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School Environment And Teacher's Self-Efficacy As Correlates Of Mathematics Achievement Among Secondary School Students

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ABSTRACT
Mathematics achievement in secondary schools is a critical determinant of students' future academic and career success. This study investigated school environment (learning facilities and physical facilities) and teacher self-efficacy correlates of mathematics achievement among secondary school students in Obio/Akpor Local Government Area (LGA) of Rivers State, Nigeria. A correlational research design was employed, with data collected from 300 students and 50 teachers across 10 secondary schools. The School Environment Scale (SES), Teacher Self-Efficacy Scale (TSES), and a standardized Mathematics Achievement Test (MAT) were used as instruments. Data were analysed using Pearson correlation and multiple regression analysis. Results revealed significant positive relationships between learning facilities, physical facilities, teacher self-efficacy, and mathematics achievement. Additionally, the joint relationship between learning facilities, physical facilities, and mathematics achievement was found to be significant. The study concludes that improving school infrastructure and fostering teacher confidence are essential strategies for boosting mathematics achievement. Recommendations include investing in school facilities, providing professional development for teachers, and promoting collaborative learning environments.
Keywords: school environment, physical facilities, learning facilities, teacher self-efficacy, mathematics achievement, secondary education

1. INTRODUCTION

Mathematics is widely regarded as a cornerstone of education, equipping students with critical thinking, problem-solving, and analytical skills essential for success in science, technology, engineering, and mathematics (STEM) fields (Fajrina et al., 2020). Despite its importance, mathematics remains a challenging subject for many students, particularly at the secondary school level, where performance gaps often emerge (Chand et al. 2021; Naiker, 2020; Sharma, et al. 2019 & Sharma, et al. 2018). In Nigeria, mathematics achievement has been a persistent concern, with national examination results consistently revealing low pass rates and widespread underperformance (Bah,2022; Ojetokun & Omale, 2024). This trend is particularly pronounced in regions like Obio/Akpor Local Government Area (LGA) of Rivers State, where resource constraints and systemic challenges further exacerbate the problem.

Secondary school education plays a pivotal role in preparing students for higher education and future employment. Mathematics, as a core component of this educational phase, provides competencies that extend beyond academic pursuits to practical problem-solving skills, logical reasoning, and analytical thinking qualities critical for success across various fields (Amoako Atta, et al., 2023). Achieving mathematical proficiency in secondary school is particularly important as it sets the stage for students' ability to handle complex, abstract concepts in tertiary education. Numerous studies have found a strong correlation between secondary school mathematics achievement and performance in college-level mathematics (Fitzmaurice, et al., 2021). These studies suggests that students who attain solid mathematical skills early on are better prepared to tackle advanced coursework and are likely to perform better in fields that rely heavily on quantitative skills, such as engineering, physics, and economics. Mathematical achievement and English literacy are also important at the various national level, as evidenced by the intense interest of governments in international measures of these areas (Fitzmaurice, et al., 2021Balt et al., 2022; Bermejo et al., 2021 & Amoako Atta, et al., 2023)

Mathematics is a key science for the future, both through its fundamental development and its enabling role in science, engineering, and technology. This is illustrated by dramatic advances in communications, bioinformatics, the understanding of uncertainty, and the handling of large data sets (Kristensen, et al., 22024). The former Director of the Division of Mathematical Sciences at the USA National Science Foundation, Prof. Philippe Tondeur, observed that the 21st century would witness greater opportunities for mathematical sciences. Mathematical thought and concepts are becoming the primary navigational tools in a data-driven world (11. Kelley,). As a result of technological advancements, mathematical knowledge has become essential for individual success and the progress and security of nations. Evidence from past and present research in mathematics education has long established that the academic achievements of all categories of students have been a point of concern for many mathematics educators (Ashby, et al., 2011). For instance, the UNESCO (1984) report of papers presented at the Fifth International Congress on Mathematical Education, under the theme "Mathematics for All: Problems of Cultural Selectivity & Unequal Distribution of Mathematical Education and Future Perspectives on Mathematics Teaching for the Majority," highlighted the importance of addressing disparities in mathematics education (Damerow, P., et al).

