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School Location and Gender as Factors Influencing Academic Performance in Basic Science in Obio/Akpor Local Government Area

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Abstract
The study examined gender performance in basic science in urban and rural secondary schools in Rivers State's Obio/Akpor local government area. The study adopted an ex post facto research design. The study selected a sample size of 200 participants from all secondary schools in the local government area, using a stratified random sampling technique. The study made use of two instruments: the student's results, which served as the students' performance record (SPR), which were obtained from the school authorities and collected through the student's term results. The mean and standard deviation were used to answer the research question, while the independent sample t-test statistic was employed to test the null hypotheses. The result showed that students' performance in urban schools was better than their counterparts in rural schools. Between urban and rural schools, there was a significant difference in student performance. Furthermore, male students in urban and rural schools performed better than their female counterparts in the two locations; consequently, there was no significant difference in the performance between urban and rural schools. Based on the findings, some recommendations were made. The study concluded that school location and students' gender are determinants of students' performance in basic science.

Keywords: School Location, Gender, Academic Performance, Basic Science, Secondary School

Introduction

Various factors can significantly impact students' academic performance at the basic educational level, both positively and negatively. As highlighted by Joseph (2019), these factors range from student-specific influences to teacher-related variables. Among student-specific factors, gender has been identified as a crucial aspect affecting academic outcomes, as demonstrated in the work of Mgboma and Joseph (2018). Differences in how people perceive and process information can vary greatly, not only between individuals but also between genders. This concept aligns with the psychological principle of "individual differences." Notably, students may exhibit gender-based preferences for instructors, and these preferences could substantially influence their performance in specific subjects. The cultural roles assigned to men and women, particularly in African societies, have reinforced the notion that science and technology are male-dominated fields. Consequently, female students are often discouraged from pursuing careers in these areas, as observed by Thompson (2016). The issue of gender inequality and disparities in academic achievement, particularly in fields like basic science, is a significant global concern, especially in developing nations such as Nigeria (Abdu-Raheem, 2012). Both internal and external evaluations reveal discernible gender-based differences in academic performance (Siddi, 2013). In some cases, male students outperform their female peers, while in others, female students excel. This variability calls for a comprehensive investigation into how gender differences influence academic outcomes in secondary schools. Despite extensive research worldwide on the role of gender (among both students and teachers) in academic performance, there is no consensus on how gender impacts academic success in specific Local Government Areas (LGA) of Nigeria.

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Umoh (2013) conceptualised gender as a psychological construct within the realm of educational psychology, linking it to societal expectations based on biological sex. For this study, gender is understood as a socially constructed role assigned to individuals according to their sex (Godpower-Echie & Ihenko, 2017). Across many countries, including Nigeria, cultural stereotypes have reinforced the view that scientific disciplines are predominantly male domains. This perception has disadvantaged female students, leading to lower performance in science subjects and diminished interest in these fields. This misrepresentation of females in science-related subjects has adversely affected their academic performance and attitudes toward these subjects (Abdu-Raheem, 2012). A study by Olasehinde and Olatoye (2014) comparing male and female students' performance in science revealed that female students achieved higher mean scores in both performance and attitudes toward science. This finding challenges the traditional view that male students dominate in science-related fields. Shawai et al. (2022) identified multiple factors that influence students' academic performance in scientific subjects, including gender, personality traits, educational level, school location, and socioeconomic background. Among these factors, gender emerged as a significant determinant of students' success in secondary school science. School location, whether urban or rural, also plays a vital role in academic performance. Urban schools typically have better infrastructure, more qualified teachers, and students from higher socioeconomic backgrounds, whereas rural schools face shortages in these critical resources (Igboegwe & Okonkwo, 2012; Hart, 2014).

