PARENTAL SOCIO-ECONOMIC STATUS AND EDUCATION AS PREDICTORS OF BIOLOGY ACHIEVEMENT AMONG SENIOR SECONDARY SCHOOL STUDENTS IN LAGOS STATE

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Abstract: *Despite the centrality of Biology to science education and its role in preparing students for careers in medicine, agriculture, and environmental science, persistent underachievement has been reported in external examinations. This study investigated the influence of parental background and parental education on the academic achievement of senior secondary school Biology students in Lagos State, Nigeria. The study adopted a descriptive survey research design, drawing a stratified random sample of 300 students across public and private schools in Education District VI. Two instruments were used for data collection: the Biology Achievement Test (BAT) and the Parental Socio-Economic Influence Questionnaire (PSEIQ). Data were analysed using Pearson's Product-Moment Correlation and one-way Analysis of Variance (ANOVA). Findings revealed that parental socio-economic status significantly shaped students' Biology performance, with learners from higher-status families attaining better results. Similarly, parental level of education was found to exert a marked influence, as students whose parents had tertiary education outperformed those from households where parents had only primary or secondary schooling. These outcomes affirm that disparities in Biology achievement extend beyond classroom instruction, reflecting broader socioeconomic and educational inequalities. The study recommends that parental factors be systematically considered when addressing underachievement in science, and that multi-level strategies be designed to reduce disparities linked to family background. In particular, policies and interventions in Lagos State should not only enhance school-level provision but also engage with family-related inequalities, while lessons from this context*

can contribute to international debates on equity in science education.

Keywords: *academic achievement; biology education; parental background; parental education; socio-economic status.*

Introduction

Science education, defined as the systematic teaching and learning of scientific disciplines, is designed to foster a deep understanding of fundamental principles and to develop critical thinking, analytical reasoning, and practical competencies. Beyond its cognitive objectives, science education is widely recognised as a driver of national development, equipping learners with the skills necessary for technological innovation, economic transformation, and social development. In Nigeria, science education is increasingly framed as a tool for human capacity development, self-reliance and sustainable growth, as it prepares students to participate productively in a knowledge-driven economy (Tijani & Adeduyigbe, 2025). By cultivating creativity and problem-solving abilities, science education contributes not only to individual advancement but also to the broader socio-economic potential of the nation.

Biology, as one of the core science subjects, occupies a particularly important place in secondary education. It prepares students for careers in medicine, pharmacy, agriculture, and environmental science, while also cultivating observation, experimentation, and interpretation skills through practical work. However, student performance in Biology has consistently been low, as reflected in external examinations such as the West African Senior School Certificate Examination (WASSCE) and the National Examination Council (NECO). Evidence indicates that while some students perform relatively well in basic observational skills, they struggle with higher-order tasks such as specimen modelling and experimental problem-solving (Oleka-John et al., 2023). This persistent underachievement suggests that factors beyond classroom teaching may significantly influence learning outcomes in Biology, necessitating investigation into the wider ecological determinants of achievement.

Among the most widely studied of these determinants are parental background and parental education level, often conceptualised as dimensions of family socioeconomic status (SES). SES reflects a family's position in the social and economic hierarchy, usually measured through income, occupation, and education, while also encompassing cultural and educational resources available at home (Betancur et al., 2018). Families with higher SES are more likely to

provide material resources, access to informal science learning opportunities, and an enabling study environment that directly supports academic progress (Ohanyelu, 2022; Ovansa, 2017). In contrast, students from lower-SES backgrounds may lack these supports, creating disparities that are evident in examination results. Parental education, as a specific indicator of SES, has been shown to shape the aspirations, expectations, and educational support that parents transmit to their children (Onyedikachim & Ezekiel-Hart, 2021). Parents with higher educational attainment are often more engaged in their children's academic development, provide homework support, and model positive attitudes towards schooling, whereas parents with limited education may be less able to offer these supports.

Evidence from Nigeria highlights the powerful role of parental background in shaping achievement. Akachukwu et al. (2018) reported that parental socio-economic status significantly influenced Biology achievement among secondary school students in Imo State, recommending interventions such as extra lessons and improved laboratory facilities for disadvantaged students. Similarly, Ovansa (2017) found that parental SES shaped academic performance in Kogi State, recommending scholarships and government support for less privileged students. Ohanyelu (2022) confirmed in Southeast Nigeria that students whose parents had higher education and income consistently performed better in science subjects. However, Okafor et al. (2018) found no significant relationship between parental educational background and Civic Education achievement in Kwara State, suggesting subject-specific dynamics that warrant closer investigation. Onyedikachim and Ezekiel-Hart (2021), in Abia State, emphasized the importance of parental educational level, recommending that highly educated parents become more involved in their children's education, while parents with lower education draw on extended family and community support. Collectively, these Nigerian studies underscore the complex but critical role of parental background and education, while also highlighting mixed findings that call for further study within specific subject contexts such as Biology.