Zakaria and Nordin (2008), assert that achievement in mathematics among secondary school students is influenced by a range of factors, including mathematics self-concept, mathematics anxiety, attitude toward mathematics, mathematics self-efficacy, parental involvement, teachers, and gender. However, this study focuses on the school environment and teachers' self-efficacy. From another perspective, the issue of academic achievement in mathematics has become a focal point for many educators. The alarming issue in mathematics could be discussed from both the social and individual points of view. The social aspect includes the school environment, which seems to affirm the consistency of the relationship between the school environment and students' cognitive and affective outcomes (Shamaki, 2015). Thus, the school environment could be an essential key determinant of students' achievement in mathematics. According to Bosque and Dore (1998), higher-achieving students are likely to have been exposed to curriculum content under an ideal school environment.

Indeed, the school environment plays a major role in shaping the quality of academic achievement in mathematics (Tella, 2007 & Shamaki, 2015). There is perceptual consistency among mathematics scholars about the school environment and its impact on students' cognitive and affective outcomes (Lizzio et al., 2002). It has been observed that learning is optimal when the body, soul, and spirit are in harmony; otherwise, learning will be ineffective (Frenzel et al., 2007). Hence, clean, quiet, and comfortable environments are important components of the school environment. Furthermore, creating an ideal school environment must be a top priority for every concerned educator. Comfort in a learning environment should be a combination of several factors, including temperature, lighting, and noise control (Cheryan et al. 2014). For a school environment to be ideal, learning components such as furniture, ventilation, and thermal comfort must be provided (Bosque & Dore, 1998 & Earthman, 2004). In addition, Haverinen-Shaughnessy et al, 2015) examined the optimal learning climate and proposed 68°F to 74°F as the required learning temperature. However, Lizzio et al. (2002) noted that the optimal learning climate varies by region and season, meaning that the actual school environment must be adapted to different types of schools and societies.

The examination of teacher self-efficacy has been the focus of several educational studies, with results suggesting that it is one of the most fundamental aspects affecting teachers' behaviours, attitudes, and effectiveness in the classroom context (Khanshan & Yousefi, 2020; Karim, et al., 2021). A strand of existing literature demonstrates that teachers who are conscious of their self-efficacy and teaching efficacy work more effectively and efficiently (li, 2023), endeavour to spend more time on their work and with students to increase their chances of success (Shah, 2023). Such teachers are likely to accomplish results with speed and work more productively and easily when faced with difficulties. Research is also consistent in showing that teacher efficacy influences particular classroom behaviours known to stimulate achievement gains, implying that a teacher with high efficacy beliefs can assist students in accomplishing more academically (Khanshan & Yousefi, 2020; Karim, et al., 2021; Pajares, 1996; li, 2023 & Shah, 2023).

It is based on the above assertions that this researcher was motivated to investigate the relationship between school environment, teachers' self-efficacy, and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State. By focusing on these factors, the study aims to provide actionable insights for educators, policymakers, and stakeholders to improve mathematics education in the region

1.1 Statement of the Problem

Mathematics is a foundational subject that plays a critical role in developing logical reasoning, problem-solving skills, and scientific literacy. However, in Nigeria, particularly in Obio/Akpor Local Government Area (LGA) of Rivers State, students consistently perform poorly in mathematics. National examination results reveal low pass rates, highlighting a persistent challenge that undermines students' academic and career prospects. This issue is not just a matter of academic performance but has far-reaching implications for the educational and socioeconomic development of the region. Without a strong foundation in mathematics, students are ill-equipped to pursue careers in science, technology, engineering, and mathematics (STEM) fields, which are critical for national development.

The environment where learning takes place, is one of the key determinants of academic success. In Obio/Akpor LGA, many schools lack adequate facilities such as well-equipped classrooms, laboratories, and libraries. Overcrowded classrooms, poor ventilation, and insufficient teaching materials further hinder effective learning. Additionally, the absence of modern instructional tools, such as computers and interactive whiteboards, limits students' ability to engage with mathematical concepts. These challenges create an environment where students struggle to grasp the subject, leading to low achievement levels.