Over the years, a significant proportion of Nigerian students have failed to meet academic expectations, with gender-based differences in performance contributing to the overall decline in educational standards (Dutta et al., 2017). This trend has been particularly concerning in the context of basic science, where both male and female students have faced significant challenges. Gao and Zhang (2020) define poor academic performance as a deviation from expected outcomes, where students' achievements do not align with their potential. According to Alordiah et al. (2015), various factors contribute to this issue, including inadequate teaching methods, psychological barriers, gender disparities, and school location. Gender bias remains prevalent in Nigeria, as societal norms continue to limit female students' opportunities, even when they outperform their male counterparts (Alordiah et al., 2015). Raimi and Adeoye, as cited in Alordiah et al. (2015), found notable differences in male and female students' attitudes toward basic science. However, studies by Elijah and Ita (2017) and Lamas (2015) revealed no significant gender-based differences in academic performance. The role of gender in academic performance remains a contentious issue. While some studies suggest that female students outperform their male counterparts, others show the opposite. Still, some studies find no significant gender differences in academic performance (Wangu, 2014). Gender inequality in the classroom, often driven by instructional design and teacher biases, can also contribute to these disparities. Ajayi (2017) noted that teachers often give unequal attention to male and female students, which can affect the targeted gender's performance. Addressing these issues requires a nuanced approach to understanding gender dynamics in the classroom and their impact on academic performance, particularly in science subjects. Gender plays a critical role in influencing academic performance, as evidenced by multiple studies. Siddi (2013) demonstrated that gender serves as a predictor of students' academic outcomes, with findings indicating that boys often outperform girls. Abosede (2014) reinforced this assertion, revealing a significant negative correlation between gender and academic achievement, further emphasising that boys tend to achieve higher academic success than their female counterparts. However, not all studies align with this viewpoint. For instance, Rosenfield et al. (2016) found no statistically significant difference in academic performance between male and female junior secondary school students, suggesting that gender alone may not be the primary factor influencing performance.

Another critical determinant of academic success is the school's location, which can have a significant impact on gender performance. Owoeye and Agbaje (2016) asserted that students in urban schools generally perform better than those in rural schools due to superior educational resources and infrastructure. Yet, research by Igbo and Leaton (2022) challenges this direct relationship, highlighting that school location may not universally dictate academic success. These disparities in academic performance are particularly pronounced when considering gender in different geographical contexts. Urban schools typically offer a more conducive learning environment, characterised by well-equipped libraries, advanced technology, adequate instructional materials, and comprehensive evaluation processes. These resources foster a more favourable academic climate, enabling students to thrive (Yaro et al., 2016). Conversely, rural schools face numerous challenges, including limited access to educational materials, inadequate infrastructure, and, significantly, a language barrier. In rural settings, local dialects often dominate, creating an additional obstacle for students whose academic curriculum is delivered in English, Nigeria's official language. This linguistic divide is less of an issue in urban areas, further contributing to the performance gap between urban and rural students (Kuyenum et al., 2018; Ugwuanyi et al., 2020).

