilities, and innovative environmental modification approaches. Develop local capacity for technology adaptation, maintenance, and ongoing innovation to ensure sustainability and cultural appropriateness.

Future Research Directions

Longitudinal Impact Assessment Studies: Conduct comprehensive longitudinal investigations examining relationships between infrastructure improvements and educational outcomes for learners with developmental disabilities across academic achievement, social inclusion, behavioral development, and post-school transition domains. These studies should track individual learner progress over multiple years while documenting environmental changes and intervention implementations.

Economic Analysis and Cost-Effectiveness Research: Undertake rigorous economic evaluations comparing costs and benefits of different infrastructure intervention approaches, assistive technology solutions, and professional development strategies. Develop cost-effectiveness models to guide resource allocation decisions and demonstrate economic benefits of inclusive education investments for policy advocacy and funding justification.

Rural-Urban Comparative Infrastructure Studies: Expand assessment methodology to rural school contexts to understand infrastructure challenges, resource constraints, and intervention needs across different geographic and demographic contexts. Compare urban-rural patterns, identify unique challenges and opportunities, and develop context-specific intervention strategies appropriate for diverse settings.

Technology Innovation and Adaptation Research: Investigate culturally appropriate, economically feasible technology solutions for supporting learners with developmental disabilities in Sub-Saharan African contexts. Explore low-cost assistive device development, mobile application adaptation, and innovative environmental modification approaches that maximize impact within resource constraints.

Regional Collaborative Research Networks: Establish multi-country research collaborations across Southern Africa to compare infrastructure conditions, policy implementation approaches, and intervention effectiveness across different national contexts. Develop regional benchmarks, share successful strategies, and create collaborative learning networks for accelerated progress toward inclusive education goals.

Closing Statement

This investigation provides essential evidence documenting the urgent need for comprehensive infrastructure improvements to realize inclusive education commitments for learners with developmental disabilities in Zimbabwe. While challenges are substantial, the documented creativity, commitment, and collaborative potential across stakeholders provide important foundations for transformative change. Success requires coordinated action across policy, practice, and community domains, supported by sustained commitment to human rights principles and evidence-based intervention approaches.

The path toward truly inclusive education infrastructure demands recognition that accessibility is not a luxury or add-on accommodation, but a fundamental requirement for educational equity and human dignity. This study provides the empirical foundation necessary to guide these essential efforts while emphasizing the moral imperative and practical urgency of immediate action to address documented inequities and barriers facing learners with developmental disabilities across Zimbabwe's education system.

REFERENCES

1. Agbenyega, J. S., & Deku, P. (2024). Inclusive education policy implementation in Ghana: Progress, challenges and sustainability factors. International Journal of Inclusive Education, 28(3), 412-428. https://doi.org/10.1080/13603116.2023.2187456
2. Ainscow, M., Booth, T., Dyson, A., Farrell, P., Frankham, J., Gallannaugh, F., Howes, A., & Smith, R. (2024). Improving schools, developing inclusion: A systematic review. Educational Review, 76(2), 234-251. https://doi.org/10.1080/00131911.2023.2278934
3. American Association on Intellectual and Developmental Disabilities. (2024). Intellectual disability: Definition, diagnosis, classification, and systems of supports (13th ed.). AAIDD.
4. Bouck, E. C., & Park, J. (2024). Assistive technology for students with disabilities: A comprehensive review of research and practice. Remedial and Special Education, 45(1), 67-82. https://doi.org/10.1177/07419325231195467
5. Cameron, R., Sankaran, S., & Scales, J. (2024). Mixed methods research design: Advanced approaches for complex investigations. Sage Publications.
6. Carnahan, C. R., Basham, J. D., & Musti-Rao, S. (2024). Universal Design for Learning and students with autism spectrum disorder: A systematic review. Focus on Autism and Other Developmental Disabilities, 39(1), 23-38. https://doi.org/10.1177/10883576231208945
7. Chataika, T. (2023). Disability and development in Sub-Saharan Africa: Progress, challenges and future directions. African Journal of Disability, 12(1), 1-15. https://doi.org/10.4102/ajod.v12i0.967
8. Chimedza, R. (2024). Teacher preparedness for inclusive education in Zimbabwe: Current status and professional development needs. Zimbabwe Journal of Educational Research, 36(2), 189-205.
9. Chimhenga, S. (2024). Educational policy reform and inclusive education in post-independence Zimbabwe: Achievements and persistent challenges. Journal of Educational Policy Analysis, 42(3), 234-251. https://doi.org/10.1080/02680939.2024.2145678
10. Chindimba, A. (2024). Prevalence and identification of developmental disabilities in Zimbabwe: Challenges and opportunities. African Journal of Special Needs Education, 28(1), 45-62.
11. Creswell, J. W., & Plano Clark, V. L. (2024). Designing and conducting mixed methods research (4th ed.). Sage Publications.
12. De Vroey, A., Struyf, E., & Petry, K. (2023). Secondary schools included: A literature review. International Journal of Inclusive Education, 27(2), 178-197. https://doi.org/10.1080/13603116.2022.2045953
13. Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. Behavior Research Methods, 39(2), 175-191. https://doi.org/10.3758/BRM.41.4.1149

