International Journal of Academic Management Science Research (IJAMSR)
ISSN: 2643-900X
Vol. 10 Issue 3 March - 2026, Pages: 82-89

Optimizing the Learning Environment for Competence-Based Curriculum Implementation in Uganda: A Multifaceted Imperative

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Abstract: *This study examined the extent to which learning environments in selected Ugandan secondary schools were optimized for the effective implementation of the Competence-Based Curriculum (CBC), introduced for lower secondary education in 2020 by the Ministry of Education and Sports. Anchored in a concurrent mixed-methods research design, the study was conducted across 320 teachers and 12 school administrators drawn from government-aided and private secondary schools in four purposively selected districts — Kampala, Wakiso, Mbarara, and Gulu — representing urban, peri-urban, and rural school contexts. Data were collected through a validated structured questionnaire with five-point Likert-scale items, an observation checklist, and semi-structured interview guides, and were analyzed using univariate descriptive statistics, bivariate correlation and independent samples t-tests, and two-level hierarchical linear modeling (HLM) in MLwiN, complemented by thematic analysis of qualitative data. The study was guided by three specific objectives: to assess the adequacy of physical infrastructure and instructional resources, to evaluate teacher pedagogical preparedness, and to examine the alignment between classroom assessment practices and CBC competency outcomes. The findings revealed that all three learning environment constructs recorded composite mean scores below the scale midpoint, indicating pervasive inadequacy across physical infrastructure ($M = 2.13$), teacher pedagogical preparedness ($M = 2.83$), and assessment practice alignment ($M = 2.34$). Bivariate analysis demonstrated that all three constructs were significantly and positively correlated with CBC implementation effectiveness ($r = .512$ to $.648$, $p < .001$), and independent samples t-tests revealed statistically significant and practically large mean differences in implementation effectiveness favoring private over government-aided schools ($t = -6.41$, $p < .001$, $d = 0.75$) and urban over rural schools ($t = -9.47$, $p < .001$, $d = 1.11$). The hierarchical linear model, which accounted for the nested structure of teachers within schools, established an intraclass correlation of .305, confirming substantial between-school variance, and identified teacher pedagogical preparedness ($\beta = 0.34$, $p < .001$) as the strongest individual-level predictor of CBC implementation effectiveness, followed by assessment practice alignment ($\beta = 0.25$, $p < .001$) and physical infrastructure adequacy ($\beta = 0.18$, $p < .001$), while school location ($\beta = 0.44$, $p < .001$) and school type ($\beta = 0.31$, $p < .01$) emerged as significant school-level contextual predictors, with the full model explaining approximately 42% of total variance. The study concluded that optimizing the learning environment for CBC implementation in Uganda constituted a multifaceted systemic imperative, and recommended accelerated equity-targeted infrastructure investment, a redesign of CBC-specific teacher professional development programs with a focus on pedagogical and assessment competence, and the institutionalization of a national CBC Assessment Alignment Framework to bridge the documented gap between curriculum policy intentions and classroom realities.*

Keywords: Competence-Based Curriculum, Learning Environment, CBC Implementation, Teacher Pedagogical Preparedness, Hierarchical Linear Modeling

Introduction

Education systems across the globe are increasingly shifting from knowledge-transmission models toward competence-based approaches that prioritize the application of skills, attitudes, and knowledge in real-life contexts. Uganda is no exception to this global transformation. In 2020, the Government of Uganda, through the National Curriculum Development Centre (NCDC) and the Ministry of Education and Sports (MoES), rolled out the Competence-Based Curriculum (CBC) for lower secondary education, marking a decisive departure from the content-heavy, examination-oriented curriculum that had long characterized the Ugandan education system (Gracious Kazaara & Julius, 2025; Julius & Audrey, 2025a; Lozano et al., 2022). This reform was driven by the recognition that the previous curriculum was inadequate in equipping learners with the practical competencies needed to navigate the demands of the 21st century, including critical thinking, creativity, communication, collaboration, and digital literacy (Rosamilha et al., 2023; Silva & Magano, 2026; Souza et al., 2022). However, the successful implementation of a competence-based curriculum is not merely a matter of policy pronouncement or syllabus revision. It demands a deliberate, sustained, and systemic transformation of the learning environment — encompassing physical infrastructure, instructional materials, teacher capacity, pedagogical approaches, assessment practices, and institutional support systems (Abelha et al., 2020; Irumba et al., 2023; Martín-Sanz et al., 2025; Vargos et al., 2021). Without an enabling learning environment, even the most thoughtfully designed curriculum risks remaining a document on paper rather than a lived experience in the classroom (Chakrabarty & Singh, 2025; Julius & Kazaara, 2025b; Julius & Nancy, 2025; Okoed, 2023). This study, therefore, investigates the extent to which learning environments in Ugandan schools have been optimized to support CBC implementation, and identifies the gaps, challenges, and opportunities that must be addressed to realize the full promise of this curriculum reform.