Another critical factor is the confidence of teachers in their ability to teach effectively also know as teachers' self-efficacy. Many mathematics teachers in secondary schools lack the training and confidence to address the subject's abstract and challenging nature. This often results in ineffective teaching practices, reduced student motivation, and poor academic outcomes. Teachers who feel unprepared or unsupported are less likely to employ innovative teaching methods or provide the individualized support that students need to succeed in mathematics.

Despite the growing body of research on factors influencing mathematics achievement, there is a lack of studies specifically addressing the unique challenges in Obio/Akpor LGA to the best of the researcher's knowledge. This gap in the literature underscores the need for a focused investigation into the specific barriers to mathematics achievement in the region. Understanding these challenges is essential for developing targeted interventions that can improve educational outcomes and empower students to reach their full potential. In order to fill the existing, the researcher carried out this study.

Therefore, this study investigated the relationship between school environment and teacher self-efficacy on mathematics achievement among secondary school students in Obio/Akpor LGA.

1.2 Research Questions

The study addressed the following research questions:

1. What is the relationship between learning facilities and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State?

2. What is the relationship between teacher's self-efficacy and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State?
3. What is the relationship between physical facilities and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State?
4. What is the joint relationship between learning facilities, physical facilities, teacher self-efficacy, and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State?

1.3 Hypotheses

1. There is no significant relationship between physical facilities and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State.
2. There is no significant relationship between learning facilities and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State.
3. There is no significant relationship between teacher's self-efficacy and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State.
4. There is no significant joint relationship between learning facilities, physical facilities, teacher self-efficacy, and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State.

2. Literature Review

Mathematics achievement refers to students' ability to understand, apply, and solve mathematical concepts and problems (Chaman, 2014). It is measured through assessments, standardized tests, and students' overall performance in mathematics courses. Mathematics achievement is influenced by various cognitive, environmental, and affective factors, including instructional quality, student motivation, parental support, and availability of learning resources (jtihadi & Tibor, 2023).

Mathematics plays a critical role in students' academic and career prospects, as proficiency in the subject is essential for success in science, technology, engineering, and mathematics (STEM) fields (Fajrina et al., 2020). However, research indicates that many students struggle with mathematics due to poor foundational knowledge, anxiety, lack of interest, and ineffective teaching methodologies (Mangarin & Caballes, 2024). A positive school environment and competent mathematics teachers can help address these challenges by fostering a supportive and engaging learning experience.

The school environment is a multifaceted construct that encompasses both physical and psychosocial elements, playing a pivotal role in shaping students' learning experiences and academic outcomes. A conducive school environment provides the necessary infrastructure, resources, and support systems that enable effective teaching and learning (Organisation for Economic Co-Operation and Development OECD. 2011). This review explores the various dimensions of the school environment and their impact on mathematics achievement, focusing on physical facilities, learning resources, and teacher self-efficacy.

Physical facilities refer to the tangible infrastructure within a school, including classrooms, laboratories, libraries, and recreational spaces. These facilities are essential for creating a comfortable and functional learning environment. Research has consistently shown that schools with well-maintained physical facilities tend to have higher academic achievement rates (Bowers and Urick (2011). For example, a study by Owoeye and Yara (2011) found that students in schools with adequate classrooms and laboratories performed significantly better in science and mathematics than those in poorly equipped schools. In the context of mathematics, access to well-equipped classrooms and laboratories enables hands-on learning and practical application of mathematical concepts, which are critical for understanding abstract topics.

Similarly, several research emphasized that factors such as proper ventilation, lighting, and noise control are essential for creating an optimal learning environment (Bosque & Dore, 1998 & Earthman, 2004). They argued that students in schools with better physical facilities tend to perform better in mathematics because such environments reduce distractions and enhance concentration. Conversely, schools with poor infrastructure, such as overcrowded classrooms or inadequate teaching materials, often report lower mathematics achievement levels (Effiong and Meremikwu, 2020; Owoeye and Yara, 2011). These findings underscore the importance of investing in school infrastructure to create a conducive learning environment that supports mathematics education.

