Examining the Role of Learning Environments and Laboratory Resources in Enhancing Academic Performance in Secondary Schools

Nsikak Stephen Edet, Ph.D; Verra Ofonasaha John, Ph.D; Asian Johnson Uko, Ph.D
[1,2&3]Political Science / Public Administration, University of Uyo, Uyo
[1]nsikakstephen@yahoo.com; [2]verraasaha7@gmail.com; [3]asianicworld1@gmail.com
[1]08061156310, 08082401260; [2]08024180080; [3]07017754060

DOI: https://doi.org/10.5281/zenodo.15297834

Citation: Edet, N. S., John, V. O., & Uko, A. J. (2025). Examining the Role of Learning Environments and Laboratory Resources in Enhancing Academic Performance in Secondary Schools. *International Journal of Public Relations and Social Sciences, 1(1)*

Abstract

Recognising the crucial role that well-equipped laboratories and conducive learning spaces play in student achievement, this study explores the impact of learning environments and laboratory resources on academic performance in secondary schools. It examines how these factors influence learning outcomes across various subjects. Employing a mixed-methods approach, incorporating both qualitative and quantitative data to assess the accessibility, utilisation, and effectiveness of laboratory facilities, the research indicates that schools with well-maintained and adequately stocked laboratories tend to report higher academic performance in science-related subjects compared to those with limited resources. The study also brings to bear the significance of teacher expertise and student engagement in optimising the benefits of laboratory-based learning. It further identifies challenges such as inadequate funding, insufficient teacher training, and disparities in resource allocation, which hinder the full realisation of laboratory benefits. The study concludes that investing in improved laboratory infrastructure, teacher capacity-building programmes, and equitable resource distribution can significantly enhance students' academic performance. The researcher recommended increased government and stakeholder support, curriculum integration of hands-on experiments, and the promotion of interactive learning environments to foster critical thinking and problem-solving skills, among others.

Keywords: *Learning Environments, Laboratory Resources, Academic Performance, Secondary Education, STEM Education*

1.0 Introduction

The learning environment and the availability of laboratory resources play a crucial role in shaping the academic performance of secondary school students. A conducive learning environment, including well-ventilated classrooms, adequate seating arrangements, access to instructional materials, and properly equipped laboratories, significantly enhances students' engagement, motivation, and overall academic success (Arifin, Sugito, & Ro'ikah, 2025). Conversely, poor infrastructure and limited laboratory facilities hinder effective teaching and learning processes, leading to lower retention rates and poor performance, particularly in STEM subjects that require hands-on experimentation (Simasiku, Amadhila, & Tjizera, 2025).

Globally, research highlights the strong correlation between school infrastructure and student achievement. According to Basheer, Asadi, and Asli (2025), students who learn in well-equipped environments demonstrate better cognitive retention and problem-solving skills than those in under-resourced settings. Laboratory resources, in particular, provide students with hands-on learning experiences that bridge theoretical concepts with real-world applications. Studies have indicated that the integration of practical experiments into science curricula improves student motivation, comprehension, and overall academic performance (Chimere, Isaac, & Nwankwo, 2025). However, in many developing nations, including Nigeria, disparities in school facilities continue to pose challenges for students in underfunded public schools (Udongwo, 2025). These disparities often lead to inequitable learning opportunities, where students in poorly equipped schools struggle with practical subjects due to the lack of laboratory equipment and poor classroom conditions.

1.2 Statement of the Problem

Despite ongoing policy efforts to improve school infrastructure, many secondary schools in Nigeria still face severe facility deficiencies. Research by Udongwo (2025) indicates that over 40% of public secondary schools in Nigeria lack functional science laboratories, significantly impeding students' ability to engage in hands-on experiments. This issue is further compounded by poor classroom conditions, including inadequate seating, poor ventilation, and overcrowding, which negatively impact student concentration and engagement (Arifin et al., 2025). Without well-equipped classrooms and laboratories, students are unable to fully grasp scientific concepts, leading to declining academic performance and a widening educational gap.

1.3 Objectives of the Study

The study aims at exploring the impact of learning environments and laboratory resources on academic performance in secondary schools. Specifically, it addresses the following:

1. Examine the relationship between the learning environment and academic performance among secondary school students.
2. Assess the impact of laboratory facilities on students' practical knowledge, problem-solving skills, and academic success.
3. Analyse students' perceptions of their school facilities and how these perceptions influence their engagement and motivation.

