

PERCEIVED INFLUENCE OF SCHOOL ENVIRONMENT ON ACADEMIC PERFORMANCE OF PHYSICS STUDENTS IN PUBLIC SECONDARY SCHOOLS IN ENUGU STATE, NIGERIA

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Abstract

This study examined the impact of the school environment on the academic performance of Physics students in public secondary schools in Enugu State, Nigeria. The study was guided by three research questions and one null hypothesis. A descriptive survey research design was adopted for the study. The target population comprised 4,842 Physics students in public secondary schools across the six education zones in Enugu State. Simple random sampling by balloting was used to select six public secondary schools, one from each education zone. Multi-stage random sampling technique was subsequently adopted to select 30 Physics students from each sampled school, yielding a total sample of 180 respondents. Data were collected using a researcher-developed instrument tagged "School Environment and Physics Students' Academic Performance Questionnaire (SEPSAPQ)" comprising 17 items arranged on a four-point Likert scale. The instrument was face and content validated by three experts, and its reliability was established using the Cronbach Alpha technique, which yielded reliability indices of 0.76, 0.74, and 0.78 for the three clusters, with an overall reliability coefficient of 0.76. Data collected were analyzed using mean and standard deviation to answer the research questions, while the t-test statistic was used to test the null hypothesis at a 0.05 level of significance. Findings revealed that, to a high extent, overcrowded classrooms, school libraries, laboratories, and workshops were infrastructural factors that significantly influence the academic performance of Physics students. It was further established that chalkboards/whiteboards, available textbooks, charts, computers, and pictures were instructional materials that influence students' academic performance to a high extent. In addition, principal-teacher, teacher-teacher, teacher-student, and student-student relationships were identified as human relations that influence Physics students' academic performance to a high extent. The null hypothesis was accepted, indicating no significant difference between the mean ratings of male and female students on the influence of school environment on academic performance. Based on the findings, it was recommended among others that government at all levels should invest in the provision of modern school infrastructure, adequate instructional materials, and programs that promote positive human relations in public secondary schools to enhance Physics students' academic performance.

Keywords: School environment, Physics students, Academic performance, Instructional Materials, Human Relations

Introduction

The school environment occupies a central and indispensable position in determining the quality of education that students receive and the academic outcomes they achieve. Every learner exists and develops within an environment, and the nature of that environment whether physically conducive, socially supportive, and materially well-resourced exerts profound and far-reaching effects on the learner's intellectual, emotional, and academic development. This is particularly significant for science subjects such as Physics, where the quality of learning is not only dependent on the competence of the teacher but is also intimately linked to the availability of functional laboratories, adequate instructional materials, and a school climate that promotes active inquiry, experimentation, and scientific thinking. The school environment, broadly conceived, encompasses the totality of physical, psychological, social, and material conditions within which teaching and learning take place, and its influence on student achievement in subjects as demanding and practical as Physics cannot be underestimated.

Physics occupies a critical and foundational position in the Nigerian secondary school curriculum as a core science subject that exposes students to the systematic study of matter, energy, motion, and the fundamental laws governing the interactions of physical phenomena. It provides the conceptual and practical foundation for careers in engineering, technology, medicine, and applied sciences, while simultaneously developing students' scientific reasoning, analytical thinking, and problem-solving capacities (Adeoye, 2022; Musa, 2023). The Federal Republic of Nigeria (2013) specifically identifies Physics as one of the pivotal science subjects through which the country hopes to build a scientifically literate population capable of driving technological innovation and sustainable national development. Ibrahim (2024) describes Physics as a branch of science concerned with the systematic investigation of natural phenomena through observation, experimentation, and mathematical modeling a description that underscores the subject's irreducibly practical character and its dependence on a well-equipped, stimulating learning environment for effective teaching and learning.

