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EFFECTS OF SCHOOL ENVIRONMENT ON SECONDARY SCHOOL STUDENTS' MATHEMATICS PERFORMANCE IN ABIA STATE

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Abstract: *The study investigated the Effects of School Environment on Secondary School Students' Mathematics Performance in Abia State. The study was guided by two specific purposes, two research questions, and two null hypotheses. The study adopted ex-post facto research design. The population of the study comprised all 9,783 Senior Secondary School Two (SS2) Mathematics students in public secondary schools in Abia State. A sample size of 400 respondents was drawn for the study. Two instruments; School Environmental Factors Questionnaire (SEFQ) and Students' Mathematics Academic Performance Proforma (SMAPP), developed by the researcher were used for data collection. The validity and reliability of the instruments were well-established. Data were collected on face-to-face basis and retrieved by the researcher and the research assistants upon completion by the students. Data collected were analyzed using mean, standard deviation, and t-test through Statistical Package for Social Sciences (SPSS). Findings revealed that school environmental factors (school location, and school facilities) have significant influence on the academic performance of students in Mathematics. In line with the findings, it was therefore recommended, among others, that government and educational authorities should provide targeted interventions to improve rural schools by ensuring equitable distribution of qualified teachers, infrastructure, and learning resources; and that school administrators and policymakers should prioritize the provision and maintenance of adequate school facilities, including classrooms, libraries, and laboratories, to create conducive learning environments.*
Keywords: *School Environment, Secondary School Students' and Mathematics Performance*

Introduction

Mathematics occupies a central position in formal education systems due to its foundational role in developing logical reasoning, problem-solving abilities, and analytical thinking required for participation in an increasingly knowledge-driven global economy. Its relevance extends across education, technology, and everyday life, influencing diverse fields such as the sciences, commerce, humanities, and the arts (Oredein & Sam-Kayode, 2022). The knowledge of Mathematics also provides the foundation for scientific discoveries, technological innovations, efficient management of resources, and data-driven decision-making processes that enhance productivity and industrial growth. Beyond its practical applications, Mathematics plays a crucial role in developing higher-order cognitive skills required in the 21st century. It promotes logical reasoning, analytical thinking, precision, and systematic problem-solving abilities that are essential for informed decision-making.

Recognizing its importance, the Federal Republic of Nigeria (FRN, 2019), in the National Policy on Education, designates Mathematics as a core subject at both primary and secondary levels of education. At the secondary school level, the policy outlines key objectives of Mathematics education, including fostering interest in the subject, enhancing computational and critical thinking skills, promoting accuracy in problem-solving, and preparing learners for further studies in mathematically oriented disciplines. In developing countries such as Nigeria, where aspirations for industrialization and digital transformation are closely tied to the quality of education, proficiency in mathematics is indispensable for building a skilled workforce capable of supporting scientific and technological growth. Thus, improving students' performance in mathematics remains a strategic priority for educational systems seeking to enhance productivity, reduce inequality, and foster long-term socio-economic development.

Despite its recognized importance, students' academic performance in mathematics in Nigeria has remained persistently low over the years, raising serious concerns among educators, policymakers, and stakeholders. Evidence from recent external examination bodies, including WAEC and NECO, indicates a recurring pattern of fluctuating trends and poor achievement, with a significant proportion of candidates failing to obtain credit-level passes required for progression into higher education. Recent

WAEC Chief Examiners' Reports (2019–2025) consistently highlight students' weaknesses in key areas such as algebra, trigonometry, and problem-solving, often attributed to inadequate conceptual understanding and poor instructional conditions. Similarly, national assessments point to systemic challenges affecting learning outcomes in mathematics across secondary schools. This persistent underperformance poses a major threat to Nigeria's educational goals and its broader aspirations for scientific and technological advancement, thereby necessitating sustained empirical investigation into the underlying causes of students' low performance in the subject.