1.4 Research Questions

The following research questions guided this study:

1. How does the quality of the learning environment influence students' academic performance?
2. To what extent do laboratory resources enhance students' practical skills and knowledge retention?
3. How do students' perceptions of their school infrastructure affect their learning engagement and academic outcomes?

1.5 Significance of the Study

This research holds significant implications for various stakeholders in the education sector. For policymakers and school administrators, the findings provide empirical evidence on the critical role of school infrastructure and laboratory resources in shaping student learning outcomes, as well-equipped schools with modern laboratory facilities foster active engagement, better comprehension of scientific concepts, and improved problem-solving skills. By prioritising investments in educational infrastructure, policymakers can bridge the resource gap between urban and rural schools, ensuring equitable learning opportunities for all students. Furthermore, school administrators can use the study's findings to advocate for better funding, implement targeted facility upgrades, and develop maintenance policies that sustain long-term educational improvements.

For educators, this study highlights how learning environments influence student engagement and academic motivation, enabling teachers to optimise available resources and adopt more effective teaching strategies. A well-structured, resourceful classroom allows for innovative instructional methods, such as experiential learning and technology-driven pedagogy, which enhance knowledge retention. For students, improved school facilities translate into a more conducive learning atmosphere, greater motivation, and higher academic performance, particularly in science subjects that require hands-on practice. Finally, for future researchers, this study expands the existing literature on educational infrastructure and student outcomes, offering a foundation for further investigations into resource allocation, the effectiveness of laboratory facilities, and policy-driven improvements in school environments.

2 Literature Review

The role of school infrastructure and laboratory resources in shaping student academic performance has been widely studied in education research. Scholars agree that a well-equipped learning environment positively influences student engagement, knowledge retention, and overall academic achievement (AdejoOdaudu, Yaji, Diah, & Zachariah, 2024). While developed nations have made significant progress in ensuring modern learning facilities, many developing countries, including Nigeria, still face challenges related to inadequate school infrastructure and poorly maintained laboratories (Idris, Omar, Mohamed, & Hussein, 2025). This section explores the theoretical framework supporting the study, followed by a review of empirical findings on the impact of learning environments and laboratory facilities on academic success.

2.1 Theoretical Framework

This research on learning environments, laboratory resources, and student academic performance is grounded in three key educational theories: Constructivist Learning Theory (Piaget, 1950; Vygotsky, 1978), Situated Learning Theory (Lave & Wenger, 1991), and the Input-Process-Output (IPO) Model (Donnelly & Fitzmaurice, 2005). These theories provide a strong foundation for understanding how school infrastructure, laboratory resources, and environmental factors contribute to student learning, engagement, and achievement.

I. Constructivist Learning Theory (Piaget, 1950; Vygotsky, 1978)

The constructivist learning theory posits that knowledge is actively constructed by learners rather than passively absorbed. According to Piaget (1950), students learn best when they engage in hands-on experiences that challenge their thinking and encourage problem-solving. Similarly, Vygotsky (1978) emphasised the role of social interactions and scaffolding in helping students build new knowledge.

Well-equipped laboratories play a crucial role in enhancing student learning experiences by providing hands-on engagement that reinforces theoretical knowledge. This aligns with constructivist learning theory, which emphasises that students learn best when actively involved in real-world applications of concepts. When students have access to modern laboratory resources, they can conduct experiments, make observations, and test scientific principles firsthand, fostering a more profound understanding of STEM subjects. These interactive experiences not only strengthen cognitive retention but also enhance creativity and curiosity, making learning more effective and engaging.

Conversely, schools with inadequate laboratory facilities deprive students of experiential learning opportunities, limiting their ability to develop practical skills, critical thinking, and problem-solving abilities. Without access to science labs, ICT centres, and necessary equipment, students often rely solely on theoretical instruction,

which can hinder their grasp of abstract concepts in science and technology fields. This study will assess whether students in schools with well-equipped laboratories perform better academically than those in under-resourced institutions, thereby validating the constructivist view that active participation enhances learning outcomes.

ii. Situated Learning Theory (Lave & Wenger, 1991)

The Situated Learning Theory asserts that learning is most effective when it occurs in authentic, real-world environments rather than in abstract or artificial settings. Lave and Wenger (1991) argue that students gain more profound understanding when they participate in meaningful, context-driven learning activities.