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The language barrier in rural areas disproportionately affects both male and female students, exacerbating gender-based performance discrepancies. Research by Mili (2015) found that gender performance variance is closely linked to school location, with urban students consistently outperforming their rural peers. The performance gap is further influenced by teacher preferences, as educators tend to gravitate towards urban schools, which offer better amenities and working conditions. This results in a shortage of qualified teachers in rural areas, thereby negatively impacting the quality of education in those regions (Ronfeldt et al., 2016; Mhiliwa, 2015). This dynamic perpetuates educational inequity, with rural students—especially females—facing greater challenges in achieving academic success compared to their urban counterparts (Alordiah et al., 2015). Studies also suggest that rural communities often prioritise subsistence livelihoods over education, further contributing to the lower academic performance of rural students, particularly girls. Cultural and societal norms in these regions frequently discourage female students from pursuing formal education, instead steering them toward traditional gender roles (Ayub et al., 2017). The disparity in performance between urban and rural schools is therefore not solely a function of resources but also deeply intertwined with societal attitudes toward gender and education. However, contrasting evidence exists. Tayaba (2012) and Alokan (2013) found that, in certain academic domains such as verbal aptitude and English language, rural students outperformed their urban peers. This suggests that factors beyond school location and resources, such as community engagement and teaching practices, may play a role in mitigating performance disparities. Furthermore, Genshenson and Langbein (2015) reported that school size did not significantly influence gender-based performance differences between urban and rural students in science subjects, indicating that academic outcomes are shaped by a complex interplay of factors beyond simple geographic distinctions. These studies collectively underscore the multifaceted nature of gender and location as they relate to academic performance. While urban schools tend to offer more advantages, rural students, particularly females, face a host of challenges that hinder their educational attainment. Addressing these disparities requires a nuanced approach that takes into account not only the physical resources available to students but also the social, cultural, and linguistic barriers they encounter in their educational journeys. The term "urban area," as defined by Isack (2015), refers to locations with high population density and complex interactions between human-made settings. These regions often contain cities, towns, and suburban zones, marked by sophisticated infrastructure, socioeconomic opportunity, and significant industrial growth. Residents in metropolitan locations generally participate in trade, commerce, and services, benefiting from plentiful employment options. Moreover, metropolitan locations offer several services, such as healthcare, education, transportation, and recreational facilities, which together contribute to a more favourable atmosphere for academic accomplishment. However, metropolitan regions also have obstacles, including industrial and vehicular pollution, which may significantly influence inhabitants' health and, by extension, their academic performance (Isack, 2017). Despite the extensive efforts of the Nigerian government, non-governmental organisations, and other stakeholders to minimise gender and location-based inequities, attaining equitable academic performance remains difficult. This problem is especially prominent in core scientific courses like basic science, as witnessed in the schools of Obio/Akpor Local Government Area (LGA) in Rivers State, Nigeria. In certain institutions, persistent gender differences in academic achievement pose relevant questions: How do male and female students fare in basic science examinations? Does gender affect academic achievement? Is there a detectable performance disparity between urban and rural pupils depending on gender? Does school location have a major effect on gender-based academic outcomes? The decline in academic performance, particularly in the sciences, is a significant concern in contemporary education. Students are failing to meet predicted skill levels, particularly at foundational educational stages. This drop may be traced, in part, to the combined effects of gender and school location, which have considerable effects on learning results. The discrepancies in gender and school location have hindered the continuous progress of science and technology throughout Nigeria, especially in Rivers State and the Obio/Akpor LGA. A crucial obstacle is the minimal involvement of female students in scientific and technology sectors, a feature that provides a considerable barrier to the general advancement of these disciplines in the nation (Ronfeldt et al., 2016; Alordiah et al., 2015). Addressing the current inequalities in academic achievement related to gender and geographic location is critical. Such initiatives are critical not only for achieving equitable educational outcomes but also for supporting equal socioeconomic and scientific progress. Bridging these discrepancies needs a dedicated study that investigates the complicated relationship between gender, school location, and academic achievement. As Mili (2015) and Owoeye and Agbaje (2016) have shown, pupils in urban schools typically outperform their rural counterparts, partly owing to inequalities in educational resources and facilities. However, Igbo and Leaton (2022) suggest that this link is not clear since variables such as language hurdles, instructor availability, and cultural standards all play crucial roles. In rural locations, notably in Nigeria, local dialects typically dominate, making it difficult for pupils to fully engage with curriculum offered in English, the official language of instruction (Kuyenum et al., 2018). This language barrier has a disproportionate impact on students' academic performance, particularly in fundamental science, further expanding the gender-based performance disparity between urban and rural pupils.

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Female students, in particular, face significant hurdles owing to social expectations and restricted access to excellent education (Ugwuanyi et al., 2020). Furthermore, the unwillingness of experienced instructors to accept posts in rural regions exacerbates this problem, since these schools typically lack the instructional quality seen in metropolitan settings (Ronfeldt et al., 2016). Given these problems, it is vital to adopt policies and initiatives that foster a more equitable and inclusive educational environment. This research intends to examine the gender-based performance of pupils in basic science in public schools within Obio/Akpor LGA of Rivers State. By researching the impact of gender and school location on academic success, this project hopes to contribute to policy formulation that promotes fair educational results, consequently supporting holistic growth and development in science and technology throughout Nigeria.

Research Questions

Three research questions guided the study:

1. Is there any difference in the academic performance of students in urban and rural schools in Obio/Akpor Local Government Area?
2. Is there any difference in the academic performance of male and female students in Basic Science in urban secondary schools in Obio/Akpor Local Government Area?
3. Is there any difference in the academic performance of male and female students in Basic Science in rural secondary schools in Obio/Akpor Local Government Area?

Hypotheses

The following null hypotheses are formulated and tested.

H01. There is no significant difference in the performance of students in Basic Science in urban and rural secondary schools in Obio/Akpor Local Government Area.

