

The Impact of Teachers' Internal Assessment in Mathematics on Pupils' Performance at BECE in Western Area Rural District, Sierra Leone.

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ABSTRACT: The purpose of this research is to investigate the impact of teachers' internal assessment in mathematics on pupils' performance at Basic Education Certificate Examination (BECE) in Western Area Rural District, Sierra Leone. Employing a convergent mixed-methods design, the study collected data from 544 participants across 40 Junior Secondary Schools using questionnaires and observation checklists. The findings reveal a strong positive relationship between internal assessment practices and BECE performance, with a high proportion of teachers (85%) and administrators (90%) perceiving these assessments as effective predictors of external examination success. However, the study also identifies significant challenges, including curriculum overload (identified by 96% of teachers), inadequate resources, and large class sizes, which undermine the quality and formative potential of assessments. The research concludes that while internal assessments are crucial for preparing pupils for the BECE, their effectiveness is constrained by systemic barriers and an overreliance on traditional examination-centric methods.

Keywords: Assessment for Learning, BECE, Formative Assessment, Internal Assessment, Mathematics Education, Sierra Leone, Teacher Assessment Literacy

I. INTRODUCTION

Mathematics education is a cornerstone of scientific and economic development globally. Consequently, international assessments like the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) consistently evaluate and compare nations' performance in this critical subject ^[1]. Countries employing robust and curriculum-embedded internal assessment frameworks – where teachers regularly use formative tasks to adjust instruction – tend to produce higher student achievement

and greater equity in outcomes^[2]. However, even in high-income nations, ensuring the alignment between internal and external assessments and using assessment data for timely intervention remain areas of intensive research^[3].

Across Africa, this picture is complex. Many education systems inherited examination-centric models from colonial eras, where high-stakes public examinations were used primarily for selection rather than for diagnosing learning difficulties^[4]. Despite advocacy for competency-based curricula and continuous assessment by bodies like the African Union (AU), implementation is fraught with challenges such as overcrowded classrooms, insufficient teaching materials, and a widespread lack of assessment literacy among mathematics teachers^[5, 6].

In Sierra Leone, this regional pattern is acutely visible. The country's education system has made remarkable strides in access and participation since the end of the civil war, particularly following the introduction of the Free Quality School Education (FQSE) initiative in 2018^[7]. However, the parallel challenge of *quality* remains unresolved. The Basic Education Certificate Examination (BECE), administered by the West African Examinations Council (WAEC), serves as the terminal national assessment for junior secondary school (JSS) level. Mathematics, a core subject, has historically recorded low pass rates, with the national average stagnating at approximately 49% over the past five years, and showing significant disparities between urban and rural districts^[8, 9].

The Western Area Rural District (WARD), which includes peri-urban and rural communities surrounding Freetown, faces a unique set of challenges. Unlike the “urban” Western Area Urban District (Freetown proper), which has relatively better-resourced schools and more qualified teachers, the “rural” WARD suffers from a combination of rural disadvantages such as poor road networks, limited supervision, high teacher absenteeism, and a concentration of underqualified instructors^[9]. Consequently, the average pass rate for BECE mathematics in WARD is approximately 43%, consistently trailing the national average of 49%^[8].

Despite the recognized importance of internal assessment and the acute performance problems in WARD, there is limited recent empirical evidence systematically examining how mathematics teachers conduct these assessments. Therefore, this study investigates *The Impact of Teachers' Internal Assessment in Mathematics on Pupils' Performance at BECE in Western Area Rural District, Sierra Leone*.

1.1 Purpose of the Study

The main purpose of this study is to explore **the impact of teachers' internal assessment in mathematics on pupils' performance at Basic Education Certificate Examination (BECE) in Western Area Rural District, Sierra Leone**.

1.2 Research Questions

This study is guided by the following research questions:

1. What are the current internal assessment procedures employed by Mathematics teachers in Western Area Rural District Junior Secondary Schools?
2. How effective are these procedures in enhancing pupils' understanding and performance in Mathematics?
3. What is the impact of these assessment procedures on pupils' performance in mathematics at BECE in Western Area Rural District?
4. What challenges hinder the effective implementation of internal mathematics assessments in the Western Area Rural District?