Background of the Study

Uganda's education system has undergone several curriculum reforms since independence, each reflecting the prevailing educational philosophies and national development priorities of its time. The introduction of the CBC for lower secondary schools in 2020 represents the most ambitious restructuring of secondary education in recent decades. Unlike its predecessor, the CBC is organized around broad learning areas, integrated themes, and competency outcomes, requiring learners to demonstrate mastery through performance tasks, projects, and portfolios rather than rote recall during terminal examinations (Charles et al., 2023; Chemutai et al., 2023; Julius & Audrey, 2025b).

Globally, countries such as Finland, Kenya, Rwanda, and South Africa have implemented competence-based or outcomes-based curricula with varying degrees of success. A recurring finding across these contexts is that curriculum reform succeeds or fails largely based on the quality and readiness of the learning environment. The physical classroom setup, availability of teaching and learning materials, teacher preparation, class sizes, and the broader school culture all play a critical mediating role between curriculum design and learner outcomes (Julius & Kazaara, 2025a).

In Uganda, the CBC rollout has taken place against a backdrop of significant structural challenges. Many schools, particularly in rural and peri-urban areas, grapple with overcrowded classrooms, a shortage of trained teachers, inadequate instructional materials, and limited access to technology. The Uganda National Examinations Board (UNEB) and NCDC have acknowledged that transitioning from a predominantly lecture-based, examination-driven pedagogy to a learner-centered, competence-oriented approach requires a fundamental reimagining of how classrooms are organized, how teachers teach, and how learners engage with knowledge (Aheisibwe & Barigye, 2023; Katurebe & Nalukwago, 2024). Furthermore, teacher training institutions have been slow to fully align pre-service and in-service training programs with the competencies and pedagogical demands of the CBC. Many teachers who are currently implementing the curriculum received their training under the old curriculum framework, making it difficult for them to fully embrace the student-centered methodologies, differentiated instruction, and formative assessment strategies that the CBC demands (Adams & Blair, 2019; Kurusumu & Rebecca, 2025; Muwanguzi et al., 2023). This pedagogical gap is compounded by inadequate school-based support, limited supervision, and insufficient professional development opportunities (Asiimwe Isaac Kazaara & Musiimenta Nancy, 2025; Bridget & Geophrey, 2023; Kukundakwe, 2024). The learning environment, broadly understood, must therefore be viewed as a multifaceted construct encompassing not only the physical space but also the socio-emotional climate of the school, the availability of resources, the quality of teacher-learner interactions, and the degree of administrative and policy support. Optimizing this environment is not a peripheral concern — it is central to the viability and sustainability of the CBC in Uganda.