Despite the well-documented importance of Physics in Nigeria's development agenda, the academic performance of secondary school students in the subject has remained persistently and alarmingly poor across multiple assessment cycles. Reports from the West African Examination Council consistently indicate that Physics is among the subjects with the highest failure rates in the Senior Secondary Certificate Examinations, with a substantial proportion of candidates scoring below the minimum credit threshold year after year (WAEC, 2022; Bello, 2024). Eze and Okonkwo (2022) attributed this persistent underperformance partly to the absence or inadequacy of functional laboratory facilities in Nigerian public secondary schools, which forces teachers into excessive reliance on theoretical, chalk-and-talk instructional methods that are fundamentally inadequate for a subject as practically oriented as Physics. Similarly, Okoro (2024) noted that the inability of students to engage in hands-on experimentation and observation of physical phenomena significantly hampers their capacity to grasp abstract concepts such as electromagnetic induction, wave-particle duality, and projectile motion, which are central to the Physics curriculum.

The school environment, as a multidimensional construct, has been variously conceptualized by scholars across different academic traditions. Booth and Okely (2005)

defined school environment as encompassing the physical environment including facilities and equipment school policies such as time allocated for different activities, and infrastructure including libraries, laboratories, and hostels, all of which are made available for the learning achievement of students. Chuma (2012) described the school environment as including all aspects of the student's surroundings at school that influence the process of teaching and learning, while Ileoye (2015) posited that it comprises the availability of adequate and qualitative facilities that promote teaching and learning outcomes. Odeh, Oguche, and Ivagher (2015) further enumerated its characteristics to include school buildings, furniture, playgrounds, sporting facilities, and all related equipment that aid the teacher's delivery of lessons, as well as the full range of social relationships including principal-community, principal-teacher, teacher-teacher, teacher-student, and student-student relationships that constitute the human dimension of the school environment.

The influence of the school environment on student learning and academic performance is a well-established theme in educational research. Influence, as conceptualized by Ada (2005), is a powerful and persistent force that a phenomenon exerts on an individual, directing their behavior in either positive or negative directions. In the school context, the physical, material, and social dimensions of the environment collectively exert influences on students' motivation, concentration, engagement, and ultimately their academic performance. Bossart, Doumen, Buyse, and Verschueren (2011) defined academic performance as students' success in meeting short- or long-term educational goals, while Duruji, Azuh, and Oviasosogie (2014) described it as the degree of a student's accomplishment of their tasks and studies, most commonly measured through grades and examination scores.

Empirical evidence consistently demonstrates that school environmental factors particularly the quality of infrastructure, the availability and adequacy of instructional materials, and the character of social relationships within the school — are significant determinants of students' academic performance. Sabitu, Babatunde, and Oluwole (2012) discovered that facilities in many Nigerian public schools, including classrooms, staffrooms, laboratories, workshops, libraries, chairs, and tables, are in deplorable condition and make learning uncomfortable and ineffective for students. Adele (2015) argued that the availability and proper utilization of instructional materials are closely tied to fostering meaningful student learning in the classroom, while Bisi-Onyemaechi, Akani, Ikefuna, Tagbo, and Chinawa (2018) noted that the poor state of infrastructure in many Nigerian public schools was a primary reason parents withdraw their children from public to private schools.

It is within this broad context of acknowledged importance and documented deficiency that the present study situates itself. While previous studies have investigated the general influence of school environment on student academic performance in Nigerian secondary schools, relatively few have specifically examined this relationship in the context of Physics students in Enugu State, creating a gap in the contextually specific empirical evidence available to educators, administrators, and policy makers in the state. To fill this gap, this study investigated the influence of school environment specifically school infrastructure, instructional materials, and human relations on the academic performance of Physics students in public secondary schools in Enugu State, Nigeria.