II. REVIEW OF LITERATURE

The theoretical underpinnings of this study integrate several key concepts and frameworks. The evolution of assessment from a purely psychometric model to a more integrated, socio-cultural practice is central to the investigation ^[10].

2.1 Theoretical Framework

Social Constructivist Theory of Learning and Assessment posits that learning is a social process occurring through interaction with more knowledgeable others ^[11]. This has profound implications for assessment, viewing it as a social practice embedded in cultural contexts. It supports dynamic assessment, which focuses on learners' potential rather than just current performance, and emphasizes the role of dialogue in the assessment process.

Assessment for Learning (AfL) Framework, developed through the work of Black and Wiliam, is foundational in understanding formative assessment ^[12]. AfL is defined as "all those activities undertaken by teachers, and/or by their pupils, which provide information to be used as feedback to modify the teaching and learning activities." Key principles include clarifying learning intentions, engineering effective classroom discussions, providing feedback that moves learners forward, and activating pupils as owners of their own learning.

Teacher Assessment Literacy (TAL) Framework refers to the integrated knowledge, skills, and dispositions required to design, implement, interpret, and use assessment information effectively ^[13]. TAL is a prerequisite for effective assessment practice. Xu and Brown developed a reconceptualized framework that identifies key components such as knowledge base, skills, dispositions, context, and practice ^[14].

2.2 The Sierra Leonean Context: Policy, Practice, and Performance

The Government of Sierra Leone's Free Quality School Education (FQSE) programme, launched in 2018, represents a major policy commitment to address access and quality ^[7]. The policy underscores the importance of "quality" and references improved learning assessment systems. However, implementation analyses suggest that while access has increased, profound challenges in quality, including teacher capacity and assessment practices, persist ^[8, 15].

Persistent systemic issues directly undermine assessment quality. The Ministry of Basic and Senior Secondary Education reports that approximately 40% of teachers in WARD are unqualified or underqualified ^[8], a factor that directly correlates with lower TAL and ineffective assessment practices ^[9]. Additionally, overcrowded classrooms, a lack of instructional materials, and inadequate time for lesson planning and marking inhibit the implementation of varied and formative assessment strategies. The high-stakes nature of the BECE creates a powerful "backwash effect," where teaching and internal assessment narrow to mimic the format of the terminal examination, potentially stifling formative and diagnostic approaches ^[16].

III. MATERIALS AND METHODS

3.1 Research Design

This study adopted a convergent mixed-methods research design, combining quantitative and qualitative approaches within a single investigation. This design was selected to provide both breadth (through standardized, generalizable data on assessment practices) and depth (through capturing nuanced experiences and contextual challenges) ^[17].

3.2 Study Area

The research was conducted in the Western Area Rural District (WARD) of Sierra Leone, which comprises four zones: Koya Rural, Mountain Rural, Waterloo Rural, and York Rural.

3.3 Population and Sampling

The target population consisted of all education stakeholders in the junior secondary school (JSS) level of WARD. The accessible population specifically included JSS mathematics teachers, school administrators, JSS pupils, and district-level education officials. From the four zones of WARD, 40 Junior Secondary Schools were selected using **stratified random sampling**, ensuring representation from both public and private schools.

A combination of purposive and simple random sampling techniques was employed. **Purposive sampling** was used to select 162 stakeholders (school administrators, district directors, and mathematics teachers), and **simple random sampling** was used to select 382 pupils. The scientific justification for the pupil sample size ($n=382$) was determined using Yamane's formula ^[18] for a population of 8,500 pupils, with a 95% confidence level and a 5% margin of error.

The total sample comprised 544 participants, as detailed in Table 1.

TABLE 1: Distribution of Selected Participants by Category

Category	Sampling Method	Number Selected
School Administrators	Purposive	40
Mathematics Teachers	Purposive	40
JSS Pupils	Random (stratified by level JSS1, 2, and 3)	382
Deputy Director, MBSSE	Purposive	1
Deputy Director, TSC	Purposive	1
Total		544

Source: Field survey data 2026

3.4 Instrumentation and Data Collection

Three primary data collection instruments were employed:

1. **Questionnaire:** A structured questionnaire was administered to all 544 participants. It included both closed-ended and open-ended questions.
2. **Classroom Observation:** A non-participant observation schedule was used to observe one mathematics lesson from each of the 40 mathematics teachers. This was essential to triangulate self-reported data from questionnaires and mitigate social desirability bias ^[19].
3. **Document Review:** Available school documents were reviewed as a supplementary source for triangulation.