14. Flanagan, S., Bouck, E. C., & Richardson, J. (2024). Technology integration in special education: A systematic review of implementation factors. Exceptional Children, 90(2), 145-162. https://doi.org/10.1177/00144029231201234
15. Florian, L., & Beaton-Greenberg, S. (2024). Inclusive pedagogy: From understanding to action. Teaching and Teacher Education, 135, 104-118. https://doi.org/10.1016/j.tate.2023.104234
16. Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2024). Using the framework method for qualitative data analysis in health research: Updated guidance and methodological developments. BMC Medical Research Methodology, 24(1), 78. https://doi.org/10.1186/s12874-024-02191-5
17. Government of Zimbabwe. (2020). Education Amendment Act 2020. Government Printers.
18. Hapanyengwi-Chemhuru, O., & Makuvaza, N. (2023). Special needs education in Zimbabwe: Historical perspectives and contemporary challenges. University of Zimbabwe Publications.
19. Hehir, T., Grindal, T., Freeman, B., Lamoreau, R., Borquaye, Y., & Burke, S. (2024). A summary of the evidence on inclusive education. Harvard Graduate School of Education.
20. Jaravaza, D. C., & Chitate, H. (2024). Implementation challenges of inclusive education policy in Zimbabwe: A multi-stakeholder perspective. Educational Management Administration & Leadership, 52(2), 289-307. https://doi.org/10.1177/1741143X23201456
21. Knight, V., & Hutzler, K. (2024). Systematic instruction for students with autism spectrum disorder: A comprehensive review. Focus on Autism and Other Developmental Disabilities, 39(2), 89-104. https://doi.org/10.1177/10883576231195123
22. Lamichhane, K., & Kamal, M. (2024). Persons with disabilities and the UN Convention: Global implementation progress and challenges. Disability & Society, 39(3), 445-463. https://doi.org/10.1080/09687599.2023.2189234
23. Lwazi, M., & Mambanga, P. (2024). Educational infrastructure and inclusive education in Southern Africa: A comparative analysis. Compare: A Journal of Comparative and International Education, 54(1), 67-85. https://doi.org/10.1080/03057925.2023.2198765
24. Majoko, T. (2024). Inclusive education in Sub-Saharan Africa: Progress, challenges and the way forward. International Journal of Educational Development, 105, 102-115. https://doi.org/10.1016/j.ijedudev.2024.102934
25. Maulik, P. K., Mascarenhas, M. N., Mathers, C. D., Dua, T., & Saxena, S. (2011). Prevalence of intellectual disability: A meta-analysis of population-based studies. Research in Developmental Disabilities, 32(2), 419-436. https://doi.org/10.1016/j.ridd.2010.12.018
26. Meyer, A., Rose, D. H., & Gordon, D. (2024). Universal Design for Learning: Theory and practice (Updated edition). CAST Professional Publishing.
27. Ministry of Primary and Secondary Education. (2024). Annual report on inclusive education implementation 2023. Government of Zimbabwe.
28. Mubika, A. K., & Bukaliya, R. (2024). Policy implementation challenges in inclusive education: The case of Zimbabwe's Education Amendment Act 2020. International Journal of Educational Policy Research and Review, 11(1), 23-39.
29. Munyi, E. W. (2024). Cultural perspectives on disability in Sub-Saharan Africa: Implications for inclusive education. African Educational Research Journal, 12(2), 178-194.
30. Mushoriwa, T. (2024). Special schools versus mainstream inclusion: Stakeholder perspectives in Zimbabwe. International Journal of Special Education, 39(1), 56-73.
31. Mutepfa, M. M., Mpofu, E., & Chataika, T. (2023). Inclusive education research in Zimbabwe: A systematic review of progress and gaps. Zimbabwe Journal of Educational Research, 35(3), 245-268.
32. Ngugi, M. (2023). Universal primary education and disability inclusion in Kenya: Achievements and persistent challenges. International Journal of Educational Development, 98, 102-118. https://doi.org/10.1016/j.ijedudev.2023.102734
33. Schalock, R. L., Luckasson, R., Tassé, M. J., & Verdugo, M. A. (2024). Intellectual disability: Definition, diagnosis, classification, and systems of supports (13th ed.). American Association on Intellectual and Developmental Disabilities.
34. Sharma, U., Aiello, P., Pace, E. M., Round, P., & Subban, P. (2024). In-service teachers' attitudes, concerns, efficacy and intentions to teach in inclusive classrooms: An international comparison. Journal of Educational Change, 25(1), 87-113. https://doi.org/10.1007/s10833-023-09489-1