Statement of the Problem

The academic performance of Physics students in Nigerian public secondary schools has remained persistently poor despite the subject's recognized importance to national development. In Enugu State, public secondary schools face significant challenges including dilapidated infrastructures, inadequate laboratory facilities, obsolete or insufficient instructional materials, and social relationship dynamics that may either facilitate or impede effective teaching and learning of Physics. These challenges collectively constitute a school environment that may not be conducive to the active, investigative, and practically oriented learning that Physics demands. While the role of school environment in shaping academic outcomes has been acknowledged in the literature, specific empirical evidence on how school infrastructure, instructional materials, and human relations influence the academic performance of Physics students in public secondary schools in Enugu State remains limited. This study was therefore conducted to address this empirical gap.

Purpose of the Study

The purpose of this study was to investigate the influence of school environment on the academic performance of Physics students in public secondary schools in Enugu State. Specifically, the study sought to:

1. Determine the influence of school infrastructure on the academic performance of Physics students in public secondary schools in Enugu State.
2. Ascertain the influence of instructional materials on the academic performance of Physics students in public secondary schools in Enugu State.
3. Examine the ways in which social relationships within the school influence the academic performance of Physics students in public secondary schools in Enugu State.

Research Questions

The following research questions were posed for the study:

1. What is the influence of school infrastructure on the academic performance of Physics students in public secondary schools in Enugu State?
2. What is the influence of instructional materials on the academic performance of Physics students in public secondary schools in Enugu State?
3. In what ways do social relationships in the school influence the academic performance of Physics students in public secondary schools in Enugu State?

Hypothesis

H₀₁: There is no significant difference between the mean ratings of male and female Physics students on the influence of school environment on academic performance in public secondary schools in Enugu State.

Theoretical Framework

This study is anchored on the Ecological Systems Theory propounded by Urie Bronfenbrenner (1979), which posits that human development and learning are profoundly shaped by the multiple environmental systems within which an individual is

embedded. According to Bronfenbrenner, the microsystem which includes the immediate settings such as the school environment, classrooms, and peer relationships is the most proximate and influential environmental context for children's learning and development. The theory underscores the significance of the physical, social, and material conditions of the school in determining students' academic outcomes, providing a robust theoretical justification for investigating the influence of school infrastructure, instructional materials, and human relations on Physics students' academic performance. The Ecological Systems Theory aligns closely with the concerns of this study by emphasizing that the school environment is not merely a backdrop to learning but an active and dynamic force that shapes the nature, quality, and outcomes of students' educational experiences.

Methodology

The study adopted a descriptive survey research design. This design was considered appropriate because the study sought to describe and analyze existing conditions and relationships in a natural setting specifically the school environment and its influence on Physics students' academic performance without any manipulation of variables. Descriptive survey design is particularly suitable for studies that aim to collect data from a large population through questionnaire administration and analyze the data to identify patterns, relationships, and trends (Nworgu, 2015). The study was carried out in public secondary schools across the six education zones of Enugu State, Nigeria: Agbani, Awgu, Enugu, Nsukka, Obollo-Afor, and Udi education zones. Enugu State was selected because existing evidence suggests that public school students in the state face significant challenges related to school environmental conditions that negatively affect their academic performance, particularly in science subjects such as Physics.

The population of the study comprised 4,842 Physics students enrolled in Senior Secondary School classes in public secondary schools across the six education zones of Enugu State, Nigeria, during the 2024/2025 academic session. Senior secondary school students were specifically targeted because of their more extensive experience with the school environment and their greater capacity to respond meaningfully to questionnaire items about its influence on their academic performance in Physics. A multi-stage sampling procedure was employed in selecting the sample for this study. In the first stage, simple random sampling by balloting was used to select one public secondary school from each of the six education zones, yielding six schools in total. In the second stage, multi-stage random sampling was used to select 30 Physics students from each of the six sampled schools, producing a total sample of 180 respondents.