Problem Statement

Despite the progressive vision embedded in Uganda's Competence-Based Curriculum, evidence emerging from schools, educational inspectorates, and preliminary studies suggests that implementation is significantly hampered by unoptimized learning environments. Many schools lack the physical infrastructure, instructional materials, and pedagogically prepared teachers necessary to deliver the CBC as intended. Classroom conditions in a large number of schools are characterized by high pupil-to-teacher ratios, inadequate furniture, poor lighting, and an absence of the learning resource centers, laboratories, and ICT tools that competence-based learning fundamentally requires (Aheisibwe & Barigye, 2023; Gracious, 2024; Julius & Geofrey, 2025; Mubaraka, 2023; Sarah & Gracious Kazaara, 2024). At the pedagogical level, a significant proportion of teachers continue to rely on didactic, teacher-centered approaches that are antithetical to the learner-centered philosophy of the CBC. This is largely attributable to inadequate pre-service and in-service training, limited access to CBC-aligned teaching and learning materials, and a lack of sustained instructional mentorship and supervision. Consequently, the competencies that the curriculum aims to develop — critical thinking, problem-solving, creativity, and collaboration — are rarely being meaningfully cultivated in learners (Julius & Kazaara, 2025a; Julius & Sula, n.d.; Julius & Twinomujuni, 2025; Mubaraka, 2023). Moreover, the assessment practices in many schools remain misaligned with the competence-based framework. Teachers are largely unfamiliar with the use of formative assessment tools, rubrics, and portfolio-based evaluation, defaulting instead to traditional tests that measure memorization rather than competence. This misalignment between instructional practice and assessment undermines the coherence and effectiveness of the CBC. The problem, therefore, is that the learning environments in Ugandan schools are not adequately optimized to support the effective implementation of the Competence-Based Curriculum, resulting in a widening gap between curriculum intentions and classroom realities. Without targeted, evidence-based interventions to address these environmental deficiencies, the transformative potential of the CBC will remain largely unrealized, and the broader national goal of producing competent, adaptable, and productive citizens will continue to be compromised.

Main Objective of the Study

The main objective of this study is to examine the extent to which learning environments in selected Ugandan secondary schools are optimized for the effective implementation of the Competence-Based Curriculum, and to propose evidence-based strategies for their improvement.

Specific Objectives

1. To assess the adequacy of physical infrastructure and availability of instructional resources in supporting competence-based teaching and learning in selected secondary schools in Uganda.
2. To evaluate the pedagogical preparedness and professional competencies of teachers in implementing the Competence-Based Curriculum within the existing learning environment.
3. To examine the alignment between classroom assessment practices and the competence-based learning outcomes prescribed by Uganda's lower secondary curriculum framework.

Research Questions

1. To what extent are the physical infrastructure and instructional resources in selected secondary schools in Uganda adequate for the effective implementation of the Competence-Based Curriculum?
2. How pedagogically prepared are teachers in selected secondary schools to implement the Competence-Based Curriculum, and what factors in the learning environment support or constrain their instructional effectiveness?
3. To what extent are the assessment practices employed by teachers in selected secondary schools aligned with the competence-based learning outcomes of Uganda's lower secondary curriculum?

Methodology

This study adopted a concurrent mixed-methods research design, integrating both quantitative and qualitative approaches to provide a comprehensive understanding of how learning environments in Ugandan secondary schools influenced the implementation of the Competence-Based Curriculum (CBC). The study was conducted in selected government-aided and private secondary schools across four districts in Uganda — Kampala, Wakiso, Mbarara, and Gulu — purposively selected to represent urban, peri-urban, and rural school contexts. A stratified random sampling technique was employed to select 320 teachers and 12 school administrators, while 24 classroom observations and 8 focus group discussions with teachers were conducted to complement the quantitative data. Data were collected using a structured questionnaire with five-point Likert-scale items, an observation checklist, and a semi-structured interview guide, all of which were pilot-tested and validated by experts in curriculum and educational measurement. The questionnaire measured three constructs aligned to the specific objectives: physical infrastructure and resource adequacy, teacher pedagogical preparedness, and assessment practice alignment with CBC outcomes. Quantitative data were entered into SPSS version 26 and analyzed at three levels. At the univariate level, descriptive statistics — including frequencies, percentages, means, and standard deviations — were computed to summarize the distribution of responses across the three constructs, providing an initial profile of the learning environment conditions in the sampled schools. At the bivariate level, Pearson product-moment correlation analysis and independent samples t-tests were conducted to examine the relationships between pairs of variables — specifically, the association between resource adequacy and teacher pedagogical preparedness, and mean differences in assessment alignment across school types (government-aided versus private). At the multivariate level, multilevel modeling (MLM), specifically a two-level hierarchical linear model, was applied using MLwiN software to account for the nested structure of the data — teachers (Level 1) nested within schools (Level 2) — thereby partitioning the variance in CBC implementation effectiveness into within-school and between-school components, and estimating the independent contributions of physical infrastructure, teacher preparation, and assessment alignment to CBC implementation outcomes, while controlling for school type, location, and school size as Level-2 covariates (Nelson et al., 2022, 2023). Qualitative data from observations and focus group discussions were analyzed thematically using Braun and Clarke's six-phase thematic analysis framework, and the emerging themes were used to triangulate and contextualize the quantitative findings.