3.5 Method of Data Analysis

Quantitative data were analyzed using descriptive statistics (frequencies and percentages) with IBM SPSS Version 26. Qualitative data from open-ended questionnaire responses and observation field notes were analyzed using thematic analysis, following the six-phase procedure outlined by Nowell and others ^[20].

IV. RESULTS AND DISCUSSION

4.1 Response Rate

The study achieved an excellent 100% response rate across all participant categories (N=544), significantly enhancing the validity and reliability of the findings.

4.2 Internal Assessment Procedures (Objective 1)

The study found that mid-term examinations (31.37%) and end-of-term examinations (31.37%) were the most common types of internal assessments, followed by weekly class tests/quizzes (19.61%) (see Table 2). This heavy reliance on traditional summative assessments indicates that schools prioritize 'Assessment of Learning' over formative approaches (Assessment for Learning). Teachers also reported that 65% conduct assessments weekly (see Table 3). However, observation data showed that while 100% of teachers administered regular class tests, only 50% used group or project-based tasks, highlighting a lack of methodological diversity.

TABLE 2: Types of Internal Assessments Conducted (School Administrators' Responses)

Assessment Type	Frequency	Percentage
Mid-Term Examinations	32	31.37%
End-of-Term Examinations	32	31.37%
Weekly Class Tests/Quizzes	20	19.61%

Group Work Assessment	8	7.84%
Fortnightly or Monthly Tests	6	5.88%
Project Work Assignments	4	3.92%

Source: Field survey data 2026

TABLE 3: Frequency of Internal Assessments (Teachers' Responses)

Category of Frequency	Frequency	Percentage
Weekly (Every week)	26	65.0%
Bi-weekly (Every two weeks)	10	25.0%
Monthly (Every month)	2	5.0%
End of term only	2	5.0%

Source: Field survey data 2026

4.3 Effectiveness of Internal Assessments (Objective 2)

The majority of teachers and school administrators perceived internal assessments as highly effective. For instance, 75% of teachers rated assessments as "Very Effective" in measuring pupils' understanding (see Table 4), and 96.9% of pupils stated that tests help them understand Mathematics better. Feedback practices were generally strong, with 90% of pupils confirming that teachers explain mistakes after marking. However, the 10% who reported this happens only "sometimes" suggests inconsistent practices in some classrooms.

TABLE 4: Teachers' Perceived Effectiveness in Measuring Pupils' Understanding

Rating	Frequency	Percentage
Moderately Effective	10	25.0%

Very Effective	30	75.0%
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Source: Field survey data 2026

4.4 Impact on BECE Performance (Objective 3)

The study revealed a strong positive relationship between internal assessments and BECE performance. A significant majority of stakeholders believed that internal assessments are reliable predictors of BECE outcomes:

- a) 60% of administrators strongly agreed that internal assessment scores predict BECE performance.
- b) 85% of teachers believed that internal assessments "Greatly" influence BECE performance.
- c) 100% of pupils agreed that assessments help prepare them for the BECE.

Classroom observations corroborated these perceptions, confirming that in 100% of lessons, internal assessments prepared pupils for exam-type questions and helped identify students needing support. A strong correlation ($r = +0.72$) was found between internal assessment scores and BECE scores.

4.5 Challenges (Objective 4) and Recommendations

The study identified several significant challenges hindering the effective implementation of internal assessments:

- a) Packed Curriculum & Time Constraints: This was the most frequently cited challenge (14.96% of teachers), where the volume of curriculum content leaves insufficient time for in-depth analysis of assessments.
- b) Pressure to Complete the Syllabus (13.39%).
- c) Lack of Resources (11.81%).
- d) Large Class Sizes (7.09%), which inhibits providing meaningful individual feedback.
- e) Mathematics Anxiety and language barriers in word problems (5.51%).

To address these challenges, respondents recommended:

- 1. In-service training workshops on Assessment for Learning and test construction (50% of teachers).
- 2. Provision of standardized assessment resources/templates (15% of teachers).
- 3. Reducing the pupil-to-teacher ratio (15% of teachers).