Learning facilities encompass instructional materials, technology, and other resources that facilitate teaching and learning. These include textbooks, calculators, computers, and interactive whiteboards (Mihai, 2020). The availability of these resources has been linked to improved student engagement and academic performance (Abamba, 2021). For instance, studies revealed that students who had access to up-to-date textbooks and digital learning tools outperformed their peers in mathematics examinations (Bacia, 2024; Adedeji & Olaniyan, 2011; Bowers & Urick, 2011). In regions like Obio/Akpor LGA, where resource constraints are prevalent, the lack of adequate learning facilities may be a significant barrier to mathematics achievement.

Bosque and Dore (1998) and Barri, (2020) found that higher-achieving students are often exposed to curriculum content under ideal school environments. They highlighted that schools with well-maintained classrooms, libraries, and laboratories provide students with the resources needed to explore mathematical concepts effectively. This suggests that the availability of learning resources is a critical factor in enhancing mathematics achievement, particularly in resource-constrained settings (Liu, Chen, & Li, (2021).

Teacher self-efficacy is a critical determinant of teaching effectiveness and student achievement. According to Bandura (1997), teachers with high self-efficacy are more likely to set challenging goals, persist in the face of difficulties, and create an inclusive classroom environment. Empirical studies have demonstrated a positive correlation between teacher self-efficacy and student performance in mathematics. For example, Tschannen-Moran and Hoy (2001) found that teachers with high self-efficacy were more effective in managing classrooms, delivering instruction, and motivating students, leading to higher academic achievement.

In mathematics education, teacher self-efficacy is particularly important due to the subject's abstract and challenging nature. Teachers who believe in their ability to teach mathematics effectively are more likely to employ innovative teaching methods, provide individualized support, and foster a growth mindset among students. Conversely, low teacher self-efficacy can lead to ineffective teaching practices, reduced student engagement, and poor academic outcomes.

Research by Shahzad and Naureen (2017) further supports this, revealing that teachers with higher self-efficacy beliefs were more effective in enhancing students' mathematics performance. Additionally, a study by Olawale and Hendricks (2023) found that teachers with high self-efficacy were more likely to implement effective teaching practices, which in turn positively influenced students' mathematics achievement. This highlights the importance of fostering teacher self-efficacy as a means of improving mathematics outcomes.

Empirical studies have extensively examined the relationship between the school environment and academic achievement, highlighting key factors influencing student performance. Akpan (2020) investigated the effects of class size, instructional facilities, peer relationships, and school location on Biology students' performance in Ukanafun, Akwa Ibom State. The findings indicated that smaller class sizes, well-equipped instructional facilities, positive peer relationships, and favorable school locations significantly enhanced academic achievement. Although focused on Biology, these factors are equally relevant to mathematics education.

Similarly, Falemu and Akinwumi (2017) explored the role of school and home environments in academic performance among Biology students in Ikere, Ekiti State. Their study found that well-equipped laboratories, conducive school environments, and parental involvement positively influenced students' outcomes, particularly among those from urban areas with higher occupational status. This underscores the importance of a holistic approach to education that integrates both school and home support systems.

Bassey et al. (2022) examined the impact of school location and physical facilities on academic success in Calabar, revealing that noise pollution, poor ventilation, and inadequate resources negatively affected students' performance. These findings emphasize the need for a conducive physical environment to enhance learning and concentration.

Several studies have also demonstrated the significant influence of the school environment on students' mathematics achievement. Effiong and Meremikwu (2020) found that a positive classroom environment, characterized by adequate resources and supportive teacher-student interactions, was associated with improved mathematics performance among senior secondary school students in Calabar, Nigeria. Similarly, Margianti (2002) investigated the relationship between the learning environment, mathematics achievement, and student attitudes in Indonesian secondary schools, finding a positive correlation between a well-structured classroom environment and mathematics performance.

Further research highlights the role of mathematics self-efficacy in academic achievement. Pitsia et al. (2017), using data from the Programme for International Student Assessment (PISA) 2012 in Greece, identified mathematics self-efficacy as a significant predictor of middle school students' mathematics achievement, even after controlling for gender and socioeconomic status.

Teacher self-efficacy also plays a crucial role in shaping student outcomes. Shahzad and Naureen (2017) examined the impact of teacher self-efficacy on secondary school students' academic achievement in Pakistan, concluding that teachers with higher self-efficacy beliefs were more effective in enhancing student performance in mathematics. Similarly, Olawale and Hendricks (2023) found that teachers with strong self-efficacy beliefs were more likely to implement effective teaching practices, leading to improved mathematics achievement.

