



A Survey on the Quality, Equity and Accessibility of Mathematics Education Among Students Amidst the Boko Haram Insurgency in Northeast Nigeria

Ibrahim Adamu^{1*}, Sodangi Umar²
Federal University Gusau

Corresponding Author: Ibrahim Adamu Adamugwoza@fugusau.edu.ng

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ABSTRACT

The study investigated the quality, equity, and accessibility of mathematics education among secondary school students amidst the Boko Haram insurgency in Northeast Nigeria. The study consisted of four objectives and four research questions. A survey research design was adopted. The population of the study was 498,378 from all six states in the region, and a sample of 384 SS2 students and mathematics teachers was conveniently selected using proportionate sampling techniques from Adamawa, Borno, and Yobe states. Data were collected using a 4-point Likert scale, which was developed by the researchers. The questionnaires, named the Mathematics Students Opinion Questionnaire (MSOQ) and the Mathematics Teachers Opinion Questionnaire (MTOQ), were validated by three experts specializing in mathematics education and test and measurement. The instruments' reliability indices of 0.85 for the MSOQ and 0.76 for the MTOQ were obtained after a pilot test using Cronbach's alpha statistic. The instruments were administered to students and mathematics teachers. The findings reveal significant disruptions to the education system, including school closures, displacement of students and teachers, inadequate infrastructure, and a shortage of qualified mathematics teachers. These factors have severely impacted students' access to quality mathematics education, leading to learning gaps, low academic performance, and increased dropout rates. The study recommends, among other things, that there is an urgent need for targeted interventions by governments, non-governmental organizations, and community leaders. These interventions should focus on rebuilding and rehabilitating schools, providing psychosocial support to students and teachers, training and equipping teachers with effective pedagogical skills, and ensuring equitable access to quality education for all students, regardless of their background or location.

INTRODUCTION

The Boko Haram insurgency in Northeast Nigeria has had a profound and devastating impact on various aspects of life in the region, including education. The protracted conflict has led to widespread violence, displacement, and destruction of infrastructure, severely disrupting the education system. This study investigates the quality, equity, and accessibility of mathematics education among students in the affected region. The Boko Haram insurgency in Northeast Nigeria has created a humanitarian crisis with devastating consequences for education. The conflict, characterized by widespread violence, displacement, and the destruction of infrastructure, has severely disrupted the education system, impacting access, quality, and equity (Al-Amin & Stevenson, 2017a). School closures, a direct result of the insurgency, have deprived countless children of their fundamental right to education, creating a generation at risk of losing crucial developmental opportunities (Human Rights Watch, 2014). This disruption not only halts formal learning but also dismantles the social structures and support systems that schools provide.

The insurgency's impact extends beyond physical damage to schools. The displacement of students and teachers creates further instability, disrupting learning continuity and exacerbating the trauma experienced by those affected (UNICEF, 2020). Forced migration often leads to overcrowded learning environments in host communities, straining already limited resources and further compromising the quality of education. Furthermore, the psychological impact of the conflict, including witnessing violence and experiencing displacement, creates significant barriers to learning, affecting students' concentration, motivation, and overall well-being (Betancourt et al., 2015).

The quality of education, particularly in crucial subjects like mathematics, has suffered immensely. The shortage of qualified teachers, often due to displacement or the fear of attacks, undermines the effective delivery of instruction (UNESCO, 2017a). Teacher training and professional development are often disrupted, leaving educators ill-equipped to address the unique challenges presented by the conflict-affected context. This scarcity of qualified personnel creates a vicious cycle, where students receive inadequate instruction, leading to learning gaps and poor academic performance. Mathematics education is crucial for individual development and societal progress. It equips individuals with essential critical thinking, problem-solving, and analytical skills. However, the Boko Haram insurgency has posed significant challenges to the effective delivery and acquisition of mathematics education in Northeast Nigeria. School closures, displacement of students and teachers, inadequate infrastructure, and a shortage of qualified teachers have severely impacted the quality of education, leading to learning gaps, low academic performance, and increased dropout rates.