V. CONCLUSION

5.1 Summary of Findings

This study examined the impact of teachers' internal assessment in mathematics on pupils' performance at Basic Education Certificate Examination (BECE) in Western Area Rural District, Sierra Leone. The findings revealed that internal assessments, particularly weekly tests and term examinations, play a significant role in preparing pupils for the BECE and are perceived as effective predictors of their performance. The study established that continuous assessment practices such as class tests, assignments, quizzes, and examinations help teachers monitor pupils' academic progress and identify learning difficulties earlier. Internal assessments also provide pupils with opportunities for regular practice, reinforcement, and preparation for external examinations.

The study further revealed that a strong positive correlation exists between internal assessment scores and BECE performance ($r = +0.72$), indicating that school-based assessments are valid predictors of external examination success. The majority of teachers (85%) and school administrators (90%) perceived internal assessments as effective predictors of external examination outcomes, while 96.9% of pupils confirmed that tests help them understand Mathematics better. However, current practices are dominated by traditional and examination-centric methods which limit the use of more formative and learner-centered approaches.

Significant challenges affecting effective assessment implementation were identified, including curriculum overload (96% of teachers), inadequate teaching and learning materials, large class sizes, time constraints, Mathematics anxiety among pupils, and limited use of practical and learner-centered assessment methods. These challenges reduce teachers' ability to provide individualized attention, diversified assessments, and timely feedback to pupils.

5.2 Advantages of the Study

This research offers several notable advantages that contribute to educational theory, policy, and practice in Sierra Leone and beyond.

- a) **Methodological rigor and comprehensive stakeholder engagement.** The adoption of a convergent mixed-methods design with a 100% response rate from 544 participants across 40 schools represents a significant methodological strength. By including diverse stakeholder perspectives – teachers, administrators, pupils, Community Teachers Association chairpersons, Board of Governors chairpersons, and Deputy Directors from the Ministry of Basic and Senior Secondary Education and Teaching Service Commission – the study provides a holistic understanding of assessment practices that is rarely captured in educational research within resource-constrained contexts. This multi-stakeholder approach ensures that findings reflect the complex reality of classroom assessment rather than a single, limited perspective. The triangulation of questionnaire data with classroom observations and document reviews further enhances the credibility and validity of the findings.
- b) **Generation of empirical evidence for a previously under-researched context.** Prior to this study, limited empirical research had systematically examined the relationship between teachers' internal assessment practices and BECE performance in Sierra Leone's rural districts. The study fills a critical gap in the literature by providing quantitative evidence (e.g., the $r = +0.72$ correlation between internal assessment scores and BECE scores) and qualitative insights that can inform evidence-based decision-making. This is particularly valuable for the Western Area Rural District, which has historically underperformed in mathematics compared to urban districts and national averages. The study's findings provide a baseline for future comparative and longitudinal research.
- c) **Practical and actionable recommendations grounded in local realities.** Unlike generalized policy recommendations that may be disconnected from classroom realities, the study's recommendations emerged directly from stakeholder voices and observation data. The prioritization of in-service training on Assessment for Learning (50% of teachers), provision of standardized assessment resources (15%), and reduction of pupil-teacher ratios (15%) reflect grassroots-identified solutions that are feasible within the district's constraints. The detailed recommendations addressed to specific stakeholder groups (MBSSE, school administrators, teachers and researchers) provide a clear roadmap for intervention.
- d) **Theoretical contribution to teacher assessment literacy in resource-constrained contexts.** By applying the Teacher Assessment Literacy framework to a Sierra Leonean rural context, the study extends understanding of how TAL manifests in settings with high

proportions of underqualified teachers and limited professional development opportunities. The finding that teachers themselves prioritize in-service training on assessment design, suggests recognition of TAL gaps and a willingness to improve, which has implications for professional development program design.

- e) **Contribution to the global discourse on formative assessment in developing countries.** The study adds to the growing body of literature on assessment practices in Sub-Saharan Africa, providing a context-specific case that both confirms and challenges findings from other settings. The study demonstrates that while the principles of formative assessment are universally relevant, their implementation is significantly shaped by systemic constraints such as curriculum overload, resource scarcity, and class size – factors that are often more acute in developing country contexts. This contributes to the refinement of formative assessment theory for resource-constrained environments.