Academic performance, which represents students' learning outcomes, has been conceptualized in various ways in the literature. According to York, Gibson and Ranklin (2015), academic performance is the extent to which a student has achieved educational goals, typically measured through examinations, tests, or continuous assessment scores. Similarly, Steinmayr et al. (2017) describe academic performance as the measurable demonstration of knowledge, skills, and competencies acquired through instruction. In the context of this study, academic performance therefore refers to students' learning outcomes in mathematics as measured by their test scores or examination results. Empirical evidence has consistently shown that students' academic achievement in Mathematics in Nigeria remains relatively low and unstable over time, despite the subject's recognized importance for national development. Earlier studies, for instance, indicate that performance in Mathematics in the West African Examinations Council (WAEC) examinations was largely below average for several decades, reflecting persistent challenges in achieving satisfactory learning outcomes in the subject (Zalmon & Wonu, 2017). More recent data from the West African Senior School Certificate Examination (WASSCE), based on WAEC Chief Examiners' Reports from 2018 to 2025, further reveal a pattern of fluctuation in students' achievement in Mathematics. For instance, while there have been periods of notable improvement in pass rates, these gains have often been followed by declines in subsequent years, indicating a lack of consistency in students' performance. Particularly concerning is the sharp decline reported in 2025, where a significantly lower proportion of candidates obtained credit-level passes. This pattern suggests that improvements in Mathematics achievement have not been sustained over time, thereby reinforcing concerns about the instability of learning outcomes in the subject.

Although these national statistics provide a general overview of students' achievement in Mathematics, they may not fully capture the variations that exist across different states and local contexts. Educational outcomes in Nigeria are often influenced by location-specific factors such as resource distribution, school conditions, and socio-economic differences, which vary considerably across various parts of the country. While some states have recorded periods of relatively high performance in external examinations, such performance is often inconsistent and not uniformly distributed across all schools or localities within the state. Within Abia State, which is the focus of this present study, there is limited recent empirical evidence providing a detailed analysis of students' academic performance in Mathematics. However, available observations and reports indicate that students' performance reflects a pattern similar to the national trend, characterized by fluctuations and inconsistencies across examination years. On this note, there is a considerable need to examine students' academic performance in Mathematics within specific contexts where these environmental conditions may uniquely shape learning outcomes.

It is imperative to note that students' academic performance in mathematics is a multifaceted outcome influenced by a complex interaction of factors operating at different levels of the educational system. Existing literature identifies student-related variables such as motivation, prior knowledge, and attitudes toward mathematics (Aremu & Sokan, 2018), as well as teacher-related factors including instructional competence and pedagogical practices (Adeyemo, 2020; Yusuf & Adigun, 2022), as important determinants of students' academic performance. However, growing attention has been directed toward school environmental factors, which provide the immediate context within which teaching and learning occur.

School environmental factors have been defined by different scholars to reflect their multidimensional nature. According to Earthman (2019), school environmental factors refer to the physical and infrastructural conditions within a school that influence teaching effectiveness and students' learning outcomes. Uline and Tschannen-Moran (2020) also defined school environmental factors as

encompassing the physical, social, and organizational features of schools that affect the teaching–learning process. Thus, school environmental factors in this study refer to the physical and organizational conditions within the school, specifically school location, school facilities, class size, and instructional materials, which may shape the quality of instructional delivery and students' learning experiences, thereby influencing students' academic performance in mathematics.

One important dimension of the school environment is school location. School location has been defined as the geographical setting in which a school is situated, typically categorized as urban or rural (Ajayi, 2018). In the same vein, Owoeye and Yara (2020) describe school location as the spatial placement of a school in relation to available social amenities and infrastructural development. In this study, school location therefore refers to whether a school is situated in an urban or rural area and how this influences access to educational resources.

Schools located in urban areas often benefit from better infrastructure, greater access to qualified teachers, and improved learning resources, whereas rural schools frequently face challenges such as inadequate facilities, teacher shortages, and limited access to instructional support. These disparities can influence the quality of teaching and students' engagement with learning tasks, thereby affecting academic performance. Some previous studies indicate that students in urban schools tend to perform better in mathematics than their rural counterparts, largely due to differences in resource availability and exposure to enriched learning environments (Owoeye & Yara, 2020; Ezeudu & Obi, 2021). However, some studies (Ajayi & Ogunyemi, 2019; Ibrahim & Danjuma, 2021) report minimal or context-dependent differences, suggesting that the effect of location may be mediated by factors such as teacher quality and school management practices, thereby necessitating further context-specific investigation.