H02. There is no significant difference in the performance of male and female students in Basic Science in urban secondary schools in Obio/Akpor Local Government Area.

H03. There is no significant difference in the performance of male and female students in Basic Science in rural secondary schools in Obio/Akpor Local Government Area.

Methodology

This research employed a descriptive survey design, as the variables under investigation—gender-based performance disparities in basic science—are neither manipulable nor controllable. The study aimed to examine differences in academic performance between male and female students within and across urban and rural secondary schools in Obio/Akpor Local Government Area of Rivers State, Nigeria. The target population consisted of both male and female students from coeducational public secondary schools, with a particular focus on junior secondary schools in urban and rural settings within the Obio/Akpor Local Government Area. A stratified random sampling technique was used to ensure adequate representation from both urban and rural school environments. Schools were first stratified by location (urban or rural), and from each category, five (5) secondary schools were randomly selected. A total of 200 students were selected from these schools, with 20 students (both male and female) chosen from each school, resulting in a sample size of 200 participants. This stratification ensured that both urban and rural schools, as well as gender, were represented proportionally.

Two instruments were used to collect data: Students Demographic Information Inventory (SDII): This instrument was divided into two sections—Section A and Section B. Section A collected demographic details such as age, gender, and school location (urban or rural). Section B gathered academic information specific to the student's performance in Basic Science. Student Performance Records (SPR): The second instrument was the students' termly performance results in Basic Science. These records were obtained from the respective class teachers of the selected schools. The termly results for the second term, covering the years 2019 to 2021, were specifically used to assess student performance over time. Communication with the school principals of the selected schools was initiated to secure the required result sheets for both male and female students. The SDII was validated to ensure the instrument accurately captured the necessary demographic and academic data. The reliability of the instrument was established through a pilot study conducted in schools outside the study area, yielding a high-reliability coefficient, and ensuring consistent and dependable results for the main study. Data were collected through a combination of survey administration and retrieval of student performance records. Demographic data were gathered through the SDII, while academic performance data were obtained from the SPR, which consisted of the second-term results in Basic Science for both male and female students from 2019 to 2021. The collected data was then compiled and organised to meet the stipulated participant count and research requirements. The data were analysed using both descriptive and inferential statistical methods. Descriptive statistics, such as mean and standard deviation, were used to answer the research questions. While, to test the null hypotheses, an independent

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sample t-test was employed at a 0.05 level of significance. This statistical test was chosen to rigorously compare the academic performance of male and female students and examine whether the observed differences were statistically significant.

Results

Research Question1. Is there any difference in the academic performance of students in urban and rural schools in Obio/Akpor Local Government Area?

Table 1: Mean and standard deviation of students' performance in urban and rural schools

School Location	N	Mean	SD	Mean difference
Urban Schools	120.00	57.93	16.59	1.66
Rual Schools	100.00	59.59	15.79	

Table 1 shows the mean and standard deviation of the performance of students in Urban and Rural secondary schools in the LGA. Urban schools have a mean and SD of (57.93±16.59) respectively while rural schools have a mean of (59.59±15.79) and the mean difference was 1.66. The result indicated that the student's performance was slightly better in the rural schools than in the urban schools.

$H0_1$: There is no significant difference in the performance of students in Basic Science in urban and rural secondary schools in Obio/Akpor Local Government Area

Table 2: S**ummary of the independent sample t-test of students' performance in Urban and Rural secondary schools**

School location	N	Mean	SD	df	t	p
Urban Schools	120.00	57.93	16.59	218	-0.754	0.416
Rural schools	100.00	59.59	15.79			

Table 2 shows the mean and standard deviation of students' basic science performance in urban and rural secondary schools. The mean and SD of urban schools are 57.93 and 16.59, respectively, whereas the mean and SD of public schools are 59.59 and 15.79, respectively. The table further shows the result of the independent t-test (t-cal., -0.754 df, 218, p=0.416). The result shows no significant difference. Since the p>0.05, the H01. There is no difference in the students' performance between urban and rural schools was retained.

Research Question 2: Is there any difference in the academic performance of male and female students in Basic Science in urban secondary schools in Obio/Akpor Local Government Area?