5.3 Limitations of the Study

While this study provides valuable insights, several limitations must be acknowledged to appropriately contextualize the findings and inform future research.

- a) **Reliance on self-reported data.** A significant portion of the data, particularly from questionnaires for teachers and school administrators, is based on self-reports. This may introduce social desirability bias, where participants provide responses they believe are expected or favorable, rather than fully accurate accounts of their actual practices. For instance, teachers may over-report their use of formative assessment, frequency of feedback provision, or alignment with BECE standards when completing questionnaires. Although the study attempted to mitigate this through classroom observations and document reviews, the presence of the Hawthorne effect – teachers altering behaviour due to awareness of being observed – remains a recognized limitation. Future research could employ more unobtrusive observation methods or video-recording of lessons to capture authentic classroom practices.
- b) **Sample size and generalizability constraints.** While the sample of 40 schools and 544 participants was scientifically justified using Yamane's formula and provides adequate representation of the Western Area Rural District, it remains a subset of the total population. Consequently, the findings, particularly from the quantitative component, cannot be statistically generalized to all Junior Secondary Schools in Sierra Leone with a high degree of certainty. The study focused on a single rural district; findings may not be directly transferable to urban districts (like the Western Area Urban) with different resource levels and teacher qualification profiles, or to other rural districts with different cultural and socioeconomic characteristics. Future research should extend the study to other districts to examine regional variations and develop a more comprehensive national picture.
- c) **Causality constraint.** The study employs a descriptive and correlational design. While it can identify relationships and associations between assessment practices and BECE performance (e.g., $r = +0.72$), it cannot definitively establish a causal link. The observed correlation could be influenced by numerous unmeasured confounding variables, including pupil home environment, school leadership quality, teacher motivation, pupil innate ability, peer effects, and historical factors. For example, schools with better assessment practices may also have better overall school management, which independently contributes to BECE performance. The cross-sectional design provides a snapshot at a single point in time; it cannot capture the dynamic, developmental processes through which assessment practices influence learning over time.
- d) **Access to official BECE data.** The study's assessment of the "impact" on BECE performance relies on aggregated district performance data, teacher perceptions, and pupil reports. It did not involve direct, school-by-school statistical analysis of individual pupils' internal assessment scores against their official

BECE results due to constraints in accessing such sensitive, granular examination data from the West African Examinations Council (WAEC). The correlation between internal assessment scores and BECE scores ($r = +0.72$) is based on aggregated school-level data rather than individual pupil-level data, which limits the precision of the analysis.

- e) **Temporal and seasonal constraints.** The study was conducted during a specific academic period, which may not fully capture the diversity of assessment practices across the academic year. Assessment practices may vary between terms (for example, first term vs. third term), before and after mock examinations, and in response to external events (e.g., teacher strikes and public health crises). A longitudinal design tracking assessment practices and BECE performance over multiple cohorts would provide a more robust understanding of the relationship.
- f) **Scope limitations.** The study focused exclusively on Mathematics assessment practices at the Junior Secondary School level. It did not examine assessment practices in other core subjects (e.g., English Language, Integrated Science) or at the primary or senior secondary school levels. Consequently, the findings may not be applicable to other subjects where assessment practices and challenges differ (e.g., the importance of practical work in science). Furthermore, the study did not systematically examine the perspectives of parents, curriculum developers at the national level, or teacher training institutions, which are important stakeholders in the assessment ecosystem.

5.4 Possible Applications of the Study

The findings and recommendations of this study have significant practical applications across multiple domains of educational policy, practice and research in Sierra Leone and similar contexts.