Closely related to school location is the availability and adequacy of school facilities. Ayeni and Adelabu (2019) defined school facilities as the physical infrastructure and material resources provided within a school to support teaching and learning. Similarly, Owoeye and Yara (2020) describe school facilities as the buildings, equipment, and amenities that create a conducive learning environment. Accordingly, school facilities in this study refer to the availability and condition of classrooms, libraries, laboratories, furniture, and other infrastructural resources that support mathematics instruction. Adequate and well-maintained facilities have been shown to enhance students' concentration, participation, and overall academic engagement, while poor or inadequate facilities can hinder effective instruction and reduce learning outcomes. Some studies have demonstrated a positive relationship between the quality of school facilities and students' academic achievement in mathematics and other subjects (Ayeni & Adelabu, 2019; Owoeye & Yara, 2020; Asiyai, 2020). However, contrary findings exist, as some researchers argue that improvements in physical facilities alone do not automatically translate into better academic outcomes without corresponding improvements in instructional quality and school leadership (Ogunode & Adah, 2020; Nwogu, 2021). These mixed findings justify the need to further examine the role of school facilities within specific contexts such as Abia State.

A growing body of empirical literature has examined the influence of these school environmental factors on students' academic achievement, with some studies (Owoeye & Yara, 2020; Ayeni & Adelabu, 2019; Asiyai, 2020; Ezeugbor & Okeke, 2022) reporting significant relationships between variables such as school location, facilities, and students' performance in mathematics. However, findings across these studies are not entirely consistent. While some report strong positive relationships (Adeyemi, 2020; Eze & Ezenwafor, 2021), others suggest that the influence of environmental factors may be moderated by variables such as teacher quality and student motivation (Ajayi & Ogunyemi, 2019; Ogunode & Adah, 2020; Ibrahim & Danjuma, 2021). These inconsistencies highlight the need for more context-specific investigations.

Moreover, while considerable research has been conducted in Nigeria, there remains a paucity of recent empirical evidence focusing specifically on secondary schools in Abia State. Given the unique socio-economic and infrastructural characteristics of the state, none of the available studies have examined the combined influence of school location, and school facilities on students' academic performance in

Mathematics within this context. It is against this backdrop that the present study investigates the Effects of School Environment on Secondary School Students' Mathematics Performance in Abia State.

Research Questions

The following research questions guided this study:

1. To what extent does school location influence SS2 students' academic performance in Mathematics?
2. To what extent do school facilities influence SS2 students' academic performance in Mathematics?

Hypotheses

The following null hypotheses were formulated and tested at the 0.05 level of significance:

HO_1: School location has no significant influence on SS2 students' academic performance in Mathematics in Abia State.

HO_2: School facilities have no significant influence on SS2 students' academic performance in Mathematics in Abia State.

Methodology

The study adopted ex-post facto research design. The design is considered appropriate for this study because school environmental factors such as school location, and facilities (the independent variables) are not manipulated but already exist, and their influence on students' academic performance in Mathematics (the dependent variable) is examined retrospectively, which makes the design more applicable in this study. The population of the study comprised all 9,783 Senior Secondary School Two (SS2) Mathematics students in public secondary schools in Abia State. According to records obtained from the State Secondary Education Management Board (SEMB), the total population of SS2 students in the three education zones is distributed as follows: Aba Zone (3,238), Ohafia Zone (2,895), and Umuahia Zone (3,650), making the total population 9,783 SS2 Mathematics students in public secondary schools in Abia State. The SS2 students were chosen because they are stable in school and have been sufficiently exposed to the secondary school Mathematics curriculum. A sample size of 370 respondents was determined for the study using the Krejcie and Morgan (1970) table for sample size determination, which recommends a sample of 370 for a population of approximately 10,000. However, to improve representativeness and account for possible attrition or incomplete responses, the sample size was increased to 400 SS2 students.