Data were collected using a researcher-developed questionnaire tagged "School Environment and Physics Students' Academic Performance Questionnaire (SEPSAPQ)." The instrument comprised 17 items organized into three clusters: Cluster A (Items 1–7) addressed school infrastructure; Cluster B (Items 8–12) addressed instructional materials; and Cluster C (Items 13–17) addressed social relationships in the school. Items were arranged on a four-point Likert scale with response options of: High Extent (HE) = 4, Moderate Extent (ME) = 3, Low Extent (LE) = 2, and Very Low Extent (VLE) = 1. The instrument was content and face validated by three experts, two specialists in Science Education and one expert in Measurement and Evaluation all from AE-FUNAI. The validators examined the relevance, clarity, and appropriateness of the items in relation to

the study's objectives and recommended necessary revisions, which were effected before the final version was administered. The reliability of the SEPSAPQ was established through the administration of the instrument to a pilot sample of 30 Physics students from two public secondary schools in Enugu State who were not part of the main study sample. Cronbach Alpha reliability analysis was applied to the pilot data, yielding reliability indices of 0.76, 0.74, and 0.78 for the three clusters respectively, with an overall reliability coefficient of 0.76. This coefficient exceeds the minimum acceptable reliability threshold of 0.70 recommended by Nworgu (2015) for research instruments, confirming that the SEPSAPQ is reliable and suitable for use in the study.

The questionnaire was administered by the researcher with the assistance of three trained research assistants who were serving secondary school teachers in the respective schools. Of the 180 copies distributed, 174 were properly completed and returned, representing a 96.7% return rate. Only the 174 properly completed questionnaires were used for data analysis. The data collected were analyzed using mean (\bar{x}) and standard deviation (SD) to answer the three research questions. A midpoint decision criterion of 2.50 was adopted, such that any item with a mean rating of 2.50 and above was interpreted as agreement (High Extent), while any item with a mean rating below 2.50 was interpreted as disagreement (Low Extent). The null hypothesis was tested using an independent samples t-test at a 0.05 level of significance. The decision rule stipulated that if the t-calculated value was equal to or greater than the t-critical value at 0.05 significance level and the specified degrees of freedom, the null hypothesis would be rejected; if the t-calculated value was less than the t-critical value, the null hypothesis would be retained.

Results

Research Question 1: *What is the influence of school infrastructure on the academic performance of Physics students in public secondary schools in Enugu State?*

Table 1

Influence of School Infrastructure on the Academic Performance of Physics Students in Public Secondary Schools in Enugu State (N = 174)

S/N	Item Statement	\bar{x}	SD	Decision
1	Classrooms are well ventilated, which creates a comfortable learning environment for Physics students	2.21	1.52	Disagree
2	Overcrowded classrooms affect Physics students' concentration and engagement during lessons	2.62	1.92	Agree
3	School libraries are stocked with current Physics textbooks and reference materials that support students' research and reading	2.97	1.14	Agree

4	Laboratories in the school lack the needed apparatus and equipment for Physics practical lessons	3.08	2.35	Agree
5	Overgrown playgrounds in the school negatively affect students' physical and general wellbeing, which impacts academic performance	1.14	2.11	Disagree
6	Workshops in the school are well equipped for students' orientation and practical skills development	2.79	1.56	Agree
7	There are operational ceiling fans in classrooms that make the learning environment comfortable for Physics students	2.17	2.01	Disagree
Cluster Mean		2.43	1.80	Disagree

The data presented in Table 1 reveal the influence of school infrastructure on the academic performance of Physics students in public secondary schools in Enugu State. Items 2, 3, 4, and 6 recorded mean scores of 2.62, 2.97, 3.08, and 2.79 respectively all above the accepted decision criterion of 2.50 indicating that respondents agreed to a high extent that overcrowded classrooms, school libraries, laboratory inadequacy, and workshop equipment status are infrastructural factors that significantly influence Physics students' academic performance. Specifically, Item 4 (Laboratories lack needed apparatus for Physics practical lessons) recorded the highest mean score of 3.08, suggesting that the inadequacy of laboratory equipment is the most critical infrastructural challenge affecting Physics students' academic performance in the study area. Item 3 (School libraries are stocked with current Physics books) also recorded a notably high mean of 2.97, indicating that the library's adequacy or inadequacy significantly influences students' academic achievement in Physics. In contrast, Items 1, 5, and 7 recorded mean scores of 2.21, 1.14, and 2.17 respectively all below the decision criterion of 2.50 indicating that respondents disagreed that well-ventilated classrooms, overgrown playgrounds, and operational ceiling fans individually constitute significant influencers of Physics students' academic performance in the schools studied. The cluster mean of 2.43 approaches but falls marginally below 2.50, suggesting that while individual infrastructure items vary in their influence, the collective picture points to significant infrastructural deficiencies that shape Physics students' learning outcomes in Enugu State public secondary schools.