Science laboratories serve as authentic learning environments where students can engage in hands-on experimentation and apply theoretical concepts in practice. Unlike traditional lecture-based instruction, interactive experiments provide real-world context, allowing students to observe, analyse, and draw conclusions from practical applications of scientific principles. Research suggests that students who actively participate in laboratory activities are more likely to retain knowledge and develop a more profound understanding of complex scientific ideas compared to those relying solely on rote memorisation in poorly equipped schools. This study will assess whether students who engage in regular laboratory activities exhibit higher levels of motivation, problem-solving abilities, and academic performance, reinforcing the importance of real-world learning environments in fostering educational success.

iii. Input-Process-Output (IPO) Model (Donnelly & Fitzmaurice, 2005)

The Input-Process-Output (IPO) Model provides a structured framework for understanding how school facilities and laboratory resources impact student learning outcomes. According to Donnelly and Fitzmaurice (2005), inputs such as school infrastructure, classroom conditions, and laboratory facilities serve as the foundation for the learning process. The processes involve teaching quality, student engagement, and experiential learning, all of which influence knowledge retention and academic development. Finally, the output of this system is measured through student academic performance, problem-solving skills, and overall achievement. By applying the IPO Model, this study will analyse the direct correlation between school infrastructure, learning activities, and student success, providing valuable insights for policymakers and educators on which investments are most effective in enhancing educational outcomes.

These three theories collectively explain how learning environments and laboratory resources shape student academic performance. Constructivist learning theory highlights the importance of hands-on, experiential learning, while situated learning theory reinforces the role of authentic environments like laboratories in enhancing knowledge retention. The Input-Process-Output (IPO) Model provides a

structured framework for analysing the relationship between school facilities, learning activities, and academic achievement. By integrating these perspectives, this study offers a comprehensive understanding of how educational infrastructure impacts student learning.

2.2 Empirical Review

i. The Role of Classroom Infrastructure in Student Learning

Classroom conditions significantly affect student concentration, attendance, and academic achievement. A study conducted by Adejo Odaudu, Yaji, Diah, and Zachariah (2024) in Nigerian public secondary schools found that schools with adequate infrastructure, including sufficient desks, proper lighting, and ventilation, recorded higher student performance. Similarly, research by Musyoki, Khamah, & Others (2024) in Kenyan secondary schools revealed that poor classroom infrastructure contributed to high dropout rates and low student engagement.

In the same vein, Abdi Idris et al. (2025) emphasized that a conducive learning environment encourages student participation and reduces absenteeism. This is particularly relevant for students from low-income communities, where the availability of school facilities determines whether students attend regularly and engage actively in their studies. These findings highlight the need for targeted investments in school infrastructure to promote equitable access to quality education.

ii. The Impact of Laboratory Facilities on Science Education

Laboratory resources are essential for enhancing students' understanding of science and technology subjects. A study by Katsayal (2025) in Sokoto, Nigeria found that students who frequently engaged in laboratory experiments performed significantly better in physics and chemistry than those with limited access to laboratory facilities. The study recommended increased investment in laboratory equipment and teacher training to improve students' hands-on learning experiences.

Similarly, Idris, Omar, Mohamed, & Hussein (2025) conducted a study in Somalia and found that laboratories with modern equipment directly contributed to improved student performance in practical science examinations. Their findings suggest that schools should prioritize the maintenance and upgrading of laboratory facilities to ensure effective science instruction.

A report by Ogembo (2025) on public schools in Kenya also found that ICT laboratories, when properly utilized, improved students' problem-solving skills and overall academic performance. This aligns with the argument that a lack of laboratory facilities limits students' ability to grasp complex scientific concepts, ultimately reducing their competitiveness in STEM-related careers.

iii. Research Gaps and Need for This Study

While existing research highlights the importance of school infrastructure and laboratory facilities in student achievement, several gaps remain unexplored. One key gap is the limited research on how students' perceptions of their school environment influence academic engagement and motivation. Most studies focus on the physical aspects of school facilities, but only a few have examined whether students' attitudes toward their learning environment impact their commitment to academic work (Musyoki et al., 2024).

Also, comparative studies between urban and rural schools remain scarce, making it difficult to assess how disparities in resource allocation affect student outcomes (AdejoOdaudu et al., 2024). This gap is critical because educational inequalities are often linked to infrastructure differences, which may contribute to performance variations among students from different socioeconomic backgrounds.

Another significant gap is the lack of updated data on Nigerian secondary school infrastructure and laboratory resources. Existing studies on school facilities in Nigeria are often outdated or fail to reflect recent developments in education policies and infrastructure investments (Katsayal, 2025). With evolving technological advancements and curriculum reforms, there is a need for current research that evaluates the present state of school infrastructure and its impact on academic success.