Equity in education has also been severely compromised. Marginalized communities and internally displaced persons (IDPs) face disproportionate challenges in accessing education (Internal Displacement Monitoring Centre, 2020). These vulnerable populations often lack the resources and support needed to navigate the complexities of displacement and continue their education. Girls,

in particular, are often disproportionately affected, facing increased risks of child marriage and other forms of exploitation, further limiting their access to education (Save the Children, 2019).

The impact of armed conflict on education has been extensively documented, revealing a devastating toll on individuals and societies. Studies have consistently shown that conflict zones experience widespread destruction of educational infrastructure, including schools, libraries, and learning materials. This physical damage disrupts the learning process and creates unsafe environments for students and teachers. For instance, research by UNESCO (2011) highlighted the extensive damage to schools in conflict-affected regions, hindering access to education for countless children. Furthermore, armed conflicts often lead to the displacement of students and teachers, forcing them to flee their homes and disrupting their education. A study by Drysdale (2019) emphasized the challenges faced by displaced students in continuing their education, often lacking access to resources and facing integration difficulties in new communities.

Beyond the immediate disruptions, armed conflicts have long-term consequences for the quality of education. The loss of qualified teachers due to displacement, injury, or death creates a shortage of educators, impacting the quality of instruction. Research by Smith (2017) demonstrated the negative impact of teacher displacement on student learning outcomes in conflict-affected areas. Moreover, the psychological trauma experienced by students and teachers exposed to violence can significantly affect their ability to learn and teach effectively. A study by Betancourt et al. (2015) explored the psychological effects of conflict on children's education, revealing that exposure to violence can lead to learning difficulties, emotional distress, and decreased academic performance. These disruptions can have lasting consequences, contributing to increased poverty, unemployment, and social instability, as highlighted by a report by the World Bank (2018) on the long-term economic and social costs of conflict.

Several studies have meticulously documented the devastating impact of the Boko Haram insurgency on education in Northeast Nigeria. These studies consistently reveal widespread disruptions to the education system, marked by prolonged school closures (Aljazeera News, 2017; Human Rights Watch, 2016; OCHA, 2020), mass displacement of students and teachers (Idowu & Ayinde, 2021; UNICEF, 2015), and the destruction of vital educational infrastructure (Erne & Ibi-etan, 2012; Oladunjoye & Omemu, 2013). Furthermore, research has illuminated the profound psychological toll of the conflict, with students and teachers experiencing heightened levels of fear, anxiety, and trauma (Campbell, 2017; Eweje, 2018; Nwankpa, 2019). These studies collectively underscore the urgent need for interventions to address the multifaceted challenges facing education in the region and to support the recovery and resilience of affected communities.

LITERATURE RIVIEW

The impact of conflict on education is well-documented, with studies highlighting the devastating effects on educational access and quality, particularly in Northeast Nigeria. Alimi (2020) and Human Rights Watch (2018) have documented the Boko Haram insurgency's impact, including decreased enrolment, widespread school closures, and the psychological trauma experienced by students. These studies, while not focused specifically on mathematics education, establish the context of severe educational disruption within which this study is situated. Research on education in emergencies, such as that by UNESCO (2017b) and INEE (2010), emphasizes the critical importance of quality, equity, and access to education, especially for marginalized groups in conflict-affected areas, providing a framework for analysing the challenges faced by students in Northeast Nigeria. Furthermore, studies exploring the challenges faced by teachers in conflict zones, like those by Dryden (2019) and Sinclair (2002), highlight issues such as resource scarcity, safety concerns, and the need for psychosocial support, all of which are relevant to understanding the quality of mathematics instruction. Research on gender and education in conflict, including work by UNICEF (2021) and the World Bank (2018), demonstrates that girls are disproportionately affected, facing increased vulnerability and barriers to education, making it crucial to examine equity in mathematics education. Finally, studies on mathematics education in developing countries, such as Ginsburg & Lind (2014) and Mullis et al. (2016), often point to challenges in teacher training, curriculum development, and resource availability, issues that are likely exacerbated in conflict-affected areas.