A multi-stage sampling approach was adopted for the study. In the first stage, the population was first stratified into the three education zones in Abia State, namely: Aba, Ohafia, and Umuahia Zones. This ensured that all zones were adequately represented in the study. In the second Stage, using simple random sampling technique, four (4) LGAs were selected from Aba Zone (due to its relatively larger student population): Aba North, Aba South, Obingwa, and Osisioma. Two (2) LGAs, Ohafia and Arochukwu were selected from Ohafia Zone while two (2) LGAs, Umuahia North and Umuahia South were also selected from Umuahia Zone.This selection ensured proportional representation across the three zones. In the third stage, from each selected LGA, two (2) public secondary schools were selected using simple random sampling technique, one urban and one rural school where applicable. This resulted in a total of sixteen (16) schools. In the fourth stage, from each selected school, 25 SS2 students were selected using simple random sampling technique. This gave a total of 25 students from each of the 16 schools, making a total of 400 SS2 students. Only students were used as respondents because they are the direct recipients of instructional processes and their academic performance constitutes the dependent variable of the study.

Two instruments were used for data collection. They include: School Environmental Factors Questionnaire (SEFQ) and Students' Mathematics Academic Performance Proforma (SMAPP). The School Environmental Factors Questionnaire (SEFQ) was developed by the researcher to obtain data on school environmental factors. The instrument was structured into two sections; A and B. Section A contained items designed to classify respondents based on objective school characteristics, specifically school location (urban or rural). These variables were measured categorically and used for grouping

respondents during data analysis. On the other hand, Section B consisted of 20 structured items designed to measure students' perceptions of key school environmental factors. The items in section B were structured on a four-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) with corresponding numerical values of 4, 3, 2 and 1, respectively.

The Students' Mathematics Academic Performance Proforma (SMAPP) was used to obtain objective data on students' academic performance in Mathematics from school records. The proforma contained columns for students' identification codes, first term scores, second term scores, and computed average scores. The average score, calculated as the mean of the first and second term scores, was used as the measure of students' academic performance in Mathematics. This approach ensured the use of objective and reliable data, thereby enhancing the validity of the study. The instruments were subjected to face validation by three experts: one in Mathematics Education and two in Measurement and Evaluation from the Department of Science Education, Michael Okpara University of Agriculture, Umudike. Their corrections and suggestions were incorporated into the final version of the instruments, thereby ensuring their validity. To determine the internal consistency reliability of the School Environmental Factors Questionnaire (SEFQ), the researcher trial-tested on 20 SS2, 10 each from schools located both urban and rural areas that were outside the study area but with similar characteristics. Data gathered were used to establish the internal consistency of the instrument using the Cronbach Alpha method. The reliability coefficient obtained for the instrument was 0.80. Data collected were analyzed using mean, standard deviation, and t-test through Statistical Package for Social Sciences (SPSS). The mean and standard deviation were used to answer the research questions. For the mean scores obtained from the items for school facilities, a benchmark mean for decision was 2.50; thus, a mean less than this was considered as inadequate school facilities, while a mean above the benchmark was considered adequate school facilities for proper analysis. On the other hand, t-test was used to test the hypotheses at 0.05 level of significance. The decision rule for testing the hypothesis was thus: Reject the null hypothesis if the exact or associated probability value is less than 0.05, otherwise do not reject.

Results and Analysis

A total of 400 copies of the questionnaire were administered and 388 copies, representing 97% return rate were appropriately completed and retrieved from the respondents while 12 copies were either missing or incomplete and as such not used. Thus, the 388 copies were coded and analysed accordingly using relevant applicable statistics. The results from data analysis are presented in tables that follow. The presentation of results and discussion follows the sequence of the research questions and the null hypotheses that guided the study.

Research Question 1: To what extent does school location influence students' academic performance in Mathematics?