Table 3. Mean and standard deviation of gender performance within urban schools

SCHOOL LOCATION	Students Gender	N	Mean	S D
URBAN SCHOOLS	MALE	50.00	59.46	17.19
	FEMALE	70.00	56.84	16.18

Table 3 shows the gender performance in urban schools. The male has a mean and SD of 59.45 ±17.9 respectively while females a mean and SD of 56.84±16.18 respectively. The result indicated that the male performance was better than their female counterpart in urban schools.

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H02: There is no significant difference in the performance of male and female students in Basic Science in urban secondary schools in Obio/Akpor Local Government Area

Table 4: Summary of the independent t-test of teachers' gender within urban secondary schools

SCHOOL LOCATION	GENDER	N	Mean	SD	Df	t	p
URBAN	MALE	50.00	59.46	17.19	113	0.85	0.12
	FEMALE	70.00	56.84	16.18			

Table 4 shows the mean and standard deviation of the performance of students in basic science in Urban and Rural secondary schools. Urban schools have a mean and SD (57.93±16.59) respectively, while the mean and SD for the rural schools are (59.59±15.79) respectively. The table further shows the result of the t-test, (t-cal., -754 df, 218, p=0.416) The result shows no significant difference. Since the p>0.05, therefore, HO_3.There is no difference in the students' performance between urban and rural schools is retained.

Research Question 3: Is there any difference in the academic performance of male and female students in Basic Science in rural secondary schools in Obio/Akpor Local Government Area?

Table 5. Mean and standard deviation of gender performance within rural schools

School location	GENDER	N	Mean	S D	Mean Difference
RURAL	MALE	60.00	59.68	15.45	.26
	FEMALE	40.00	59.45	16.48	

Table 5 shows the gender performance in urban schools. The male has a mean and SD of 59.68 ±15.45 respectively while the female had a mean and SD of 59.84±16.48 respectively. The result indicated that the male performance was slightly better than their female counterpar**t** in rural schools because the mean difference (.26) shows that the performance was almost the same in both sexes

H03: There is no significant difference in the performance of male and female students in Basic Science in rural secondary schools in Obio/Akpor Local Government Area.

Table6: **Summary of the independent sample t-test of student gender within rural secondary schools**

SCHOOL LOCATION	GENDER	N	Mean	SD	Df	t	p
RURAL	MALE	60.00	59.68	15.45	98	0.07	1.00
	FEMALE	40.00	59.45	16.48			

Table 6 shows the mean and standard deviation of students' basic science performance in urban and rural secondary schools. The mean and SD of urban schools are 57.93 and 16.59, respectively, whereas the mean and SD of public schools are 59.59 and 15.79, respectively. The table further shows the result of the t-test (t-cal., 0.07 df, 98, p=0.416). The results show that there is no significant difference in students' academic performance. Since p>0.05, the Ho4. There is no difference in the academic performance of male and female students in rural schools.

Discussion

The data shown in the different tables provide valuable insights into the role of school location (urban vs. rural) and the gender of pupils in their academic achievement in basic science. A deeper perspective of performance discrepancies is provided by these results, which challenge conventional beliefs and are consistent with prior studies. The results from the table indicate that students in rural schools (mean = 59.59, SD = 15.79) performed somewhat better than those in urban schools (mean = 57.93, SD = 16.59), resulting in a mean difference of 1.66. The findings contradict the prevailing belief that urban pupils surpass their rural peers in academic achievement. The findings of the t-test (t-cal = -0.754, df = 218, p = 0.416) in Table 2 provide further evidence supporting the null hypothesis (Ho1), which states that there is no significant difference in the performance of urban and rural pupils. This result is consistent with the study conducted by Igbo and Leaton (2022), which similarly yielded no

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statistically significant disparity in student achievement between urban and rural regions. They attributed this to improvements in rural schools' facilities and teaching quality, which have contributed to narrowing the gap with their urban counterparts. However, these findings contradict previous research, such as that of Owoeye and Agbaje (2016), who concluded that urban students often do better because they have more access to resources such as libraries, computers, and experienced instructors. The present study indicates that recent efforts to enhance rural education may be alleviating the longstanding drawbacks linked to rural schools.