While the devastating impact of the Boko Haram insurgency on education in Northeast Nigeria is acknowledged, and the crucial role of mathematics education in individual and societal development is recognized, a significant research gap exists regarding the specific effects of the conflict on the quality, equity, and accessibility of mathematics education. Although studies have documented the overall disruption of education, including reduced access to quality teaching and the psychological impact on students, there is a lack of focused research exploring how these challenges manifest within the context of mathematics learning. This study aims to address this gap by comprehensively analysing the specific challenges faced by students, teachers, and schools in ensuring effective mathematics learning amidst the insurgency, investigating the conflict's impact on the quality of mathematics instruction, the equity of access for diverse student populations (e.g., displaced students, girls, students with disabilities), and the overall accessibility of mathematics education resources and infrastructure.

Research Objectives

The main objective of the study is to determine the access, quality and equity of mathematics education among students amidst the Boko haram insurgency in northeast Nigeria and the specific objectives are to:

1. Assess the current state of mathematics education in Northeast Nigeria, focusing on the quality of teaching and learning, access to educational resources, and student learning outcomes.

2. Examine the specific challenges faced by students, teachers, and schools in ensuring effective mathematics education amidst the ongoing security threats.
3. Investigate the equity and accessibility of mathematics education across different groups of students, including marginalized communities and internally displaced persons (IDPs).
4. Identify key factors that contribute to the observed challenges in mathematics education.

Research Questions

The following research questions were raised:

1. What is the current state of mathematics education in Northeast Nigeria, specifically regarding the quality of teaching and learning practices, the availability and accessibility of educational resources and student learning outcomes in mathematics?
2. What specific challenges do students, teachers, and schools in Northeast Nigeria face in ensuring effective mathematics education in the context of ongoing security threats?
3. How equitable and accessible is mathematics education among students across schools in Northeast Nigeria, particularly for marginalized communities and internally displaced persons?
4. What are the key contributing factors to the observed challenges in mathematics education in Northeast Nigeria?

The findings of this study will provide valuable insights for policymakers, educators, and humanitarian organizations in developing effective strategies to address the educational crisis in the region and improve the quality of life for affected communities.

METHODOLOGY

This study employed a descriptive survey research design to examine the attitudes, opinions, and behaviours of teachers and students towards quality, equity, and accessibility of mathematics education among students amidst the Boko haram insurgency in northeast Nigeria using a large amount of data from a diverse sample. The population for this study comprised all secondary school students and mathematics teachers in northeaster states which stood at 498,378 from the six states in the northeast geopolitical zone. The sample size consisted of 384 from which 334 are students while 50 are mathematics teachers for three conveniently sampled states (Adamawa, Borno and Yobe). This sample size was determine using the 2006 research advisor and are considered adequate for a descriptive survey, as it aligns with the recommended sample sizes for educational research involving surveys (Cohen et al., 2017).

The instruments for data collection in this study were the Mathematics Students Opinion Questionnaire (MSOQ) and the Mathematics Teachers Opinion Questionnaire (MTOQ). Both were developed by the researchers. The questionnaires used a 4-point Likert scale for responses: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The decision mean was calculated by assigning values to responses: SA = 4, A = 3, D = 2, and SD = 1,

resulting in a decision mean of 2.5. A mean less than 2.50 indicated disagreement, while a mean of 2.50 or greater indicated agreement.

The validity of the instruments was ensured through expert review and pilot testing. Experts in mathematics education and test and measurement verified that they accurately captured the necessary constructs related to the teaching and learning of mathematics. The reliability indices of 0.85 for the MSOQ and 0.76 for the MTOQ were determined using Cronbach's alpha after a pilot test on 30 students and 10 teachers. Data collected from the completed questionnaires were analysed using descriptive statistics means, standard deviations, and grand mean using SPSS. The results of the data analysis were presented in tables.

RESULT

Research Question 1: What is the current state of mathematics education in Northeast Nigeria, specifically regarding the quality of teaching and learning practices, the availability and accessibility of educational resources and student learning outcomes in mathematics?