International studies reinforce this evidence while also revealing nuances. In China, Liu et al. (2019) conducted a meta-analysis across 215,649 students and found a moderate overall relationship between SES and achievement, though stronger for language subjects than for science and mathematics. Li and Qiu (2018) showed that family background influenced children's educational performance through both competition for quality educational opportunities and through parenting practices that shape study habits. These findings underscore the mechanisms through which SES operates, extending beyond

resources to include parental involvement and expectations. In South Africa, Prinsloo et al. (2018) found that cultural capital and language factors strongly influenced science achievement.

Furthermore, Juan and Visser (2017) highlighted the combined roles of home assets, language use, and school infrastructure. Addido et al. (2025), using TIMSS data, revealed that parental education and the number of books at home were strong predictors of science achievement in Egypt, Morocco, and South Africa, while access to digital devices showed negative associations. In Sweden, Wiberg and Rolfsman (2019) found that students with highly educated parents and book-rich homes consistently outperformed their peers in science, while Betancur et al. (2018) in the United States demonstrated that both parental income and education contributed to disparities in science outcomes from early childhood, operating through pathways such as literacy and informal science learning opportunities.

The Nigerian context has also benefited from recent scholarship. Nja et al. (2022) examined socioeconomic rank among science students in Calabar and found strong correlations between family income, academic achievement, study habits, and cognitive attitudes, with parental control emerging as a powerful mediator. Oleka-John et al. (2023) demonstrated that parental education and income made distinct contributions to Biology achievement and practical skills in Abuja, with students performing best in observation skills but weakest in specimen modelling. These findings align with broader international evidence, such as Selvitopu and Kaya (2023), whose meta-synthesis across 70 years of studies confirmed that SES remains a medium-strength predictor of achievement, stronger than parental involvement or expectations. Importantly, these studies also reveal gaps: many are cross-sectional, fail to account for prior achievement or school-level factors, and offer limited disaggregation between theory and practice in science subjects.

Despite the richness of the literature, significant gaps remain. First, most Nigerian studies have focused on general science or Biology achievement in selected states such as Imo, Kogi, Abia, and Abuja, with limited focus on Lagos State, where the diversity of school types and parental backgrounds presents a unique educational context. Second, while international evidence confirms the role of SES and parental education, findings regarding the strength and direction of these influences are inconsistent, varying across cultural and subject domains. Third, very few studies have explicitly examined the dual components of Biology, practical and theoretical parts, despite evidence that achievement may diverge across these domains. These limitations point to the need for focused, context-specific research in

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Lagos State that investigates how parental background and education influence Biology achievement.

The problem, therefore, is that while parental background and education are widely acknowledged as critical influences on student achievement, Biology performance in Nigeria remains persistently low, and little is known about how these parental factors operate within Lagos State. Addressing this issue is essential not only for improving examination outcomes but also for ensuring that Biology education contributes meaningfully to national goals of technological and socio-economic development.

In response to these limitations, this study investigates the influence of parental background and parental education on the achievement of senior secondary school Biology students in Lagos State. The study aims to generate evidence-based insights that can inform teachers, policymakers, and stakeholders in strengthening Biology outcomes and reducing educational disparities.

Purpose of the Study
The specific objectives of the study were to:
1. Ascertain the extent to which parental background influences the academic performance of secondary school Biology students.
2. Find out the extent to which parental level of education influences the academic performance of secondary school Biology students.

Research Questions
The study answered the following questions:
1. To what extent does parental background influence the academic achievement of secondary school Biology students?
2. To what extent does parental level of education influence the academic achievement of secondary school Biology students?

Hypotheses
The study tested the following hypotheses:

H_{01}: Parental background has no significant effect on the academic achievement of senior secondary school Biology students.

H_{02}: Parental level of education has no significant effect on the academic achievement of senior secondary school Biology students.