Table 1: Mean and standard deviation on the influence of school location on students' academic performance in Mathematics

School location	N	Mean	Standard Deviation	Decision
Urban	181	52.31	6.21	High
Rural	207	46.42	7.05	Low

The result in Table 1 reveals that the mean academic performance score of students in public schools in urban areas was higher (*Mean* = 52.31, *SD* = 6.21), compared to the mean score of their counterparts in rural areas which was relatively lower (*Mean* = 46.42, *SD* = 7.05). This implies that school location has considerable influence on students' academic performance in Mathematics, in favour of the students in urban schools.

Hypothesis One

School location has no significant influence on students' academic performance in Mathematics in Abia State.

Table 2: t-test analysis of the influence of school location on the academic performance of students in mathematics

School location	N	$\bar{X}$	SD	t-value	df	Sig.	Decision
Urban	181	52.31	6.21	8.665	386	0.000	Significant
Rural	207	46.42	7.05				

The results in table 2 shows that a t-value of 8.665 at a degree of freedom of 386 and exact probability (sig.) value of 0.000 were obtained from the data analysis. Since the exact probability (sig.) value of 0.000 is less than 0.05 level of significance ($p < .05$) at which the result was being tested, this means that the result is significant. Thus, the null hypothesis one was rejected and inference drawn was that school location has a significant influence on students' academic performance in Mathematics in Abia State, in favour of the students in urban schools.

Research Question 2: To what extent do school facilities influence students' academic performance in Mathematics?

Table 3: Mean and standard deviation on the influence of school facilities on students' academic performance in Mathematics

School facilities	N	Mean	Standard Deviation	Decision
Adequate	142	55.16	4.62	High
Inadequate	246	45.71	6.23	Low

Result in Table 3 indicates that the mean academic performance score of students in public schools with adequate school facilities was higher (*Mean* = 55.16, *SD* = 4.62), compared to the mean score of their counterparts in public schools with inadequate school facilities which was relatively lower (*Mean* = 45.71, *SD* = 6.23). This therefore signifies that school facilities have sizeable influence on students' academic performance in Mathematics, in favour of the students in schools with adequate school facilities.

Hypothesis Two

School facilities have no significant influence on students' academic performance in Mathematics in Abia State.

Table 4: t-test analysis of the influence of school facilities on students' academic performance in Mathematics in Abia State

School facilities	N	$\bar{X}$	SD	t-value	df	Sig.	Decision
Adequate	142	55.16	4.62	15.743	386	0.000	Significant
Inadequate	246	45.71	6.23				

The Result in table 4 reveals that a t-value of 15.743 at a degree of freedom of 386 and exact probability (sig.) value of 0.000 were obtained from the data analysis. Given that the exact probability (sig.) value of 0.000 is less than 0.05 level of significance ($p < .05$) at which the result was being tested, this implies that the result is significant. Therefore, the null hypothesis two was rejected and inference drawn was that school facilities have significant influence on students' academic performance in Mathematics in Abia State, in favour of students in public schools with adequate school facilities.

Discussion of Findings

Influence of school location on students' academic performance in Mathematics

The findings of this study revealed that school location has considerable influence on students' academic performance in Mathematics, in favour of the students in urban schools. Further analysis reviewed that school location has a significant influence on SS2 students' academic performance in Mathematics in Abia State, in favour of the students in urban schools. This finding could be attributed to several interrelated factors. Urban schools are generally characterized by better access to educational resources such as well-equipped classrooms, functional libraries, and modern instructional materials, all of which

enhance effective teaching and learning of Mathematics. In addition, urban schools tend to attract more qualified and experienced teachers due to better living conditions and access to professional development opportunities. These advantages create a more stimulating and supportive learning environment that fosters students' academic success.

Furthermore, students in urban areas are more likely to benefit from exposure to enriched academic environments, including access to extra coaching, digital learning tools, and peer academic competition, which collectively enhance their performance. In contrast, rural schools often face challenges such as inadequate infrastructure, shortage of qualified teachers, and limited access to instructional materials, all of which can hinder effective learning and reduce students' academic achievement in Mathematics.