Results

Table 1: Descriptive Statistics of Learning Environment Constructs (Univariate Analysis)

Construct / Item	N	Mean	SD	Min	Max	Skewness
Physical Infrastructure & Resource Adequacy						
Availability of CBC-aligned textbooks	320	2.41	0.87	1	5	0.62
Adequacy of classroom space per learner	320	2.18	0.93	1	5	0.74
Availability of ICT tools for learning	320	1.89	0.81	1	5	1.12
Availability of science/practical labs	320	2.05	0.96	1	5	0.88
Composite Infrastructure Score	**320**	**2.13**	**0.78**	**1**	**5**	**0.84**
Teacher Pedagogical Preparedness						
Knowledge of CBC competency framework	320	3.12	0.91	1	5	-0.21
Use of learner-centered methodologies	320	2.76	1.04	1	5	0.18
Ability to design performance tasks	320	2.54	0.99	1	5	0.41
Participation in CBC in-service training	320	2.88	1.11	1	5	0.09
Composite Preparedness Score	**320**	**2.83**	**0.86**	**1**	**5**	**0.12**
Assessment Practice Alignment						
Use of formative assessment strategies	320	2.62	0.94	1	5	0.33

Use of rubrics and performance indicators	320	2.31	0.88	1	5	0.57
Use of portfolio-based evaluation	320	1.97	0.85	1	5	1.08
Alignment of tests with CBC outcomes	320	2.44	0.92	1	5	0.49
Composite Assessment Alignment Score	**320**	**2.34**	**0.79**	**1**	**5**	**0.62**

Note: Responses were measured on a 5-point Likert scale (1 = Strongly Disagree / Very Inadequate; 5 = Strongly Agree / Very Adequate)

The univariate analysis revealed that all three constructs measuring the learning environment recorded composite mean scores that fell below the scale midpoint of 3.00, indicating that the conditions necessary for effective CBC implementation were generally inadequate across the sampled schools. The construct of physical infrastructure and resource adequacy recorded the lowest composite mean score (M = 2.13, SD = 0.78), with the availability of ICT tools registering the most deficient rating (M = 1.89, SD = 0.81) and a notably high positive skewness value of 1.12, confirming that the distribution was heavily concentrated toward the lower end of the scale and that the majority of teachers perceived ICT infrastructure as severely lacking. Similarly, the availability of science and practical laboratories (M = 2.05, SD = 0.96) and adequacy of classroom space (M = 2.18, SD = 0.93) both fell well below the midpoint, pointing to pervasive physical environment deficiencies. Teacher pedagogical preparedness recorded the highest composite mean among the three constructs (M = 2.83, SD = 0.86), with knowledge of the CBC competency framework being the most highly rated item (M = 3.12, SD = 0.91), suggesting that while some awareness of the CBC framework existed, practical instructional competencies such as the ability to design performance tasks (M = 2.54, SD = 0.99) and the use of learner-centered methodologies (M = 2.76, SD = 1.04) remained below the threshold of adequacy. Assessment practice alignment recorded a composite mean of 2.34 (SD = 0.79), with portfolio-based evaluation emerging as the most poorly practiced assessment strategy (M = 1.97, SD = 0.85), closely followed by the use of rubrics and performance indicators (M = 2.31, SD = 0.88).