METHODS
Research Design

The study adopted a descriptive survey research design to examine the influence of parents' socio-economic status on the academic performance of secondary school Biology students in Lagos State. The descriptive survey design was considered appropriate as it allowed for the collection of quantitative data from a large sample of students to identify patterns, relationships, and trends between parental socio-economic variables and students' academic achievement. Through this design, the study captured real-world data on parental background and education, and their respective effects on students' performance in Biology. In addition, the study employed a correlational approach to analyze the degree of association between parental socio-economic factors and students' academic achievement. Pearson's correlation and ANOVA were used to determine the strength and significance of these relationships. This methodological approach ensured that the study provided empirical evidence on how different socio-economic factors impacted students' academic outcomes, thereby enabling data-driven conclusions and recommendations.

Population for the Study
The study was conducted in Local Education District VI, which was established in August 2005 from the defunct Lagos State Post-Primary Teaching Service Commission (TESCOM) by the Lagos State Government. The district is divided into three zones for administrative convenience: Ikeja Zone 1, Mushin Zone 2, and Oshodi/Isolo Zone 3. It comprises 104 junior and senior secondary schools and one technical college, with a staff strength of 3,820. The population for this study consisted of all senior secondary school Biology students in the selected schools within Local Education District VI, Lagos State.

Sample and Sampling Techniques
The target population for this study comprised senior secondary school Biology students in Lagos State, from which a total of 300 students were selected as the sample size using a stratified random sampling technique. This method ensured fair representation of students from different socio-economic backgrounds, taking into account parental education, income, and occupation. Stratification was carried out based on school type (public and private) and student departments to capture the diversity within the study population. Following stratification, a simple random sampling method was applied to select students from each category, giving every student an equal chance of inclusion. This procedure minimized selection bias and enhanced the reliability and generalizability of the findings. The final sample included students across different age groups and gender distributions, thereby providing

a comprehensive perspective on the influence of parental socio-economic status on Biology achievement.

Research Instruments
Biology Achievement Test
The Biology Achievement Test (BAT) is a standardized assessment tool designed to evaluate senior secondary school students' knowledge and understanding of fundamental Biology concepts. Adapted from past questions of the West African Examinations Council (WAEC), National Examinations Council (NECO), and Joint Admissions and Matriculation Board (JAMB), the instrument aligns with the Nigerian senior secondary school Biology curriculum for SSS1–SSS3. The test comprises 50 multiple-choice questions covering major areas such as cell biology, genetics, ecology, physiology, and environmental science. Each correct response is awarded 2 marks, while incorrect responses receive no mark, giving a total obtainable score of 100 marks. The test is to be answered within one hour, and all items are compulsory. The BAT provides a reliable measure of students' mastery of Biology content and serves as an effective tool for assessing their learning outcomes.

Parental Socio-Economic Influence Questionnaire (PSEIQ)
The Parental Socio-Economic Influence Questionnaire (PSEIQ) was developed by the researcher to gather information on how parental background and level of education influence the academic achievement of senior secondary school Biology students. It is divided into three sections: Section A, which gathers socio-demographic data, including gender and age. Section B, which consists of five items assessing the influence of parental background, including work schedule, financial stability, expectations, and emotional support; and Section C, which contains five items focusing on how parents' educational attainment influences students' exposure, decision-making, and aspirations for higher education. Sections B and C are structured on a four-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). This structure enabled the instrument to provide quantitative data on the role of parental socio-economic factors in shaping students' educational experiences.

Validity of the Instruments
The Biology Achievement Test (BAT) instrument was face validated by two research experts in the Department of Science Education, University of Lagos, along with two experienced and certified professional Biology teachers. Their feedback ensured that the test

items were relevant, clear, and aligned with the biology curriculum for SSS1–SSS3. Necessary refinements were made to improve clarity, appropriateness, and coverage of content areas.

For the Parental Socio-Economic Influence Questionnaire (PSEIQ), the instrument was face validated by three research experts in the Department of Science Education, University of Lagos, who provided valuable insights and suggestions for refinement, ensuring that all items were relevant, clear, and aligned with the study objectives. Subsequently, adjustments were made to the questionnaire structure and wording to address the supervisor's recommendations, thereby strengthening its validity.

Reliability of the Instrument

The reliability of BAT was established using two methods. The test was administered to 30 students (10% of the sample size) from selected senior secondary schools in Education District III, which was outside the study area, to avoid biasing the main research sample. The Kuder-Richardson Formula 20 (KR-20) was used because the items were dichotomously scored (correct or incorrect), making it the most suitable technique for multiple-choice achievement tests. This analysis produced a reliability coefficient of 0.88, indicating a high level of internal consistency. In addition, the test–retest method was applied to determine the stability of the test over time by re-administering the instrument to the same group after a two-week interval. The correlation of the two sets of scores yielded a reliability coefficient of 0.78, confirming that the BAT consistently measured students' knowledge of Biology across time.