35. Shogren, K. A., Burke, K. M., Anderson, M. H., Antosh, A. A., Wehmeyer, M. L., LaPlante, T., & Shaw, L. A. (2024). Self-determination and students with intellectual and developmental disabilities: A meta-analysis of intervention research. Research and Practice for Persons with Severe Disabilities, 49(1), 34-52. https://doi.org/10.1177/15407969231201567
36. Singal, N., & Salifu, E. M. (2024). The promise and reality of inclusive education in Sub-Saharan Africa: A critical analysis. Compare: A Journal of Comparative and International Education, 54(2), 234-252. https://doi.org/10.1080/03057925.2023.2187234
37. Szumski, G., & Karwowski, M. (2023). Academic achievement of students without special educational needs in inclusive classrooms: A meta-analysis update. Educational Research Review, 40, 100-118. https://doi.org/10.1016/j.edurev.2023.100523
38. Taderera, C. (2024). Resource allocation and inclusive education in Zimbabwe: Equity concerns and policy implications. Zimbabwe Journal of Educational Research, 36(3), 289-307.
39. Thompson, J. R., Wehmeyer, M. L., Hughes, C., Shogren, K. A., Palmer, S. B., & Seo, H. (2024). The supports paradigm and intellectual disability: Current research and future directions. Intellectual and Developmental Disabilities, 62(1), 45-67. https://doi.org/10.1352/1934-9556-62.1.45
40. UNESCO. (2023). Global Education Monitoring Report 2023: Technology in education - A tool on whose terms? UNESCO Publishing.
41. United Nations. (2006). Convention on the Rights of Persons with Disabilities. Treaty Series, 2515, 3.
42. World Health Organization. (2011). World report on disability. WHO Press.
43. Zimbabwe National Statistics Agency. (2024). Population and housing census 2022: Disability report. ZIMSTAT.