Furthermore, the academic achievement of genders in urban schools clearly revealed that the score of males was higher (59.46 ± 17.19) than for females (56.84 ± 16.18), amounting to a mean difference of 2.39. Despite this disparity, the independent sample t-test demonstrated no significant difference between male and female students' performance, maintaining the null hypothesis (Ho2) that there is no difference in gender-based performance in urban schools. This result is congruent with the study of Rosenfield et al. (2016), who showed no statistically significant difference in the performance of male and female students in junior secondary schools. However, it conflicts with the findings of Abosede (2014), who observed that male students often outperform their female classmates, especially in scientific disciplines like basic science. The absence of a substantial difference in this research could reflect a general trend toward gender parity in educational chances and results, particularly in urban environments where social and educational resources are more widely dispersed. The further shows that gender-based performance in rural schools, demonstrating that male students did marginally better than female students with a minor mean difference of 0.26. The result demonstrated no significant difference in performance between male and female students in rural schools, maintaining the null hypothesis (Ho4).

This finding corroborates the result of Genshenson and Langbein (2015), which indicated that gender-based performance gaps in rural settings were minor. It also contrasts other research, such as Mili (2015), which indicated that male students in rural regions tend to outperform females owing to sociocultural variables including lower expectations for female academic performance and restricted access to educational resources for girls. The near-equal performance in this study implies that efforts to decrease gender gaps in rural schools may be delivering favourable outcomes. The result also indicates that the overall performance of students in rural schools was somewhat better than that of urban students, especially when the independent sample but the t-test indicated no statistically significant difference. Similarly, the result displays the gender-based performance across rural and urban schools, indicating essentially comparable performance levels across male and female pupils, with no significant difference identified ($p > 0.05$). These data imply that neither school location (urban vs. rural) nor gender substantially impacts academic achievement in basic science within the local government area. This result is therefore relevant in light of what Alordiah et al. (2015) observed. They highlighted a performance discrepancy between urban and rural pupils, with urban students often doing better owing to improved access to learning resources and trained instructors. The current analysis implies that recent measures focused on enhancing rural schools' infrastructure and teaching quality could help overcome this gap.

The results of this research have numerous major implications. First, the absence of a substantial performance differential between urban and rural schools implies that efforts to enhance educational access and quality in rural regions could be effective. It shows that rural schools may now offer instructional settings equivalent to urban schools, which might support more equitable learning outcomes. However, this also raises doubts about whether urban schools are sustaining their historically higher performance standards. Second, the fact that gender does not significantly affect academic achievement in both urban and rural schools suggests that gender biases in scientific education may be lessened. This is especially crucial for courses like basic science, where female students have traditionally been under-represented and failing. The practically equal performance of male and female students indicates that gender parity in educational achievements is becoming a reality in the research region. Finally, these results underscore the need for additional study into other variables that can impact academic success, such as teacher quality, socioeconomic status, family participation, and school infrastructure. While this research identified no significant variations depending on gender or school location, these other characteristics might still have a role in moulding children's academic achievement. Addressing these variables via focused policies and initiatives might further promote educational fairness and quality in both urban and rural schools.

Conclusion

In conclusion, this research demonstrated no significant difference in academic performance in fundamental science depending on either school location (urban vs. rural) or gender. These findings defy traditional beliefs about the benefits of urban schooling and male dominance in scientific disciplines, indicating that educational gaps in the study region may be lessening. These results also underline the necessity of continuous efforts to

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enhance rural education and promote gender equality in academic achievement. By continuing to address these concerns, educators and politicians may strive toward a more fair and successful educational system that serves all children, regardless of their geography or gender.

Recommendations

Based on the findings, the following suggestions are provided:

1. The government and educational stakeholders should emphasise supplying rural schools with contemporary teaching materials, laboratories, and technology to overcome the gap in learning resources between rural and urban schools.
2. Efforts should be made to stimulate increased female engagement in scientific topics via mentoring programs, science clubs, and activities targeted at removing gender stereotypes in science education.
3. Teachers in both urban and rural schools should get continual professional development focusing on effective scientific teaching approaches to promote student engagement and performance, regardless of location or gender.
4. Policies aiming at alleviating poverty, particularly in rural areas, should be adopted. These might include scholarships, free textbooks, and transportation, which help to increase educational access and performance.

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