The reliability of PSEIQ was determined to ensure consistency of measurement across items. The validated questionnaire was administered to 30 students (10% of the sample size) from Education District III, outside the study area, to prevent overlap with the main sample. The Cronbach Alpha coefficient was used because it is most appropriate for Likert-scale items, as it measures the internal consistency of multiple related items. The analysis gave a coefficient of $r = 0.79$, indicating acceptable reliability and confirming that the instrument was consistent in measuring parental socio-economic influence on students' educational experiences.

Procedure for Data Collection

The researcher obtained a letter of introduction from the Department of Science Education, University of Lagos, to conduct the study. The questionnaires were self-administered, and visits were made to the principals of the selected senior secondary schools to seek their consent

and explain the purpose of the study. Only schools and students who were willing to participate were included in the process. Relevant stakeholders in education also supported the researcher during data collection. To facilitate effective administration, two research assistants were recruited and trained in questionnaire administration and accurate recording of responses. Efforts were made to ensure that the questionnaires were properly completed and promptly retrieved from the respondents, after which the return rate was documented.

Method of Data Analysis
The data collected were coded, entered, and analyzed using the Statistical Package for the Social Sciences (SPSS) version 27.0. Pearson's Product-Moment Correlation (PPMC) was used to examine the degree of association between parental socio-economic variables and students' academic achievement. In addition, one-way Analysis of Variance (ANOVA) was applied to test the hypotheses and determine whether there were statistically significant differences in students' Biology achievement based on parental background and parental level of education. The significance level was set at 0.05, and results were presented in tables for clarity and ease of interpretation.

RESULTS
Analysis of Research Questions
Research Question 1: *To what extent does parental background influence the academic achievement of secondary school Biology students?*

Table 1: *Influence of Parental Background on the Academic Achievement of Secondary School Biology Students*

Parental Background (SES Level)	AC (Mean Score)	SD	Pearson's r	p-value
Low SES	55	10.2	-0.45	0.001
Middle SES	65	8.3		
High SES	78	7.8		

Note: SES – Socio-economic Status, AC – Academic Achievement, SD – Standard Deviation

The results in Table 1 show that parental background, measured by socio-economic status (SES), has a significant influence on the academic achievement of secondary school Biology students. Students

from low SES backgrounds recorded the lowest mean achievement score (M = 55, S = 10.2), those from middle SES backgrounds performed moderately (M = 65, S = 8.3), while students from high SES backgrounds achieved the highest scores (M = 78, S = 7.8). The negative and moderate correlation between SES and academic achievement (r = –.45, p = .001) indicates that lower parental socio-economic background is significantly associated with reduced academic achievement. This finding suggests that as parental SES increases, students' performance in Biology improves substantially.

Research Question 2: *To what extent does parental level of education influence the academic achievement of secondary school Biology students?*

Table 2: *Influence of Parental Level of Education on the Academic Achievement of Secondary School Biology Students*

Parental LOE	AC (Mean Score)	SD	Pearson's r	p-value
Primary	50.4	9.1	-0.52	0.001
Secondary	62.3	8.4		
Tertiary	75.8	7.6		

Note: LOE – Level of Education, AC – Academic Achievement, SD – Standard Deviation

The findings in Table 2 indicate that parental level of education (LOE) has a marked influence on the academic achievement of secondary school Biology students. Students whose parents had only primary education recorded the lowest mean score (M = 50.4, S = 9.1), those whose parents had secondary education performed better (M = 62.3, S = 8.4), while students whose parents attained tertiary education achieved the highest scores (M = 75.8, S = 7.6). The correlation between parental level of education and academic achievement was negative and moderate (r = –.52, p = .001), signifying that lower parental educational attainment is significantly associated with poorer academic performance. This suggests that students' achievement in Biology improves substantially as parental educational level increases.