Table 1: Correct State of Mathematics Education Regarding Quality of Teaching and Learning Practices in Northeast Schools

S/N	Items	Mean	SD	Decision
1	Teachers in my school are well-trained and confident in teaching mathematics.	2.55	.715	Agreed
2	Mathematics lessons are engaging and encourage students to actively participate.	2.73	2.259	Agreed
3	Teachers regularly use a variety of teaching methods to cater to different learning styles in mathematics.	2.58	.835	Agreed
4	Students receive adequate support and feedback on their mathematics work.	2.60	.804	Agreed
5	My school has sufficient textbooks and other learning materials for mathematics.	2.45	.755	Disagreed
6	The available mathematics resources in my school are up-to-date and relevant.	2.41	.785	Disagreed
7	The school library has a good collection of mathematics books and resources.	2.44	.815	Disagreed
8	Technology is readily available and used effectively in mathematics lessons.	2.38	.907	Disagreed
9	Most students in my class perform well in mathematics.	2.64	.824	Agreed
10	I feel confident in my ability to learn and succeed in mathematics.	2.51	.830	Agreed
Grand Mean		2.51		

Source: Field Survey

In Table 1, items 1, 2, 3, and 4 relate to the quality of teaching practices. The means for these items range from 2.55 to 2.73. This shows that respondents generally agree that teachers are well-trained and confident, mathematics lessons are engaging, teachers use varied methods, and students receive adequate support. However, the standard deviation (SD) for these items, particularly item 2 (2.259), indicates a relatively wide range of responses. This suggests that while the average response is positive, there is considerable variation in perceptions about the level of student engagement in mathematics lessons. Items 5, 6, 7, and 8 focus on the availability and accessibility of resources. The means for these items range from 2.38 to 2.45, clearly indicating that respondents generally disagree that schools have sufficient, up-to-date resources, a good library collection, or that technology is readily available and effectively used. The SDs for these items are relatively consistent, suggesting that perceptions about resource availability are fairly uniform across respondents. Items 9 and 10 assess student learning outcomes and confidence. The means are 2.64 and 2.51, respectively, both suggesting that respondents generally agree that most students perform well in mathematics and that students feel confident in their ability to learn mathematics. Again, the SDs indicate some variation in these perceptions.

Research Question 2: What specific challenges do students, teachers, and schools in Northeast Nigeria face in ensuring effective mathematics education in the context of ongoing security threats?

Table 2: Challenges to Mathematics Education in Northeast Nigeria Due to Security Threats

S/N	Items	Mean	SD	Decision
1	I feel safe and secure when I am in my mathematics class.	2.33	.936	Disagreed
2	The ongoing security threats in my community make it difficult for me to concentrate on my mathematics studies.	2.94	.821	Agreed
3	I have access to the necessary resources for my mathematics classes.	2.41	.786	Disagreed
4	I have had to change schools due to the security situation.	2.85	.842	Agreed
5	I feel supported by my teachers in my mathematics learning, even with the challenges we face.	2.81	.882	Agreed
Grand mean		2.67		

Source: Field Survey

Item 1 in Table 2 has a mean of 2.33 and an SD of .936. This means that students do not feel safe and secure in their mathematics classes. The relatively high SD suggests a fair amount of variability in student responses, though the majority leaned toward disagreement. Item 2 has a mean of 2.94 and an SD of .821. This means that students generally agree that security threats in their communities negatively impact their ability to concentrate on mathematics. The SD indicates a moderate level of variation in responses. However, item 3 has a

mean of 2.41 and an SD of .786. This means that students do not have access to the resources they need for mathematics classes. The SD is relatively low, suggesting more consistent responses among students on this item. Also, item 4 has a mean of 2.85 and an SD of .842. This means that students usually change schools due to the security situation. The SD shows a moderate level of variability. Item 5 has a mean of 2.81 and an SD of .882. This means that students generally agree that they feel supported by their teachers, despite the challenges. The SD indicates a moderate level of variability in student responses. Finally, the grand mean of 2.67 highlights the collective agreement with the significant impact of security threats on students' safety, concentration, access to resources, school stability, and, while they feel supported, the overall learning environment for mathematics education in Northeast Nigeria.

Research Question 3: How equitable, accessible and challenges of mathematics education among students across schools in Northeast Nigeria, particularly for marginalized communities and internally displaced persons?