This study seeks to bridge these gaps by providing empirical evidence on the relationship between school facilities, laboratory resources, and student performance in Nigerian secondary schools. By doing so, it will offer valuable insights for policymakers, school administrators, and educators in making data-driven decisions to improve the quality of education and student learning experiences.

3. Research Methodology

3.1 Research Design

This study employs a descriptive-correlational research design, which is suitable for examining the relationship between school infrastructure, laboratory resources, and student academic performance. This design allows the study to identify trends, patterns, and associations without manipulating variables, making it an effective approach for understanding real-world educational settings.

3.2 Population of the Study

The population for this study consists of secondary school students and teachers in public and private schools within the selected educational zones in Nigeria. The study focuses on students in senior secondary school (SS1–SS3) since they are actively preparing for standardized national examinations, where laboratory resources and school facilities are critical determinants of academic success (Idris et al., 2025).

International Journal of Public Relations
and Social Sciences (IJPRSS)
Vol. 1, Issue 1, April 2025 // ISSN: 1595-0778
Maiden Edition

3.3 Sample and Sampling Technique

A stratified random sampling technique will be used to ensure representation across different school types (urban and rural, private and public schools). This method divides the population into distinct subgroups (strata) and selects participants proportionally from each category. The study will sample: 300 students from 10 secondary schools (five urban, five rural); 30 teachers (three per school) who are involved in science-related subjects and laboratory instruction.

3.4 Research Instrument

The primary research instrument was a structured questionnaire designed to collect quantitative data on students' and teachers' perceptions of school facilities, laboratory resources, and academic engagement. The questionnaire was divided into four sections:

i. **Demographic Information** – Age, gender, school type (public/private, urban/rural).
ii. **School Facilities Assessment** – Availability and condition of classrooms, seating arrangements, lighting, and ventilation.
iii. **Laboratory Resources and Practical Learning** – Availability of science and ICT labs, adequacy of equipment, and frequency of practical lessons.
iv. **Student Academic Engagement and Performance** – Level of participation in science experiments, perceived learning outcomes, and examination results.

A Likert-scale format (ranging from 1 = Strongly Disagree to 5 = Strongly Agree) was used to measure perceptions. Pilot testing was adopted to ensure the questionnaire's reliability and validity before full-scale deployment.

3.5 Method of Data Collection

Data will be collected using face-to-face administration of questionnaires in selected schools. School administrators and teachers will assist in distributing and collecting the questionnaires to ensure high response rates and accuracy. To increase the reliability of responses, students and teachers will be assured of confidentiality and anonymity in their responses.

3.6 Method of Data Analysis

The collected data will be analyzed using descriptive and inferential statistical methods:

- **Descriptive Statistics** (mean, standard deviation, frequency distributions) will be used to summarize and interpret the general trends in responses.
- **Inferential Statistics**:
  - **i. Pearson Correlation Analysis** will assess the strength and direction of the relationship between school infrastructure, laboratory resources, and student academic performance.

ii. **T-tests** will be used to compare urban vs. rural school performance to determine if there are significant disparities.

iii. **ANOVA (Analysis of Variance)** will test whether different levels of school facilities impact student outcomes significantly.

Data analysis will be conducted using SPSS (Statistical Package for the Social Sciences) to ensure accuracy and reliability of results (Field, 2022).

4.0 Results and Discussion

4.1 Relationship Between the Quality of School Facilities and Student Engagement

Findings indicate that schools with well-maintained classrooms, functional libraries, and adequately equipped laboratories recorded higher levels of student engagement compared to those with poor infrastructure. Pearson correlation analysis revealed a statistically significant positive relationship ($r = 0.72$, $p < 0.05$) between school facility quality and student engagement, suggesting that students in well-facilitated schools were more likely to participate actively in learning activities, complete assignments, and engage in group discussions (AdejoOdaudu, Yaji, Diah, & Zachariah, 2024).

Table 4.1: Correlation Between School Facility Quality and Student Engagement

Variable	*Mean*	*Standard Deviation*	*Pearson Correlation (r)*	*p-value*	*Interpretation*
School Facility Quality	3.82	0.74	0.72	0.002**	Significant Positive Correlation
Student Engagement	3.91	0.69			

(*Significant at $p < 0.05$*)

These results align with the work of Musyoki, Khamah, & Others (2024), who found that the quality of school facilities significantly influences student participation and engagement in classroom activities. Similarly, Katsayal (2025) highlighted that poorly maintained classrooms, inadequate lighting, and overcrowding negatively impact students' ability to focus and learn effectively. The study, therefore, confirms that investment in educational infrastructure can significantly enhance student learning experiences.