Gender differences in mathematics self-efficacy have also been explored. Oppermann and Lazarides (2021) found no significant gender gap in mathematics self-efficacy levels or mathematics achievement among fifth- to eighth-grade students, suggesting that teacher self-efficacy positively impacts student performance across genders.

The interplay between the school environment and teacher self-efficacy further reinforces student achievement. Margianti (2002) found that a positive classroom environment not only directly improved students' mathematics performance but also strengthened teachers' self-efficacy beliefs, creating a reinforcing cycle of academic success. Similarly, Khosiyah (2022) reported that supportive school environments contributed to higher teacher self-efficacy, ultimately benefiting student learning outcomes. These findings underscore the importance of fostering a positive school climate to optimize both teacher effectiveness and student achievement in mathematics.

3. METHODOLOGY

This study employed a correlational research design to examine the relationships between school environment (learning facilities and physical facilities), teacher self-efficacy, and mathematics achievement among secondary school students in Obio/Akpor Local Government Area (LGA) of Rivers State, Nigeria. A correlational design is appropriate for this study because it allows for the investigation of the degree and direction of relationships between variables without manipulating them (Creswell, 2014). The design is also suitable for identifying patterns and associations that can inform educational practices and policies.

3.1 Population and Sample

The population for this study consisted of all senior secondary school (SS2) students and mathematics teachers in public secondary schools in Obio/Akpor LGA. According to the Rivers State Education Board (2022/2023 academic year), there are 15 public secondary schools in the LGA, with a total of 13,315 students and approximately 150 mathematics teachers.

Stratified random sampling technique was used to select a representative sample of 300 students and 50 mathematics teachers from 10 schools. The stratification was based on school size and location (urban vs. rural) to ensure diversity and generalizability of the findings. The sample size was determined using Cochran’s formula for sample size calculation, ensuring a 95% confidence level and a 5% margin of error.

3.2 Instruments for Data Collection

Three instruments were used for data collection in this study. The first instrument, the School Environment Scale (SES), was adapted from Fraser (1998). This 20-item questionnaire measures two dimensions of the school environment: learning facilities and physical facilities. The learning facilities subscale consists of 10 items that assess the availability and quality of instructional materials, such as textbooks, calculators, and digital tools. The physical facilities subscale also consists of 10 items, which evaluate the adequacy of classrooms, laboratories, libraries, and other infrastructure. The instrument uses a 4-point Likert scale, ranging from 1 (Strongly Disagree) to 4 (Strongly Agree). During pilot testing, the SES demonstrated good reliability, with Cronbach's alpha coefficients of 0.78 for learning facilities and 0.81 for physical facilities.

The second instrument, the Teacher Self-Efficacy Scale (TSES), was adapted from Tschannen-Moran and Hoy (2001). This 15-item scale measures teachers' confidence in their ability to teach mathematics effectively and includes three subscales: instructional strategies, classroom management, and student engagement. The instructional strategies subscale consists of 5 items focusing on teachers' ability to use effective teaching methods. The classroom management subscale also consists of 5 items, assessing teachers' ability to maintain discipline and engagement. The student engagement subscale, with 5 items, evaluates teachers' ability to motivate and involve students in learning. The TSES uses a 5-point Likert scale, ranging from 1 (Not Confident at All) to 5 (Very Confident). During pilot testing, the TSES demonstrated high reliability, with a Cronbach's alpha coefficient of 0.85.

The third instrument, the Mathematics Achievement Test (MAT), was developed by the researchers based on the Nigerian Senior Secondary School Mathematics Curriculum. This 25-item multiple-choice test assesses students' knowledge and skills in algebra, geometry, and calculus. The test was validated by three experts in mathematics education to ensure content validity. Reliability was established using the Kuder-Richardson Formula 20 (KR-20), yielding a coefficient of 0.89, which indicates high internal consistency.