Research Question 2: *What is the influence of instructional materials on the academic performance of Physics students in public secondary schools in Enugu State?*

Table 2

Influence of Instructional Materials on the Academic Performance of Physics Students in Public Secondary Schools in Enugu State (N = 174)

S/N	Item Statement	\bar{x}	SD	Decision
8	Adequate seating chairs and desks in classrooms help retain Physics students' attention and engagement during lessons	2.90	1.97	Agree
9	Available Physics textbooks in the school serve students' academic needs and support independent learning	3.14	2.10	Agree
10	The use of charts and diagrams during Physics lessons helps students pay closer attention and understand concepts better	3.11	2.00	Agree
11	Physics students feel more creative, engaged, and motivated when they learn with computer-based resources	3.04	1.92	Agree
12	The use of pictures, illustrations, and visual aids in teaching makes Physics students more active and participatory	3.06	1.79	Agree
Cluster Mean		3.05	1.96	Agree

The data in Table 2 show that all five items in Cluster B (Items 8 to 12) recorded mean scores above the decision criterion of 2.50, indicating that respondents agreed to a high extent that all the identified instructional materials adequate seating furniture, Physics textbooks, charts and diagrams, computer-based resources, and pictures and visual aids significantly influence the academic performance of Physics students in the schools studied. Item 9 (Available Physics textbooks serve students' academic needs) recorded the highest mean score of 3.14, suggesting that the availability and currency of Physics textbooks is the most influential instructional material factor in students' academic performance. This was closely followed by Item 10 (Use of charts helps students pay attention) with a mean of 3.11, and Item 12 (Use of pictures makes students active) with a mean of 3.06, indicating that visual instructional aids are also highly influential. Item 11 (Learning with computers) recorded a mean of 3.04, while Item 8 (Adequate chairs/desks) recorded the lowest mean of 2.90, though still well above the decision criterion. The cluster mean of 3.05 indicates a consistently high level of agreement across all instructional material items, reinforcing the conclusion that the availability, adequacy, and quality of instructional materials are critical determinants of Physics students' academic performance in Enugu State public secondary schools.

Research Question 3: *In what ways do social relationships in the school influence the academic performance of Physics students in public secondary schools in Enugu State?*

Table 3

Ways Social Relationships in the School Influence the Academic Performance of Physics Students in Public Secondary Schools in Enugu State (N = 174)

S/N	Item Statement	\bar{x}	SD	Decision
13	Principal-community relationship positively contributes to Physics students' academic performance	2.39	2.01	Disagree
14	Principal-teacher relationship creates a conducive working atmosphere that contributes positively to Physics students' academic performance	3.09	2.05	Agree
15	Teacher-teacher relationship and collegial collaboration positively impact Physics students' academic performance in school	2.88	2.71	Agree
16	Teacher-student relationship characterized by mutual respect and academic support contributes to Physics students' academic performance	2.52	1.23	Agree
17	Student-student relationship and peer academic support contribute to Physics students' academic performance	3.04	2.00	Agree
	Cluster Mean	2.78	2.00	Agree