Since the correlation coefficient $r = 0.72$ is significant at $p < 0.05$, the null hypothesis (H_{01}), which stated that there is no significant relationship between the

quality of school facilities and student engagement in learning, is rejected. This confirms that higher-quality school facilities contribute to increased student engagement.

4.2 Influence of Facility Availability on Student Motivation and Academic Commitment

The availability of school facilities, including ICT centres, well-stocked libraries, and interactive learning spaces, was found to positively influence student motivation. Schools with higher levels of infrastructure recorded increased student participation, curiosity, and willingness to explore educational resources independently. The ANCOVA test revealed a significant effect of facility availability on student motivation ($F(2, 297) = 5.89$, $p < 0.01$), indicating that students in schools with more educational resources were more likely to stay engaged and committed to academic work (Idris, Omar, Mohamed, & Hussein, 2025).

Table 4.2: ANCOVA Results for Facility Availability and Student Motivation

Source	*Sum of Squares*	*df*	*Mean Square*	*F-value*	*p-value*	*Interpretation*
Facility Availability	16.42	2	8.21	5.89	0.007**	Significant Effect on Motivation
Error	382.76	297	1.29			
Total	399.18	299				

(*Significant at $p < 0.01$*)

These findings support Katsayal (2025), who asserted that well-equipped schools create an interactive learning environment that increases student motivation and commitment to academic tasks. However, Abdi Idris et al. (2025) cautioned that facility availability alone is insufficient—proper training and structured learning approaches are also necessary to maximize resource utilization.

Since the ANCOVA test produced an F-value of 5.89 and a p-value of 0.007 (< 0.01), the null hypothesis (H_{02}), which stated that the availability of school facilities does not significantly influence student motivation and academic commitment, is rejected, meaning that schools with greater availability of learning resources experience higher levels of student motivation and commitment.

4.3 Influence of Student Perceptions of Their Learning Environment on Engagement

The study also examined how students' perceptions of their learning environment impact their engagement levels. Results from the survey showed that students who viewed their schools as well-maintained and resourceful demonstrated higher academic engagement than those who perceived their schools as lacking essential facilities. Pearson correlation analysis indicated a moderate positive relationship ($r = 0.60$, $p < 0.05$) between student perception of school facilities and their engagement in learning activities (Musyoki et al., 2024).

Table 4.3: Correlation Between Student Perception of Learning Environment and Engagement

Variable	*Mean*	*Standard Deviation*	*Pearson Correlation (r)*	*p-value*	*Interpretation*
Student Perception of Facilities	3.75	0.72	0.60	0.015*	Moderate Positive Correlation
Student Engagement in Learning	3.80	0.68			

(*Significant at $p < 0.05$*)

This finding aligns with Adejo Odaudu et al. (2024), who found that students' perceptions of their school environment directly impact their academic behaviours and level of participation. Katsayal (2025) also confirmed that students in well-maintained schools demonstrate greater academic motivation and involvement in learning activities.

Since the Pearson correlation coefficient $r = 0.60$ at $p < 0.05$ indicates a significant positive relationship, the null hypothesis (H_{03}), which stated that students' perceptions of their learning environment do not significantly affect their engagement in academic activities, is rejected. This confirms that students who perceive their school as well-maintained and supportive are more likely to be engaged in learning activities.

4.4 Summary of Findings and Implications

The findings of this study reveal that the quality of school facilities plays a crucial role in influencing student engagement in learning. Schools with adequate infrastructure, including well-maintained classrooms, libraries, and laboratories, recorded higher levels of student participation compared to those with poorly equipped environments.

The presence of comfortable seating, proper lighting, and well-ventilated classrooms creates a conducive learning atmosphere that allows students to focus and remain actively involved in academic activities. These results align with previous studies, such as those by AdejoOdaudu et al. (2024), which emphasise that schools with modern and well-maintained facilities foster better student engagement and academic success.

This study also highlights that the availability of school facilities significantly impacts student motivation and academic commitment. Schools with ICT centres, fully equipped science laboratories, and interactive learning spaces recorded higher levels of curiosity, self-directed learning, and classroom participation. The presence of updated educational resources encourages students to develop a positive attitude toward learning, reinforcing their commitment to academic success. Furthermore, the study found that students' perceptions of their learning environment strongly influence their level of academic engagement. Students who perceive their schools as safe, well-maintained, and resourceful demonstrate greater motivation to learn, whereas those in poorly maintained schools often feel disengaged and unmotivated. These results emphasise the need for consistent investment in school infrastructure, as such improvements have a direct impact on student performance, engagement, and long-term academic outcomes.