These findings painted a deeply concerning picture of the learning environment in Ugandan secondary schools relative to CBC requirements, and they corroborated existing empirical evidence on the challenges that confront curriculum reform in sub-Saharan Africa. The low ratings on physical infrastructure were consistent with reports by the Uganda Ministry of Education and Sports (2022) and UNESCO (2021), which documented that a significant proportion of secondary schools in Uganda, particularly in rural districts, lacked the basic resource endowment necessary to support active, inquiry-driven learning. The relatively higher but still inadequate teacher preparedness scores suggested that the in-service training programs that had been rolled out to support CBC implementation had generated some awareness among teachers, yet had not translated into meaningful pedagogical transformation at the classroom level — a finding that resonated with the "knowing-doing gap" documented in curriculum implementation literature. The particularly low scores on assessment alignment were especially alarming given that assessment is both the mirror and the engine of curriculum implementation; when assessment practices remain tethered to rote-recall testing, the transformative intent of the CBC is effectively neutralized at the point of learner evaluation. Collectively, these univariate results established a compelling empirical foundation for the bivariate and multilevel analyses that followed.

Table 2: Correlation and Independent Samples t-Test Results (Bivariate Analysis)

Table 2a: Pearson Correlation Matrix Among Learning Environment Constructs and CBC Implementation Effectiveness

Variable	1	2	3	4
1. Physical Infrastructure & Resource Adequacy	1.000			
2. Teacher Pedagogical Preparedness	.487**	1.000		
3. Assessment Practice Alignment	.431**	.563**	1.000	
4. CBC Implementation Effectiveness	.512**	.648**	.591**	1.000

***p* < .01 (two-tailed); N = 320**

Table 2b: Independent Samples t-Test — CBC Implementation Effectiveness by School Type

School Type	N	Mean	SD	t	df	p-value	Cohen's d
Government-Aided Schools	198	2.47	0.83				
Private Schools	122	3.08	0.79	-6.41	318	<.001	0.75

Table 2c: Independent Samples t-Test — CBC Implementation Effectiveness by School Location

School Location	N	Mean	SD	t	df	p-value	Cohen's d
Rural Schools	174	2.31	0.77				
Urban/Peri-Urban Schools	146	3.19	0.81	-9.47	318	<.001	1.11

The bivariate analysis produced several statistically significant and substantively meaningful findings. The Pearson correlation matrix (Table 2a) revealed that all three learning environment constructs were significantly and positively correlated with CBC implementation effectiveness at the $p < .01$ level. Teacher pedagogical preparedness demonstrated the strongest association with CBC implementation effectiveness ($r = .648$, $p < .001$), followed by assessment practice alignment ($r = .591$, $p < .001$) and physical infrastructure and resource adequacy ($r = .512$, $p < .001$). Among the predictor constructs themselves, the correlation between teacher pedagogical preparedness and assessment practice alignment was the highest ($r = .563$, $p < .001$), suggesting a meaningful co-

variation between how well-prepared teachers were and how appropriately they aligned their assessment practices with CBC outcomes — a finding consistent with the theoretical proposition that pedagogy and assessment are functionally inseparable in competence-based education. The moderate correlation between physical infrastructure and teacher pedagogical preparedness ($r = .487$, $p < .001$) further implied that schools with better resource endowments tended to have more pedagogically prepared teachers, possibly because better-resourced schools were also more likely to provide ongoing professional development opportunities. Importantly, none of the inter-construct correlations exceeded .70, thereby ruling out concerns of multicollinearity ahead of the multilevel modeling analysis.

The independent samples t-tests (Tables 2b and 2c) yielded highly significant mean differences in CBC implementation effectiveness across both school type and school location. Private schools recorded a significantly higher mean CBC implementation effectiveness score ($M = 3.08$, $SD = 0.79$) compared to government-aided schools ($M = 2.47$, $SD = 0.83$), with $t(318) = -6.41$, $p < .001$, and a Cohen's d effect size of 0.75, indicating a medium-to-large practical difference. Even more striking was the urban-rural disparity: urban and peri-urban schools significantly outperformed rural schools on CBC implementation effectiveness ($M = 3.19$, $SD = 0.81$ versus $M = 2.31$, $SD = 0.77$), with $t(318) = -9.47$, $p < .001$, and a very large Cohen's d effect size of 1.11. These effect sizes were not trivial statistical artifacts but reflected deeply structural inequalities in the Ugandan education system, where geographical location and school ownership type served as powerful determinants of the quality of the learning environment and, by extension, the fidelity of CBC implementation. These findings strongly echoed the equity concerns raised in the UNESCO Global Education Monitoring Report (2023) regarding the uneven distribution of educational resources in low- and middle-income countries, and they underscored the urgent need for targeted policy interventions that address the systemic disadvantages faced by government-aided and rural schools in Uganda's CBC rollout.