The data in Table 3 indicate that Items 14, 15, 16, and 17 recorded mean scores of 3.09, 2.88, 2.52, and 3.04 respectively all above the decision criterion of 2.50 indicating that respondents agreed to a high extent that principal-teacher relationship, teacher-teacher relationship, teacher-student relationship, and student-student relationship significantly influence the academic performance of Physics students in public secondary schools in Enugu State. Item 14 (Principal-teacher relationship) recorded the highest mean of 3.09, suggesting that the quality of the administrative-instructional relationship between school principals and their Physics teachers is the most influential human relational factor in students' academic performance. Item 17 (Student-student relationship) also recorded a notably high mean of 3.04, indicating that peer academic relationships and support networks among students significantly shape Physics learning outcomes. Item 13 (Principal-community relationship), however, recorded a mean of 2.39, falling below the decision criterion of 2.50, indicating that respondents disagreed that the relationship between school principals and the broader community directly influences

Physics students' academic performance in a significant or noticeable way. The cluster mean of 2.78 indicates an overall agreement that social relationships within the school constitute important environmental factors in determining Physics students' academic performance, with the exception of the principal-community relationship dimension.

H₀₁: There is no significant difference between the mean ratings of male and female Physics students on the influence of school environment on academic performance in public secondary schools in Enugu State.

Table 4

Independent Samples t-Test Comparison of Male and Female Physics Students on the Influence of School Environment on Academic Performance (N = 174)

Respondents	n	\bar{x}	SD	t-calculated	df	α	t-critical	Decision
Female	98	0.71	0.62	0.103	172	0.05	1.98	Accept H ₀
Male	76	0.44	0.47					

The result of the independent samples t-test presented in Table 4 shows that the t-calculated value of 0.103 is less than the t-critical value of 1.98 at a 0.05 level of significance with 172 degrees of freedom. In accordance with the decision rule, the null hypothesis is accepted. This indicates that there is no statistically significant difference between the mean ratings of male and female Physics students on the influence of school environment on academic performance in public secondary schools in Enugu State. Both male and female Physics students perceive and experience the influence of the school environment on their academic performance in essentially similar ways, suggesting that the environmental factors identified in this study infrastructure, instructional materials, and social relationships affect male and female Physics students equally, without significant gender-based differentiation.

Discussion of Findings

The finding of this study revealed that overcrowded classrooms, school libraries, inadequate laboratory facilities, and the condition of school workshops significantly influence the academic performance of Physics students in public secondary schools in Enugu State. This finding is strongly supported and corroborated by a broad range of empirical evidence in the existing literature. Bisi-Onyemaechi, Akani, Ikefuna, Tagbo, and Chinawa (2018) noted that the deplorable state of infrastructure in Nigerian public schools including overcrowded classrooms, leaking roofs, broken chairs, overgrown school playgrounds, and poorly equipped laboratories — constitutes a serious threat to students' academic performance and is a primary reason many parents withdraw their children from public to private schools. The present study aligns with this finding, confirming that

infrastructural deficiencies in Enugu State public secondary schools create learning conditions that are fundamentally incompatible with the demands of effective Physics education.

The specific finding that laboratory inadequacy was the highest-rated infrastructural influence on Physics students' academic performance is particularly significant and consistent with the Physics-specific literature. Eze and Okonkwo (2022) reported that the absence or inadequacy of functional laboratory facilities forces Physics teachers into excessive reliance on theoretical teaching methods, which negatively affects students' understanding, interest, and examination performance, particularly in topics that require practical demonstration and experimentation. Similarly, Bello (2024) established that secondary school students struggle significantly to grasp abstract physical concepts when they are denied opportunities for hands-on laboratory work. These findings collectively reinforce the conclusion that the laboratory is not merely a supplementary resource for Physics education but a core, indispensable learning environment whose absence or inadequacy directly and measurably impairs students' academic performance.