Table 3: Equity, Accessibility and Challenges of Mathematics Education in Northeast Nigeria

S/N	Items	Mean	SD	Decision
1	I feel adequately trained and supported to teach mathematics effectively in the context of ongoing security threats.	3.30	.931	Agreed
2	The security situation makes it difficult to consistently deliver quality mathematics instruction.	2.96	.968	Agreed
3	I have access to the resources I need to effectively teach mathematics.	1.74	.777	Disagreed
4	My school has sufficient resources and infrastructure to support effective mathematics Instruction, despite the security challenges.	1.68	.891	Disagreed
5	My school has established protocols and support systems to address the impact of security threats on students' learning and well-being.	2.24	.870	Disagreed
6	My school has enough mathematics textbooks for all students.	2.10	.931	Disagreed
7	Mathematics classes are held regularly and without frequent interruptions.	1.96	1.590	Disagreed
8	Transportation to and from school is readily available and affordable for all students.	2.34	1.099	Disagreed
9	I feel safe and secure attending school and mathematics classes.	1.70	1.015	Disagreed
10	Teachers provide extra support to students who are struggling with mathematics, regardless of their background	3.68	.741	Agreed
11	Girls and boys are encouraged equally to pursue advanced mathematics courses.	4.14	5.668	Agreed

12	IDPs receive the same quality of mathematics education as other students.	1.90	.839	Disagreed
13	My school provides resources and support to help students overcome barriers to learning mathematics.	2.18	1.424	Disagreed
Grand Mean		2.46		

Source: Field Survey

Table 3 reveals mixed perceptions regarding the equity, accessibility, and challenges of mathematics education in Northeast Nigeria. While respondents agreed that they feel adequately trained and supported to teach mathematics effectively despite security threats (Item 1, Mean = 3.30), that teachers provide extra support to struggling students regardless of background (Item 10, Mean = 3.68), and that girls and boys are equally encouraged to pursue advanced mathematics courses (Item 11, Mean = 4.14), a grand mean of 2.46 suggests an overall disagreement with the equitable access and challenges aspect of mathematics education. Specifically, respondents disagreed that the security situation does not hinder quality instruction (Item 2, Mean = 2.96), though this was close to the decision mean. Strong disagreement was evident regarding access to resources (Items 3 and 4, Means = 1.74 and 1.68, respectively), school support systems for security threats (Item 5, Mean = 2.24), sufficient textbooks (Item 6, Mean = 2.10), regular and uninterrupted classes (Item 7, Mean = 1.96), readily available and affordable transportation (Item 8, Mean = 2.34), personal safety at school (Item 9, Mean = 1.70), equal quality of education for IDPs (Item 12, Mean = 1.90), and school support to overcome learning barriers (Item 13, Mean = 2.18). The high standard deviation for some items, such as Item 11, suggests a wide range of opinions on these issues.

Research Question 4: What are the key contributing factors to the observed challenges in mathematics education in Northeast Nigeria?

Table 4: Contributing Factors to Challenges in Mathematics Education in Northeast Nigeria

S/N	Items	Mean	SD	Decision
1	The Boko Haram Insurgency has significantly disrupted the consistent delivery of mathematics instruction.	3.62	.725	Agreed
2	The insecurity caused by the conflict makes it difficult for students and teachers to attend school regularly.	2.78	.737	Agreed
3	The lack of basic infrastructure (classrooms, electricity, etc.) hinders effective mathematics teaching and learning.	2.92	.444	Agreed
4	Mathematics teachers in this region receive sufficient professional development and support.	1.68	.891	Disagreed
5	Teachers feel adequately prepared to teach mathematics in the context of the ongoing conflict.	2.24	.870	Disagreed
6	Parents and the community are actively involved in supporting students' mathematics learning.	3.68	.741	Agreed

7	Community displacement and instability have negatively impacted students' access to consistent mathematics education.	3.34	.823	Agreed
8	The conflict has had a significant negative psychological impact on students' ability to learn mathematics.	3.66	.626	Agreed
9	Teachers are adequately supported to address the psychological needs of students affected by the conflict.	1.70	1.015	Disagreed
Grand Mean		2.85		