Table 3: Multilevel Model Results — Predictors of CBC Implementation Effectiveness (Two-Level Hierarchical Linear Model)

Parameter	Model 0 (Null Model)	Model 1 (Level-1 Predictors)	Model 2 (Full Model)
Fixed Effects			
Intercept	2.71*** (0.09)	1.04*** (0.14)	0.87*** (0.16)
Physical Infrastructure (L1)	—	0.21*** (0.05)	0.18*** (0.05)
Teacher Preparedness (L1)	—	0.39*** (0.06)	0.34*** (0.06)
Assessment Alignment (L1)	—	0.29*** (0.06)	0.25*** (0.06)
School Type: Private (L2)	—	—	0.31** (0.11)
School Location: Urban (L2)	—	—	0.44*** (0.10)
School Size (L2)	—	—	0.08 (0.06)
Random Effects (Variance Components)			
Level-2 Variance (Between Schools)	0.214	0.098	0.061
Level-1 Variance (Within Schools)	0.487	0.301	0.289
Model Fit			
ICC	.305	—	—
-2 Log Likelihood	841.3	763.4	741.2
AIC	847.3	775.4	757.2
Variance Explained (R^2)	—	~35%	~42%

*Standard errors in parentheses. *$p < .05$; **$p < .01$; **$p < .001$*

The multilevel modeling results provided the most analytically rigorous and contextually nuanced understanding of the factors driving CBC implementation effectiveness across the sampled schools. The null model (Model 0) first established the necessity of the multilevel approach by revealing an intraclass correlation coefficient (ICC) of .305, indicating that approximately 30.5% of the total variance in CBC implementation effectiveness was attributable to differences between schools rather than between individual teachers — a proportion large enough to render single-level regression analysis statistically inappropriate and to confirm that school-level factors exerted a substantial contextual influence on implementation outcomes. Model 1, which introduced the three Level-1 teacher-level predictors, explained approximately 35% of the total variance and significantly reduced both the between-school variance (from 0.214 to 0.098) and the within-school variance (from 0.487 to 0.301), confirming that teacher pedagogical preparedness ($\beta = 0.39$, $SE = 0.06$, $p < .001$), assessment practice alignment ($\beta = 0.29$, $SE = 0.06$, $p < .001$), and physical infrastructure adequacy ($\beta = 0.21$, $SE = 0.05$, $p < .001$) were all independently significant positive predictors of CBC implementation effectiveness, even when estimated simultaneously. Teacher pedagogical preparedness emerged as the strongest individual-level predictor, with a one-unit increase in preparedness associated with a 0.39-unit increase in CBC implementation effectiveness, net of the other predictors — affirming the central role of the teacher as the most proximal agent of curriculum enactment.

The full model (Model 2), which incorporated school-level covariates, explained approximately 42% of total variance and further reduced the between-school variance to 0.061, indicating that school type, location, and size together accounted for a meaningful

portion of the school-level heterogeneity in implementation effectiveness. School location — specifically being urban or peri-urban — was the strongest school-level predictor ($\beta = 0.44$, SE = 0.10, $p < .001$), meaning that after controlling for teacher-level factors, urban and peri-urban schools were still expected to achieve significantly higher CBC implementation effectiveness scores than rural schools, reflecting the persistent structural advantage conferred by geography in access to resources, supervision, and professional networks. School type also exerted a significant positive effect ($\beta = 0.31$, SE = 0.11, $p < .01$), confirming that private schools maintained a meaningful advantage over government-aided schools even after teacher-level factors were statistically controlled. Notably, school size did not emerge as a significant predictor ($\beta = 0.08$, SE = 0.06, $p > .05$), suggesting that the number of learners enrolled per school was not, in itself, a meaningful driver of implementation effectiveness once the quality-related dimensions of the environment were accounted for. The progressive reduction in the -2 Log Likelihood and AIC values from Model 0 through Model 2 confirmed that each successive model represented a significantly improved fit to the data. Taken together, these multilevel findings established a clear and policy-relevant hierarchy of predictors: teacher-level factors, particularly pedagogical preparedness, were the most immediate levers for improving CBC implementation, but school-level structural inequalities — especially the urban-rural and public-private divides — continued to impose significant contextual constraints that individual teacher effort alone could not overcome, necessitating targeted, system-level policy responses.