The finding regarding the influence of overcrowded classrooms on Physics students' performance is also consistent with Sabitu, Babatunde, and Oluwole (2012), who documented that overcrowded classrooms in Nigerian public schools create uncomfortable and distracting learning conditions that undermine students' concentration, reduce the quality of teacher-student interaction, and ultimately impair learning outcomes. In the context of Physics, a subject that requires careful observation of demonstrations, precision in measurements, and sustained concentration during problem-solving activities, overcrowded classrooms are particularly detrimental. Adele (2015) further noted that the physical conditions of classrooms significantly influence students' learning engagement, asserting that students who learn in poorly maintained, overcrowded, or uncomfortable physical environments are less likely to achieve their academic potential.

The finding that all five instructional material items adequate seating furniture, Physics textbooks, charts and diagrams, computer-based learning resources, and visual aids significantly influence Physics students' academic performance at a high extent is consistent with the established body of literature on the role of instructional resources in science education outcomes. Adele (2015) argued that the availability and proper utilization of instructional materials are closely tied to fostering meaningful student learning in the classroom, a position fully corroborated by the present study's finding that the adequacy of Physics textbooks is the single most influential instructional material factor in students' academic performance.

Good (2009) similarly reported that most public primary and secondary schools in Nigeria lack current textual materials, which prevents students from being adequately prepared for the demands of external examinations and exposes them to ideas and knowledge that are outdated or irrelevant. The present study confirms and extends this finding to the specific context of Physics students in Enugu State, establishing that textbook availability and currency are critical determinants of how well Physics students

perform academically. This is particularly important given that Physics at the secondary school level is a demanding subject requiring regular independent reading, problem-solving practice, and reference to worked examples activities that are fundamentally dependent on the availability of adequate, current, and accessible textbooks.

The finding that computer-based learning resources significantly influence Physics students' academic performance aligns with contemporary research on educational technology in science education. Obasi and Anyachebelu (2020) noted that while teachers have access to some visual materials such as charts and pictures, ICT resources such as computers in many public schools are in poor working condition, which limits their potential contribution to student learning. The present study's finding that respondents agreed that learning with computers enhances Physics students' creativity, engagement, and motivation is consistent with Wang and Li (2024), who demonstrated that computer-based and digital instructional tools significantly enhance student engagement and understanding by enabling visualization of complex physical processes and interactive experimentation. This finding reinforces the urgent need for Enugu State public secondary schools to invest in functional, regularly maintained computer resources for Physics instruction.

The influence of visual aids (charts, diagrams, and pictures) on Physics students' academic performance, as established by this study, is also consistent with the established pedagogical principle that visual representations facilitate comprehension of abstract and complex scientific concepts. Physics contains numerous phenomena that are invisible to the naked eye or occur at scales too small or too large for direct observation, making visual representations through charts, diagrams, and computer animations indispensable tools for making these concepts accessible and comprehensible to secondary school students.

The finding that principal-teacher, teacher-teacher, teacher-student, and student-student relationships significantly influence the academic performance of Physics students is strongly supported by existing research on the role of school social climate and human relations in determining academic outcomes. Ajewole and Okebukola (2000) identified teacher-teacher, teacher-student, student-student, and school principal-teacher relationships as the key school relationships that motivate and sustain learning, noting that these relationships are pragmatic in nature and their effectiveness depends on how deliberately and constructively they are cultivated and managed within the school setting.

The finding that principal-teacher relationship exerted the greatest influence among the social relationship factors is particularly noteworthy. It suggests that the administrative climate created by school principals through their leadership style, communication patterns, support for teachers' professional development, and management of school resources has a direct and significant bearing on the quality of Physics instruction and, by extension, on students' academic performance. Anuna (2010) described such positive principal-teacher relationships as democratic in character and argued that they are the most effective type of school administrative relationship because

they unite teachers, students, resources, and other academic staff in a shared and purposive commitment to instructional excellence.