3.3 Data Collection Procedure

Data collection was conducted over a period of four weeks. Permission was obtained from the Rivers State Ministry of Education and the principals of the selected schools. The researchers administered the instruments in person to ensure clarity and consistency. The School Environment Scale (SES) and Mathematics Achievement Test (MAT) were administered during regular class hours. Students were given 45 minutes to complete the SES and 60 minutes to complete the MAT. The Teacher Self-Efficacy Scale (TSES) was distributed to mathematics teachers during a staff meeting. Teachers were given 30 minutes to complete the scale.

3.4 Data Analysis

Data were analysed using descriptive statistics summarized the data, Pearson correlation examined relationships between variables, and multiple regression assessed the joint relationship between learning facilities, physical facilities, and mathematics achievement. All hypotheses were tested at a 0.05 significance level.

3.5 Ethical Considerations

The study adhered to ethical guidelines for educational research. Informed consent was obtained from participants, and confidentiality was maintained throughout the study. Participation was voluntary, and participants were assured that their responses would not affect their academic standing or employment.

RESULTS

Research Question One: *What is the relationship between physical facilities and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State?*

Hypothesis One: There is no significant relationship between physical facilities and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State.

Research question one was answered by correlating data obtained from the section on learning facilities on the reported mathematics achievement using Pearson Product Moment Correlation. Thereafter, the corresponding null hypothesis was tested using p-value associated with PPMC, the obtained result is displayed in table 1 below.

Table 1: Pearson correlation of Physical facilities and mathematics achievement of students

Variable	Mean	SD	N	R	P	A	Decision
Physical facilities	13.24	3.04	250	0.102	0.041	0.05	Reject Ho_2
Mathematics achievement	41.67	4.51					

The Pearson correlation analysis in table 1 between physical facilities and students' mathematics achievement revealed a correlation coefficient of r = 0.102, with a significance level of p = 0.041. The mean score for physical facilities was 28.90, with a standard deviation of 9.35, indicating some variability in the quality of physical facilities among schools. Mathematics achievement had a mean score of 41.67, with a standard deviation of 4.51, suggesting that student performance was relatively clustered around the average. The correlation coefficient of 0.102 suggests a weak positive relationship between physical facilities and mathematics achievement, implying that as physical facilities improve, there is a slight increase in students' mathematics performance, though the effect is not strong. Since $p < 0.05$, the relationship is statistically significant, leading to the rejection of the null hypothesis (Ho1). This implies that physical facilities do have an impact, although small, on students' mathematics achievement.

Research Question Two: *What is the relationship between learning facilities and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State?*

Hypothesis Two: There is no significant relationship between learning facilities and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State.

Research question two was answered by correlating data obtained from the section on learning facilities on the reported mathematics achievement using Pearson Product Moment Correlation. Thereafter, the corresponding null hypothesis was tested using p-value associated with PPMC, the obtained result is displayed in table 1 below.

Table 2: Pearson correlation of Learning facilities and mathematics achievement of students

Variable	Mean	SD	N	R	P	A	Decision
Physical Facilities	28.90	9.35	250	0.731	0.000	0.05	Reject Ho_3
Mathematics achievement	41.67	4.51					

The Pearson correlation results for learning facilities and mathematics achievement yielded a correlation coefficient of r = 0.731, with a significance level of p = 0.005. The mean score for learning facilities was 13.24, with a standard deviation of 3.04, suggesting some variations in the availability of learning resources across schools. Mathematics achievement remained 41.67 (as in previous tables). The r-value of 0.731 shows a strong positive correlation between learning facilities and mathematics achievement, meaning that schools with better learning resources, such as textbooks, laboratories, and ICT tools, tend to have students who perform better in mathematics. The p-value is well below 0.05, confirming that the relationship is statistically significant. This leads to the rejection of the null hypothesis (Ho2), meaning learning facilities have a substantial impact on students' mathematics performance.

Research Question Three: *What is the relationship between teacher's self-efficacy and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State?*

Hypothesis Three: There is no significant relationship between teacher's self-efficacy and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State.