Conclusion

This study set out to examine the extent to which learning environments in selected Ugandan secondary schools were optimized for the effective implementation of the Competence-Based Curriculum, and the findings collectively and unequivocally demonstrated that the learning environment, in its physical, pedagogical, and assessment dimensions, remained critically underprepared to support the transformative vision embedded in Uganda's CBC reform. The univariate analysis established that all three constructs — physical infrastructure and resource adequacy, teacher pedagogical preparedness, and assessment practice alignment — fell below the acceptable threshold of adequacy, with ICT availability and portfolio-based assessment emerging as the most severely deficient dimensions. The bivariate analysis further confirmed that all three constructs were significantly and positively associated with CBC implementation effectiveness, and that profound structural inequalities along school type and geographical location lines were compounding these deficiencies, with rural and government-aided schools bearing a disproportionate implementation burden. The multilevel modeling results provided the most compelling evidence, revealing that teacher pedagogical preparedness was the strongest proximal predictor of implementation effectiveness, while school location and school type exerted significant contextual influences that transcended individual teacher effort, collectively explaining approximately 42% of the variance in CBC implementation outcomes. These findings affirmed that optimizing the learning environment for CBC implementation in Uganda was not a singular or peripheral administrative task but a multifaceted systemic imperative requiring coordinated, sustained, and equity-driven interventions across infrastructure, teacher development, assessment reform, and education governance — and that failure to act decisively on these fronts risked entrenching the gap between curriculum policy ambitions and classroom realities, ultimately undermining Uganda's broader aspirations for quality, inclusive, and competency-driven secondary education.

Recommendations

Accelerate Targeted Investment in Physical Infrastructure and Digital Learning Resources, Prioritizing Rural and Government-Aided Schools**.** The Ministry of Education and Sports, in partnership with the Ministry of Finance and development partners, should establish a dedicated CBC Learning Environment Fund to systematically address the documented deficiencies in physical infrastructure, laboratory facilities, and ICT tools, with resource allocation formulas weighted in favor of rural and government-aided schools that were found to be most severely disadvantaged. Capital investment alone is insufficient; it must be accompanied by robust maintenance frameworks and community accountability mechanisms to ensure that resources translate into sustained improvements in the quality of the learning environment.

Redesign and Intensify CBC-Specific Teacher Professional Development Programs with a Focus on Pedagogical Practice and Assessment Competence. Given that teacher pedagogical preparedness emerged as the strongest predictor of CBC implementation effectiveness, the National Curriculum Development Centre and teacher training institutions should urgently redesign both pre-service and in-service teacher education programs to embed sustained, school-based, competency-oriented professional development that goes beyond awareness-raising to actively build teachers' capacity to design performance tasks, apply learner-centered methodologies, use formative assessment strategies, and construct and employ rubrics and portfolios aligned with CBC outcomes, supported by regular instructional coaching, peer learning communities, and mentorship structures at the school level.

Develop and Institutionalize a National CBC Assessment Alignment Framework to Bridge the Gap Between Instructional Practice and Competence-Based Evaluation. Since assessment practice alignment was found to be among the weakest dimensions of the learning environment and a significant predictor of CBC implementation effectiveness, the Uganda National Examinations Board and NCDC should collaborate to develop a comprehensive, school-level CBC Assessment Alignment Framework that provides teachers with standardized yet flexible rubrics, formative assessment tools, portfolio templates, and performance indicator banks aligned to each learning area's competency outcomes, alongside a structured school-based assessment quality assurance system to monitor and support fidelity of assessment practice across all school types and locations.

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