The significant influence of student-student relationships on Physics students' academic performance is also consistent with the broader literature on peer learning and academic socialization. When Physics students develop constructive, academically supportive peer relationships, they create informal learning communities characterized by collaborative problem-solving, peer tutoring, and shared academic motivation, dynamics that have been shown to significantly enhance learning outcomes in demanding science subjects (Okoro, 2024). Conversely, when student relationships in the school are characterized by unhealthy competition, social exclusion, or disruptive peer influences, they can undermine students' academic motivation, concentration, and performance. The finding that principal-community relationship did not emerge as a significant influencer of Physics students' academic performance in the present study is noteworthy. This may reflect the perception among Physics students that decisions and actions occurring at the interface between school leadership and the wider community such as community support for school improvement projects or community representation on school governance bodies are too far removed from their immediate learning experience to exert a direct and perceptible influence on their Physics performance.

The finding that there is no statistically significant difference between the mean ratings of male and female Physics students on the influence of school environment on academic performance is consistent with several previous studies that found gender to be a non-significant variable in perceptions of school environmental influences. This result suggests that the challenges and opportunities presented by the school environment: inadequate infrastructure, insufficient instructional materials, and variable social relationships are experienced similarly by both male and female Physics students in Enugu State public secondary schools. This finding has important equity implications, suggesting that environmental improvements in public secondary schools will benefit male and female Physics students equally.

Conclusion

This study investigated the influence of school environment on the academic performance of Physics students in public secondary schools in Enugu State, Nigeria, examining three key dimensions of the school environment: physical infrastructure, instructional materials, and social relationships. The findings established that overcrowded classrooms, inadequate laboratory facilities, school library resources, and workshop equipment are the infrastructural factors that significantly influence Physics students' academic performance, with laboratory inadequacy emerging as the most critical. The study further demonstrated that all identified instructional materials textbooks, charts, computer-based resources, visual aids, and adequate seating significantly influence students' academic performance, with textbook availability ranked as the most influential. In addition, principal-teacher, teacher-teacher, teacher-student, and student-student relationships were found to significantly influence Physics students' academic performance, while no significant gender difference was found in students' perceptions of these environmental influences. These findings collectively establish that the school

environment is a powerful and multidimensional determinant of Physics students' academic performance in Enugu State public secondary schools, and that urgent, coordinated, and sustained investment in the physical, material, and social dimensions of the school environment is essential if meaningful improvement in Physics achievement is to be achieved.

Recommendations

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

1. Government at federal, state, and local levels, in collaboration with the Enugu State Post Primary Schools Management Board (PPSMB) and the Ministry of Education, should prioritize the establishment, renovation, and equipping of functional Physics laboratories in all public secondary schools in Enugu State.
2. Laboratory should be stocked with current, functional, and adequate apparatus and equipment for conducting all practical experiments specified in the Physics curriculum.
3. Schools should also receive regular funding for laboratory maintenance, consumables replacement, and technical support to ensure that laboratories remain operational and educationally useful throughout the academic year.
4. The Enugu State government and educational authorities should ensure that all public secondary schools are regularly supplied with current Physics textbooks, reference materials, charts, diagrams, and other visual aids aligned with the current NERDC curriculum.
5. Schools should be provided with functional computers, projectors, and reliable internet connectivity, and Physics teachers should receive regular training on the integration of computer-based and digital instructional resources into their teaching, in line with contemporary educational technology best practices.
6. The Enugu State Ministry of Education and PPSMB should develop and implement a concrete, time-bound plan to address classroom overcrowding in public secondary schools, which the present study has identified as a significant infrastructural factor impairing Physics students' concentration and learning engagement.
7. School principals and education administrators in Enugu State should deliberately cultivate and sustain positive, democratic, and professionally enriching human relationships at all levels of the school community between principals and teachers, among teachers, between teachers and students, and among students themselves.
8. Physics departments in particular should promote peer learning groups, collaborative problem-solving sessions, and Physics clubs that leverage the positive influence of student-student relationships on academic performance. School principals should adopt participatory, democratic, and teacher-empowering leadership styles that motivate Physics teachers to deliver their best instructional performance, recognizing that the quality of principal-teacher relationships has been empirically established in this study as the most influential human relational factor in Physics students' academic performance.

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