The finding of this study is consistent with several previous empirical studies. For instance, the finding aligns with that of Adeyemo and Ibraheem (2021), who reported that school location significantly influences students' academic achievement, with students in urban schools performing better due to better access to resources and qualified teachers. Similarly, the finding is in consonance with Ajayi (2018), whose study revealed that students in urban schools performed significantly better than their rural counterparts, attributing this to improved learning environments and availability of educational resources.

In the same vein, the finding agrees with Ezeudu and Obi (2021), who found that students in urban schools achieved higher academic performance due to better access to learning resources and supportive school environments. Likewise, Ibrahim and Bako (2021) reported significant disparities between urban and rural schools, noting that students in urban schools performed better as a result of better access to facilities and instructional materials. However, the finding partially contrasts with Ajayi and Ogunyemi (2019), who observed that although school location initially appears significant, its effect diminishes when other variables such as school facilities and teacher quality are controlled. This suggests that school location may not independently determine academic performance but rather operates through other school environmental factors. Similarly, Ibrahim and Danjuma (2021) found that the influence of school location is mediated by factors such as school resources and socio-economic conditions. These variations notwithstanding, the preponderance of evidence supports the conclusion that school location significantly influences students' academic performance in Mathematics, particularly through its impact on access to educational resources and quality learning environments.

Influence of school facilities on students' academic performance in Mathematics

The study also found that school facilities has sizeable influence on students' academic performance in Mathematics, in favour of the students in schools with adequate school facilities. Hence, it was further revealed that school facilities have significant influence on SS2 students' academic performance in Mathematics in Abia State, in favour of students in public schools with adequate school facilities. This finding may be explained by the critical role that physical infrastructure plays in facilitating effective teaching and learning. Adequate school facilities such as well-ventilated classrooms, functional libraries, equipped laboratories, and appropriate seating arrangements create a conducive learning environment that enhances students' concentration, engagement, and overall academic performance.

In Mathematics, in particular, the availability of instructional spaces and supportive facilities enables teachers to adopt diverse teaching strategies, including demonstrations and practical illustrations, which improve students' understanding of abstract concepts. Conversely, inadequate or poorly maintained facilities can lead to overcrowding, discomfort, and reduced instructional effectiveness, thereby negatively affecting students' academic performance.

The finding of this study is consistent with several empirical studies reviewed. For instance, the finding agrees with Asiyai (2020), who found that the adequacy and quality of school facilities significantly correlate with students' academic performance, with better-equipped schools recording higher achievement. Similarly, the finding supports the results of Owoeye and Yara (2020), who reported a significant positive relationship between school facilities and students' academic achievement, emphasizing the importance of well-equipped learning environments. In addition, the finding is in line

with Ayeni and Adelabu (2019), whose study revealed that the availability and proper maintenance of school facilities enhance teaching effectiveness and improve students' academic outcomes. Likewise, Ogunode and Adah (2020) found that inadequate infrastructural facilities significantly hinder students' academic performance, highlighting the negative consequences of poor learning environments.

Despite this general agreement, some nuances exist. For example, while the reviewed studies emphasize the importance of facilities, they also suggest that the mere availability of facilities may not be sufficient without proper utilization. This implies that school facilities function as enabling conditions whose effectiveness depends on how well they are integrated into teaching and learning processes.

Conclusion

Based on the findings of the study, it is concluded that school environmental factors, namely school location, and school facilities have significant influence on students' academic performance in Mathematics in secondary schools in Abia State. The study clearly establishes that students in urban schools, and schools with adequate facilities tend to perform better academically in Mathematics. This implies that the quality of the school environment plays a crucial role in shaping students' learning experiences and academic outcomes. Therefore, improving school environmental conditions is essential for enhancing students' academic performance in Mathematics in secondary schools.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Government and educational authorities should provide targeted interventions to improve rural schools by ensuring equitable distribution of qualified teachers, infrastructure, and learning resources.
2. School administrators and policymakers should prioritize the provision and maintenance of adequate school facilities, including classrooms, libraries, and laboratories, to create conducive learning environments.

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