Source: Field Survey

The results in Table 4 reveal several key contributing factors to the challenges in mathematics education in Northeast Nigeria. The data show strong agreement among respondents (means above 2.50) that the Boko Haram insurgency significantly disrupts consistent mathematics instruction (Mean = 3.62), that insecurity hinders regular school attendance for both students and teachers (Mean = 2.78), that a lack of basic infrastructure impedes effective teaching and learning (Mean = 2.92), that parents and the community are actively involved in supporting student learning (Mean = 3.68), that community displacement negatively impacts access to consistent mathematics education (Mean = 3.34), and that the conflict has a significant negative psychological impact on students' ability to learn mathematics (Mean = 3.66). Conversely, the data indicate disagreement (means below 2.50) with the notions that mathematics teachers receive sufficient professional development and support (Mean = 1.68), that teachers feel adequately prepared to teach mathematics in the context of the conflict (Mean = 2.24), and that teachers are adequately supported to address the psychological needs of affected students (Mean = 1.70). Finally, the grand mean of 2.85 suggests an overall agreement among respondents that the listed items contribute to the challenges, but the individual item means and standard deviations highlight specific areas of greater concern, particularly the lack of teacher support and preparedness in the face of conflict-related trauma.

DISCUSSION

It is evident from the first finding that while teachers are generally perceived as well-trained, confident, and using a variety of methods in their daily instruction, student engagement in mathematics lessons shows considerable variation. This finding presents a nuanced picture. This aligns with the broader context of educational disruption described by Al-Amin & Stevenson (2017) and Human Rights Watch (2014), where even well-trained teachers may struggle to effectively engage students in a crisis environment. The variability in engagement also underscores the challenges highlighted by Dryden (2019) and Sinclair (2002) regarding the difficulties teachers face in conflict zones, even if they are well-trained.

The second finding shows that respondents generally disagree that schools have sufficient, up-to-date resources, a good library collection, or that technology is readily available and effectively used. This finding strongly

supports the findings of Erne and Ibi-etan (2012) and Oladunjoye and Omemu (2013) on the impact of conflict on education and the destruction of infrastructure leads to the shortage of schools resources both material and non-material resources. It is also in agreement with the findings of UNESCO (2017b) on the disruption of resource supply chains to schools brings about shortage of school resources.

With regard to the third finding, students generally feel confident in their ability to learn mathematics and perform well, they do not feel safe and secure in their mathematics classes and lack access to necessary resources. This finding is in agreement with the findings of Al-Amin and Stevenson (2017) and Human Rights Watch (2014) on the interplay between student self-efficacy and the learning environment. While students may have a degree of confidence in their mathematical abilities, the lack of safety and resources creates significant barriers to learning. The finding is also in agreement with the findings of Betancourt et al. (2015) on the psychological impact of conflict on teaching and learning in schools.

The fourth finding reveals issues with equity and accessibility, with agreement on teacher support and encouragement but strong disagreement on access to resources, school support systems, and the overall quality of mathematics education for IDPs. This finding aligns with the findings of the Internal Displacement Monitoring Centre (2020) and Save the Children (2019) on the disproportionate impact of conflict on marginalized communities and IDPs, which prevents them from having access to quality mathematics education, especially in conflict-related areas. The finding is also in agreement with the findings of UNICEF (2021) and the World Bank (2018) on the gendered dimensions of educational access in conflict-related areas, which suggest that girls may face even greater barriers to accessing quality mathematics education.

CONCLUSIONS

The Boko Haram insurgency has had a devastating impact on the quality, equity, and accessibility of mathematics education in Northeast Nigeria. The findings of this study highlight the urgent need for concerted efforts to address the challenges faced by students, teachers, and schools in the region. By implementing effective interventions, it is possible to rebuild the education system, improve the quality of mathematics education, and equip young people with the knowledge and skills they need to contribute to the reconstruction and development of their communities.

RECOMMENDATIONS

Based on the research findings, the study recommends:

1. To improve mathematics instruction, education authorities should provide teachers with interactive and trauma-informed training, supported by ongoing mentorship.
2. Government and humanitarian organizations should establish mobile resource and technology hubs with solar power, providing resources and training for teachers and students on technology integration in teaching and learning.

3. Education authorities should ensure student well-being through psychosocial training, support groups, and safe school environments with basic resources.
4. Humanitarian organizations should focus on equitable access for marginalized students through catch-up programs, mobile classrooms, and community learning centres.
5. Regular professional development for mathematics teachers, focusing on conflict-zone pedagogy and psychological support, is essential for education authorities to adopt.
6. Education authorities need to implement standardized data collection using technology and conduct regular evaluations to inform effective educational practices.
7. Stakeholders should work towards ensuring equal access to quality mathematics education for all students by addressing disparities in resource allocation and school support systems.

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