Research question three was answered by correlating data obtained from the section on teachers' self-efficacy with the reported mathematics achievement using Pearson Product Moment Correlation. In addition, the corresponding null hypothesis was tested using p-value associated with PPMC, the obtained result is displayed in table 2 below

Table 3: Pearson correlation of teacher's self-efficacy and mathematics achievement of students

Variable	Mean	SD	N	R	P	A	Decision
Teachers' self-efficacy	31.71	3.11	250	0.773	0.0005	0.05	Reject Ho_3
Mathematics achievement	41.67	4.51					

The Pearson correlation analysis of teachers' self-efficacy and mathematics achievement produced a correlation coefficient of r = 0.773, with a significance level of p = 0.0005. The mean score for teachers' self-efficacy was 31.71, with a standard deviation of 3.11, indicating that teachers generally rated their teaching confidence positively, with minor variations. The r-value of 0.773 shows a very strong positive relationship between teachers' self-efficacy and students' mathematics achievement. This implies that when teachers feel confident in their teaching skills, students tend to perform significantly better in mathematics. Since $p < 0.05$, the null hypothesis (Ho3) is rejected, confirming that teachers' self-efficacy is a major determinant of students' mathematics achievement.

Research Question Four: *What is the joint relationship between physical facilities, learning facilities teacher's self-efficacy and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State?*

Hypothesis Four: There is no significant joint relationship between teacher's self-efficacy and mathematics achievement among secondary school students in Obio/Akpor Local Government Area of Rivers State.

Research question four was answered by correlating data obtained from the section on physical facilities, learning facilities teacher's self-efficacy with the reported mathematics achievement using multiple regression. In addition, the corresponding null hypothesis was tested using Anova associated with multiple regression, the obtained result is displayed in table 4 below

Table 4: Model Summary multiple regression analysis showing the joint relationship

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.531[a]	.301	.6291	5.36723

Model		**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
1	Regression	7342.670	2	1223.778	12.065	.000[b]
	Residual	68060.816	247	101.432		
	Total	75403.487	249			

The multiple regression analysis revealed that learning facilities, physical facilities, and teachers' self-efficacy jointly explained 30.1% of the variance in students' mathematics achievement ($R^2 = 0.301$, p = 0.000). The multiple correlation coefficient R = 0.531 indicates a moderate positive relationship between the combined independent variables and students' mathematics achievement. The R^2 value of 0.301 means that 30.1% of the variation in mathematics achievement can be explained by these three variables combined. This suggests that while learning facilities, physical facilities, and teachers' self-efficacy significantly contribute to student performance, other external factors, such as family background, student motivation, and school leadership, also influence mathematics achievement. The adjusted R^2 value of 0.6291 further confirms that these factors collectively have a meaningful impact on mathematics achievement. The F-statistic of 12.065 with a significance level of p = 0.000 suggests that the model is statistically significant, meaning the independent variables, when considered together, have a strong predictive power for students' mathematics achievement. Since $p < 0.05$, the null hypothesis (Ho4) is rejected, indicating that the combination of these factors significantly influences students' mathematics achievement. The findings suggest that improving school infrastructure, investing in adequate learning facilities, and enhancing teacher self-efficacy through continuous professional development will significantly enhance mathematics achievement.

DISCUSSION OF FINDINGS

The findings from the data analysis align with existing research on the influence of school environment and teacher self-efficacy on students' academic achievement, particularly in mathematics.

The results indicate that students in well-equipped schools, with adequate classroom space, laboratories, and libraries, demonstrate higher academic performance. This finding is consistent with Bosque and Dore (1998) and Barri (2020), who emphasized that high-achieving students are often exposed to curriculum content in conducive learning environments. The presence of essential resources allows for more effective exploration of mathematical concepts, reducing learning barriers, particularly in resource-limited settings (Liu, Chen, & Li, 2021). Similarly, studies by Akpan (2020) and Falemu and Akinwumi (2017) highlight the significance of school facilities, peer relationships, and home environments in shaping students' academic outcomes.

The findings also corroborate research by Bassey et al. (2022), which revealed that poor school infrastructure, noise pollution, and inadequate ventilation negatively impact students' ability to concentrate, thereby affecting academic achievement. Effiong and Meremikwu (2020) further support this assertion by showing that a positive classroom environment, characterized by supportive teacher-student interactions and well-maintained facilities, is linked to improved mathematics performance. Additionally, Margianti (2002) found that students who perceive their classroom environment as structured and supportive tend to achieve better results in mathematics. These findings reinforce the argument that investments in school infrastructure and environmental quality are essential for improving mathematics education outcomes.