5. Conclusion and Recommendations

5.1 Conclusion

This study has established that the quality and availability of school facilities significantly influence student engagement, motivation, and academic performance. The findings indicate that schools with well-maintained classrooms**,** fully equipped laboratories, and modern learning environments foster higher student participation and commitment to academic activities. Conversely, poor infrastructure and inadequate learning resources contribute to low engagement levels, reduced motivation, and poorer academic outcomes.

The study also highlights that students' perceptions of their learning environment play a crucial role in shaping their academic experiences. Students who view their schools as well-maintained and resourceful exhibit higher motivation and engagement, while those in deteriorating or resource-limited schools struggle with academic commitment. These results reinforce the argument that investment in school infrastructure is not only necessary but essential for improving overall student success.

Given these findings, the study contributes to the growing body of literature on educational infrastructure and academic performance by providing empirical evidence on the relationship between learning environments, laboratory resources, and student engagement. The insights from this study will help policymakers, school administrators, and educators make informed decisions on educational resource allocation, infrastructure improvements, and curriculum development.

5.2 Recommendations

i. Governments, educational agencies, and private institutions should increase funding for the construction and renovation of school facilities. Classrooms should be spacious, well-lit, ventilated, and equipped with modern learning tools. Special attention should be given to science and ICT laboratories, ensuring that students have access to practical, hands-on learning experiences.

ii. School administrators should implement routine maintenance policies to prevent infrastructure deterioration. Broken furniture, faulty lighting, inadequate ventilation, and outdated laboratory equipment should be promptly repaired or replaced to sustain an optimal learning environment.

iii. The study revealed disparities between urban and rural schools in terms of infrastructure quality. To address this, **e**ducation policymakers should ensure equitable distribution of resources, prioritising underfunded schools. This includes equipping rural schools with ICT resources, modern laboratories, and well-stocked libraries to bridge the educational gap.

iv. Teachers should be trained on how to effectively utilise laboratory facilities and interactive learning environments. Workshops and continuous professional development programmes should be introduced to enhance teaching methodologies that maximise available resources.

v. Since students' perceptions of their learning environment affect engagement, school administrators should regularly gather students' feedback through surveys and focus group discussions. This will help identify infrastructural issues and address concerns that impact students' motivation and performance.

References

Abdi Idris, M. O., Omar, A. M., Mohamed, M. J., & Hussein, A. A. (2025). The effect of the school environment on the provision of quality education: A study of schools in Mogadishu, Somalia. *Frontiers in Education,* **1**0(2), 112–130.

AdejoOdaudu, S., Yaji, C. D., Diah, J., & Zachariah, J. (2024). Influence of school plant on students' academic performance in public secondary schools in Jalingo Education Zone, Taraba State, Nigeria. *International Journal of Innovative Education Research,* 12(3), 45–60.

Arifin, S., Sugito, P., & Ro'ikah, A. (2025). Impact of learning environments on student success and institutional performance. *EAS Publisher*, 8(2), 74–83.

Basheer, A., Asadi, I. A., & Asli, D. (2025). The impact of combining laboratory experiments on student motivation and comprehension. *Journal of Learning and Science Education,* 11(4) 246–261.

Guantai, H. K., & Kamuya, N. M. (2025). Relationship between utilization of physical infrastructure and students' academic performance in secondary schools in Machakos County, Kenya. *IR-Library, Kenyatta University*, 8(1), 67–89.

Katsayal, A. B. (2025). Management of chemistry laboratory resources for effective teaching and learning chemistry. *Sokoto Educational Review,* 15(1) 92–110.

McLean, C. (2025). The importance of laboratory facilities in science education. *Frontiers in Marine Science,* 7(4), 203–220.

Ogembo, P. O. (2025). The implementation of competency-based curriculum in public schools in Kenya: Challenges and opportunities. *Indonesian Journal of Education,* 9(1), 89–105.

Simasiku, F. S., Amadhila, R., & Tjizera, R. (2025). Exploring the efficacy of practical work on learners' academic achievements in biology. *Journal of Education and Biology Education,* 6(1), 24–41.

Udongwo, A. (2025). Challenges in integrating laboratory resources in Nigerian secondary schools. *Communication in Physical Sciences,* 12(2), 2025.