Hypotheses Testing
H_{o1}: *There is no significant effect of parental background on the academic achievement of senior secondary school Biology students.*

Table 3: *ANOVA on the Effect of Parental Background on the Academic Achievement of Secondary School Biology Students*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	784.861	7	112.123	3.367	.002
Within Groups	9723.736	292	33.300		
Total	10508.597	299			

The result of the one-way analysis of variance (ANOVA) presented in Table 3 examined whether parental background had a significant effect on the academic achievement of senior secondary school Biology students. The analysis revealed that there was a statistically significant difference in students' academic achievement scores based on parental background, $F(7, 292) = 3.37$, $p = .002$. The between-groups sum of squares (784.861) with a mean square of 112.123 indicates that variations attributable to parental background were considerable when compared with the within-groups mean square of 33.300. Given that the obtained significance value is less than the conventional threshold of .05, the null hypothesis, which stated that parental background has no significant effect on the academic achievement of Biology students, is rejected. This suggests that the academic achievement of students differed across categories of parental background, thereby highlighting the importance of family-related factors in shaping students' performance in Biology at the senior secondary level.

H_{o2}**:** *There is no significant effect of parental level of education on the academic achievement of senior secondary school Biology students.*

Table 4: *ANOVA on the Effect of Parental Level of Education on the Academic Achievement of Secondary School Biology Students*

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2818.496	10	281.850	10.592	.000
Within Groups	7690.101	289	26.609		
Total	10508.597	299			

The one-way analysis of variance (ANOVA) in Table 4 assessed the effect of parental level of education on the academic achievement of senior secondary school Biology students. The result shows that there was a statistically significant difference in achievement scores across the categories of parental education, $F(10, 289) = 10.59$, $p < .001$. The between-groups sum of squares (2818.496) with a mean square of

281.850 was considerably higher than the within-groups mean square of 26.609, indicating that a large proportion of the variation in students' achievement can be explained by differences in their parents' level of education. Since the significance value is less than the conventional .05 level, the null hypothesis, which stated that parental level of education has no significant effect on the academic achievement of senior secondary school Biology students, is rejected. This implies that students' academic achievement in Biology varied significantly depending on the educational attainment of their parents, underscoring the crucial role of parental education in influencing learners' academic outcomes.

Discussions
The findings of this study provide compelling evidence that both parental backgrounds, measured through socio-economic status (SES), and parental level of education exert significant influences on the academic achievement of senior secondary school Biology students in Lagos State. This aligns with a substantial body of literature which identifies family-related factors as key determinants of science learning outcomes.

Findings from this study revealed that students from higher socio-economic backgrounds achieved significantly better results in Biology than their peers from middle and low socio-economic groups. This confirms the assertion of Ovansa (2017) and Ohanyelu (2022) that students from more privileged families benefit from access to educational resources, stable home environments, and supportive parental expectations that collectively enhance their performance. Similarly, Akachukwu et al. (2018) emphasized that parental SES strongly influenced Biology achievement in Imo State, a finding mirrored in the present study within the Lagos context. At the international level, Betancur et al. (2018) and Wiberg and Rolfsman (2019) reported similar outcomes in the United States and Sweden, respectively, where socio-economic advantages translated into stronger science performance. Thus, this study reinforces the cross-cultural validity of SES as a determinant of student achievement, while offering locally relevant insights for Lagos State.

However, it is worth noting that Okafor et al. (2018) found no significant relationship between parental background and achievement in Civic Education. The divergence from the present findings suggests that the influence of SES may vary across subject domains, with science subjects such as Biology perhaps being more resource-intensive and therefore more sensitive to variations in parental socio-economic conditions. This supports the view of Oleka-John et al.

(2023) that Biology, particularly its practical component, requires more than classroom instruction, demanding supplementary resources and parental support which are unequally distributed across socio-economic strata.

Another key finding of this study is that parental education significantly influenced Biology achievement. Students whose parents had attained tertiary education outperformed those whose parents had only primary or secondary schooling. This finding resonates with Onyedikachim and Ezekiel-Hart (2021), who observed that parents with higher levels of education are more likely to be actively involved in their children's learning, model positive study habits, and provide both intellectual and emotional support. The results of this study also confirm the argument of Addido et al. (2025), who found that parental education and book availability in the home were strong predictors of science achievement across several African countries. These results underline the role of parental education in shaping not only academic aspirations but also the learning culture within the home environment.

The strength of the association found in this study supports the claim of Nja et al. (2022) that parental education and socio-economic ranking strongly influence students' study habits, attitudes, and eventual academic performance. Furthermore, Oleka-John et al. (2023) demonstrated that parental education and income made distinct contributions to practical and theoretical aspects of Biology, which corroborates the present finding that higher parental education equips students with the intellectual and motivational support needed to navigate complex areas of Biology beyond basic observational skills.