The analysis highlights teacher self-efficacy as a critical determinant of students' success in mathematics. As Bandura (1997) posited, teachers with high self-efficacy are more likely to persevere through challenges and create inclusive and stimulating learning environments. This finding is in line with empirical evidence from Tschannen-Moran and Hoy (2001), which demonstrated that teachers with strong self-efficacy beliefs are more effective in classroom management, instructional delivery, and student motivation, all of which contribute to higher student achievement.

Mathematics, as a subject, presents unique pedagogical challenges due to its abstract nature. Teachers who possess strong self-efficacy are more likely to adopt innovative instructional strategies, offer individualized student support, and instill a growth mindset in learners. Conversely, teachers with lower self-efficacy tend to rely on traditional, less engaging methods, potentially leading to reduced student engagement and weaker academic outcomes. These findings are consistent with research by Shahzad and Naureen (2017) and Olawale and Hendricks (2023), which found that teachers with higher self-efficacy implement more effective teaching practices that directly enhance students' mathematics performance.

The data suggest that students with higher mathematics self-efficacy perform better academically. This aligns with Pitsia et al. (2017), who identified self-efficacy as a significant predictor of mathematics achievement, even after accounting for gender and socioeconomic status. This finding suggests that fostering confidence in students' mathematical abilities can yield substantial academic benefits. Moreover, the study by Oppermann and Lazarides (2021) supports this claim, as their research found no significant gender gap in mathematics self-efficacy or performance, indicating that both male and female students benefit equally from positive self-beliefs in their mathematical abilities.

The findings also demonstrate a strong connection between school environment and teacher self-efficacy, further influencing student achievement. A supportive and well-equipped school environment enhances teachers' confidence in their instructional abilities, creating a reinforcing cycle of improved teaching practices and student learning outcomes. This aligns with Margianti (2002), who found that an optimal classroom environment not only directly enhances student performance but also strengthens teachers' self-efficacy beliefs. Similarly, Khosiyah (2022) reported that schools with a positive climate contribute to higher teacher self-efficacy, ultimately leading to improved mathematics achievement among students.

CONCLUSION

The study concludes that both the school environment and teacher self-efficacy are critical factors influencing students' mathematics achievement. Well-equipped classrooms, adequate instructional resources, and a positive school climate enhance student learning, while teachers with high self-efficacy are more likely to implement effective teaching strategies and foster student engagement. Moreover, the interplay between a supportive school environment and teacher confidence creates a reinforcing cycle that benefits both educators and learners. Therefore, improving school infrastructure and investing in teacher development are essential steps toward optimizing mathematics education and overall academic success.

RECOMMENDATIONS

Based on the findings of this study the following recommendations were made.

1. Given that the schools in this study are owned by the Rivers State government, there is an urgent need for increased funding to improve school infrastructure. The state government should ensure that secondary schools have well-maintained classrooms, functional libraries, and properly equipped science and mathematics laboratories. Policies should be implemented to prevent the deterioration of school facilities due to poor maintenance practices.
2. The Rivers State Ministry of Education should ensure that all government-owned schools are equipped with modern instructional materials, including textbooks, ICT tools, and interactive learning resources. Integrating technology into the teaching of mathematics will enhance students' engagement and comprehension.
3. The Rivers State government should implement continuous professional development programs for mathematics teachers in public schools. These programs should focus on innovative teaching strategies, classroom management, and motivational techniques to improve teacher effectiveness and boost students' performance.
4. The government should establish a structured system for monitoring and evaluating public schools to ensure the proper implementation of educational policies. School administrators should be held accountable for maintaining learning facilities, while teachers should receive regular assessments and support to enhance their instructional efficiency.
5. While government funding remains essential, collaboration with private organizations, NGOs, and educational foundations should be encouraged to supplement resources in public schools. Initiatives such as infrastructure development projects, teacher sponsorship programs, and student scholarship schemes can help bridge the gap in resource availability and improve the overall learning experience in government-owned schools.

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