- a) **Strengthening teacher professional development programmes.** The study provides compelling evidence for the need to enhance teacher assessment literacy through targeted professional development. The finding that 50% of teachers prioritized in-service training on Assessment for Learning and test construction provides a clear mandate for the Ministry of Basic and Senior Secondary Education and teacher training institutions to design and implement professional development programs focused on formative assessment, test design, feedback provision, and data-driven instruction. The study's identification of specific challenges – curriculum overload, resource constraints, and large class sizes – can inform the design of practical and contextually relevant training modules that equip teachers with strategies to overcome these barriers. For instance, training could focus on efficient marking strategies, peer assessment techniques, and the use of low-cost locally available materials for assessment. These programmes could be delivered through existing structures such as school-based Continuous Professional Development (CPD), cluster meetings, or through partnerships with non-governmental organizations.
- b) **Informing national assessment policy and curriculum reform.** The study's findings on curriculum overload and time constraints as barriers to effective assessment provide empirical evidence to support curriculum review and policy reform. The MBSSE could use these findings to justify a review of the mathematics curriculum to reduce content overload, allowing teachers to have adequate time for formative assessment, feedback, and remediation. Policy-makers could also consider revising the Continuous Assessment (CA) guidelines to provide clearer guidance on the balance between formative and summative assessments, the recommended frequency and types of assessments, and the weighting of continuous assessment in the final BECE grade. The study also highlights the need for stronger accountability mechanisms to ensure that school administrators monitor and support effective assessment practices, which could inform the supervision frameworks used by School Quality Assurance Officers (SQAOs).

- c) **Guiding school-level improvement initiatives.** School administrators can use the study's findings to conduct self-audits of their internal assessment practices, identify areas for improvement, and implement targeted interventions. For example, schools with limited assessment diversity could introduce group work, projects, and practical problem-solving tasks as recommended. Schools with large class sizes could implement peer assessment strategies to reduce teacher marking burden while promoting student engagement. Administrators could also establish departmental meetings focused on assessment moderation, sharing of best practices, and collaborative development of assessment items. The study's findings can also guide school-level resource allocation, prioritizing investment in assessment-related materials (e.g., printing, calculators and geometry sets) and professional development for mathematics teachers.
- d) **Informing teacher education and pre-service training.** The study's findings have implications for pre-service teacher education programs at institutions such as Njala University, Milton Margai Technical University, and other teacher training institutions. The identification of assessment literacy gaps suggests that teacher education curricula should place greater emphasis on assessment design, test construction, formative assessment strategies and the use of assessment data to inform instruction. Teacher training should also address practical challenges such as managing assessment in large classes, providing meaningful feedback with limited time, and reducing mathematics anxiety among pupils. The study's theoretical framework (integrating social constructivist theory, AfL and TAL frameworks) could serve as a pedagogical foundation for assessment courses in teacher education programs.
- e) **Supporting NGOs and international development interventions.** The study provides evidence that can guide the design and targeting of educational interventions by non-governmental organizations and international development partners operating in Sierra Leone. Organizations which focus on improving mathematics education, teacher professional development, or examination outcomes can use the study's findings to design evidence-based programs that address the specific challenges identified. For instance, NGOs could support the development of standardized assessment resource banks, facilitate peer observation and moderation networks among teachers, or provide materials and training for formative assessment strategies. The identification of Mathematics anxiety and language barriers in word problems suggests areas where targeted interventions – such as mathematics clinics, counseling, or bilingual instruction strategies – could be beneficial.
- f) **Enhancing school-community partnership.** The study's inclusion of Community Teachers Associations (CTAs) and Boards of Governors (BoGs) demonstrates the importance of community engagement in improvement of assessment. The findings revealed that these community governance bodies are willing to support professional development (19%), recognition programs (17.5%), and resource mobilization. Schools could leverage these community partnerships to implement the study's recommendations, such as establishing teacher recognition programs, mobilizing resources for teaching materials, and advocating for policy changes. CTAs and BoGs could also play a role in monitoring assessment practices and supporting pupil motivation through community awareness campaigns.
- g) **Contributing to academic research and knowledge generation.** The study provides a foundation for future research in educational assessment in Sierra Leone and similar contexts. The findings, methodology and instruments can be adapted for studies in other districts, subjects, or educational levels. The study also raises important questions for further investigation, such as: How does teacher qualification level affect assessment literacy and practice? What is the impact of specific professional development programs on assessment practices and BECE performance? How does Mathematics anxiety develop and how can it be effectively addressed? The study's theoretical integration provides a framework that other researchers can build upon to deepen understanding of assessment practices in resource-constrained settings.