While the results of this study are broadly consistent with national and international evidence, they also add important contextual insights. Lagos State presents a unique setting with its diversity of school types and student populations. The significant effects of both parental background and parental education observed here suggest that educational inequalities are likely to be amplified in urban centers where disparities in wealth, access to quality schooling, and parental literacy levels are more pronounced. This underscores the need for policy interventions, such as scholarships, mentorship programs, and strengthened school-based support systems, to mitigate the disadvantages faced by students from less privileged backgrounds.

Moreover, this study contributes to the debate on whether SES remains a stronger predictor of achievement than parental involvement. Selvitopu and Kaya's (2023) meta-synthesis concluded that SES had a medium-strength predictive power, surpassing parental involvement alone. The findings of the present study confirm this trend, showing that while parental involvement may play a role, the structural

advantages linked to socio-economic resources and educational attainment create more enduring effects on Biology outcomes.

Taken together, these findings affirm that the persistent underachievement in Biology observed in national examinations cannot be explained solely by instructional factors within schools but must be understood within the broader ecological context of family background and parental education. By demonstrating statistically significant differences in Biology achievement across parental SES and educational categories, this study provides strong empirical evidence that family-related inequalities shape learning outcomes in Lagos State. Addressing these disparities will require holistic strategies that extend beyond classroom interventions to include parental sensitization, targeted support for disadvantaged learners, and systemic efforts to reduce socio-economic barriers to educational success.

Broader Implications and Significance of the Findings

The findings underscore the enduring importance of parental socio-economic status and educational attainment as critical factors in shaping students' achievement in Biology. This highlights the broader significance of family background in science education research, confirming that learning outcomes are not solely determined by classroom instruction but are deeply embedded in wider social and economic contexts. By situating academic performance within this broader ecological framework, the study contributes to a more holistic understanding of why disparities in science achievement persist in Nigeria.

The results also carry important implications for how Biology is conceptualized. They demonstrate that performance differences cannot be fully explained by individual aptitude or school-level resources alone, but are closely linked to parental influences that extend into students' study habits, aspirations, and confidence in learning. This suggests that any analysis of underachievement in Biology must take into account the interplay between home and school environments, rather than attributing outcomes exclusively to curriculum delivery or teacher effectiveness.

At a broader policy and societal level, the findings point to the role of education as both a driver of social mobility and a potential source of inequality when family backgrounds differ significantly. They indicate that educational achievement continues to reproduce patterns of advantage and disadvantage across generations, as students from more educated and economically secure families are better positioned to succeed. This raises critical questions about equity in access to science education and about how systemic structures may either perpetuate or

mitigate disparities in learning outcomes across different socio-economic groups.

Conclusions and Recommendations
Conclusions
This study examined the influence of parental background and parental education on the academic achievement of senior secondary school Biology students in Lagos State. The findings revealed that both socio-economic status and parental educational attainment significantly shaped students' performance, with learners from more privileged and better-educated families attaining higher scores. These results confirm that achievement in Biology is not only determined by school factors but also by broader family-related influences that operate through resources, study support, and academic expectations.

The study further contributes to the body of literature by situating these relationships within the Lagos context, where social and economic diversity is particularly pronounced. It highlights that Biology achievement reflects wider inequalities in opportunity, thereby reinforcing the need for comprehensive strategies that address both school-level provision and family background. Ultimately, the study demonstrates that addressing disparities in parental socio-economic and educational conditions is essential for improving Biology outcomes and advancing the goals of science education in Nigeria.

Recommendations
Based on these findings, the following recommendations are made:
1. Teachers should adopt instructional practices that are sensitive to differences in students' family backgrounds and provide additional support for learners from less advantaged homes.
2. Parents should be encouraged to take active interest in their children's education, irrespective of their own level of schooling.
3. School administrators should organize sensitization programs that highlight the importance of parental involvement in students' learning.
4. Government and policymakers should provide scholarships and financial support to students from low socio-economic backgrounds to reduce inequalities in access to learning opportunities.
5. Educational stakeholders should priorities the provision of well-equipped laboratories in public schools to minimize the extent to which family resources determine practical learning.

6. Community-based organizations should develop mentorship and peer-support initiatives that bridge the gap between students from different socio-economic and educational backgrounds.
7. Future research should explore how school-level interventions can mediate the effects of socio-economic and parental education disparities on Biology achievement.

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