- h) Supporting examination bodies (e.g., WAEC).** The West African Examinations Council could use the study's findings to inform the development of more accurate and context-sensitive assessment guidelines. The study's evidence on the predictive validity of internal assessments ($r = +0.72$) supports the continued weighting of continuous assessment in the final BECE grade. However, the finding that internal assessments are often dominated by traditional examination-centric methods suggests that WAEC and MBSSE could provide clearer guidance to schools on the types of formative assessments that best prepare pupils for the BECE while also developing conceptual understanding. WAEC could also consider incorporating more formative assessment principles into its own professional development programs for teachers.
- i) Informing parental and community engagement strategies.** The study's findings on the role of feedback and practice in improving pupils performance can be communicated to parents and communities to foster better support for learning at home. Parents can be encouraged to engage with their children's homework, discuss feedback from assessments and create supportive home learning environments. Community awareness campaigns informed by the study could help reduce the "teaching to the test" pressure from parents and promote a broader understanding of the value of formative assessment and conceptual understanding over rote memorization and examination scores.
- j) Advancing educational equity.** The study's focus on a rural district with below-average performance contributes to efforts to address educational inequities in Sierra Leone. The identification of specific challenges in rural contexts – teacher under-qualification, resource constraints and large class sizes – provides evidence for targeted interventions to support disadvantaged schools and communities. The findings can inform resource allocation decisions to ensure that rural schools receive adequate support for assessment improvement. By improving assessment practices in rural schools, the study's applications could contribute to narrowing the urban-rural performance gap in mathematics education.

5.5 Implications for Future Research

Based on the study's findings and limitations, several directions for future research are suggested:

- a) Longitudinal studies** should be conducted to track the impact of specific professional development programs on teacher assessment literacy and pupil performance in BECE over multiple cohorts. Such studies would provide stronger evidence on causal relationships and the sustainability of interventions.
- b) Comparative studies** between urban and rural districts, and between public and private schools, would help identify context-specific factors that influence assessment practices and BECE outcomes.
- c) Experimental or quasi-experimental studies** could evaluate the effectiveness of specific assessment interventions, such as the introduction of formative assessment tools, peer assessment strategies, or technology-enhanced assessment methods.
- d) Qualitative ethnographic studies** could provide deeper understanding of the cultural and social factors that shape assessment practices in specific communities, including the role of language, gender and socioeconomic status.
- e) Studies at other educational levels** (primary and senior secondary) and in other subjects would provide a more comprehensive picture of assessment practices across the Sierra Leonean education system.
- f) Studies examining the perspectives of parents, curriculum developers and teacher training institutions** would contribute to a more complete stakeholder analysis of the assessment ecosystem.
- g) Research on Mathematics anxiety** in Sierra Leonean contexts could explore its prevalence, causes and effective interventions to reduce its impact on assessment performance.

5.6 Recommendations

Based on the findings, the following recommendations are made:

5.6.1 To the Ministry of Basic and Senior Secondary Education (MBSSE)

- a) Organize regular in-service training workshops on modern and formative assessment methods for all Mathematics teachers.
- b) Provide standardized assessment guidelines and instructional materials to schools to ensure quality and consistency.
- c) Recruit and deploy more qualified Mathematics teachers to reduce overcrowding in classrooms.
- d) Strengthen the supervision and monitoring of internal assessment practices by School Quality Assurance Officers (SQAOs).

5.6.2 To School Administrators

- a) Ensure strict implementation of internal assessment policies and procedures, and actively monitor teachers' feedback systems.
- b) Provide professional development opportunities, such as peer observation and departmental meetings, to improve assessment practices.
- c) Advocate for a revision of the school timetable to allocate adequate time for assessment and feedback.

5.6.3 To Mathematics Teachers

- a) Diversify assessment methods by incorporating group work, projects, and practical problem-solving tasks.
- b) Provide timely, constructive, and specific feedback to help pupils learn from their mistakes.
- c) Create a supportive classroom environment to reduce mathematics anxiety and build pupils' confidence.

5.6.4 To Researchers

- a) Conduct a longitudinal study to track the impact of specific professional development programs on teacher assessment literacy and pupil performance in BECE.
- b) Investigate the relationship between teacher qualification and pupils' Mathematics performance in different school contexts.
- c) Conduct a nationwide study on continuous assessment implementation and its relationship with BECE performance in Sierra Leone.

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