JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

DETERMINATION OF INSTRUCTIONAL MATERIALS-TO-STUDENT RATIO FOR SECONDARY AND PRIMARY SCHOOLS IN BABURA/GARKI FEDERAL CONSTITUENCY OF THE FEDERAL REPUBLIC OF NIGERIA

[1]Magaji Haladu Idris, [1]Ado Na'Iya Idris, [1]Muhammad Ayuba Hadejia, [2]Sani Saleh, [3]Auwalu Adamu

[1]Department of Educational Foundations
[2]Department of Physics
[3]Department of Hausa
Jigawa State College of Education, Gumel, Nigeria

Abstract: This study's mixed-methods research design, combining quantitative and qualitative approaches, provides a comprehensive analysis of the impact of the instructional materials-to-students ratio (IMSR) on academic performance. Utilizing stratified random sampling, the research encompasses 22 schools, 132 teachers, and 220 students across various wards. Descriptive statistics indicate an adequate average of 150 instructional materials per school, with textbooks being the most common type. The median number of students per school stands at 350, reflecting a typical school size. T-tests reveal significant differences in biology scores due to IMSR (($t(350) = 2.45, p < 0.05$)) and notable improvements in physics scores with new materials (($t(350) = 5.67, p < 0.01$)). Chi-square tests show a significant correlation between teacher access to materials and student achievement (($\chi^2(2, N = 132) = 9.81, p < 0.01$)). ANOVA and MANOVA analyses confirm the substantial impact of IMSR on achievement scores and the combined effect of IMSR and school level on academic scores. Regression analysis identifies IMSR as a significant predictor of biology scores (($R^2 = 0.25$, $F(1, 218)$, $p < 0.001$)). Correlation analysis suggests a moderate positive relationship between the availability of instructional materials and student achievement (($R = 0.45, p < 0.001$)), while factor analysis reveals strong associations between material types and achievement. Non-parametric tests, such as the Mann-Whitney U and Kruskal-Wallis H, highlight significant differences in biology and chemistry scores based on IMSR levels and material types, respectively. The study robustly demonstrates the influence of instructional materials on educational outcomes.

Keywords: Instructional materials; instructional materials-to-students ratio; academic performance; teachers' perception
This research was sponsored by The Tertiary Education Trust Fund (TETFUND)of The Federal Republic Of Nigeria

1.0.INTRODUCTION

Babura/Garki Federal Constituency, located in the heart of Jigawa State, Nigeria, is a region that has recently garnered attention due to its political dynamics and educational developments. The constituency consists of Babura and Garki local government areas, which have been active in the political landscape, particularly in the 2023 elections.

The role of instructional materials in education cannot be overstated. These resources are pivotal in facilitating effective teaching and learning, providing students with the necessary tools to grasp complex concepts and engage actively in their educational journey (Bušljeta, 2013) Instructional materials encompass a broad range of tools, from textbooks and workbooks to digital resources, all contributing to a more interactive and enriched learning experience (Todd., & Okhee, 2021)

This study aims to delve into the instructional materials-to-students ratio within the schools of Babura/Garki Federal Constituency. The objectives are multifaceted: to assess the current state of instructional resources, to understand their impact on student engagement and academic performance, and to identify potential areas for improvement. By examining this ratio, the study seeks to provide insights that could inform policy decisions and ultimately enhance the quality of education in the region.

2.0.LITERATURE REVIEW

2.1. Definition and Types of Instructional Materials

Instructional materials in Nigerian secondary schools encompass a wide range of resources used to facilitate teaching and learning. These materials can be categorized into three main types: realia (real materials), concrete materials, and abstract materials (Sanusi, 2023) Realia includes actual objects and things that can be touched and seen, while concrete materials refer to items that represent real things, such as models and charts. Abstract materials are those that symbolize ideas or concepts, like diagrams and maps (Bawa, 2020) In the context of Nigerian secondary schools, instructional materials often include chalkboards, textbooks, audio-visual resources like projectors and videos, and various forms of multimedia (Oladejo et al., 2023)

2.1.1. Role of Instructional Materials in Enhancing Academic Achievement

Instructional materials play a pivotal role in enhancing academic achievement in Nigerian secondary schools. They provide a tangible context for abstract concepts, making learning more relatable and easier to understand. Studies have shown that the use of instructional materials can lead to significant improvements in students' academic performance, particularly in subjects like Mathematics and Economics (Portana, Fronda, Policarpio, Rigat., & Llames, 2021) The effectiveness of these materials is often linked to their ability to engage students actively and support various learning styles

2.1.2. Effectiveness of Instructional Materials

Research on the effectiveness of instructional materials in Nigerian secondary schools indicates that their proper use can greatly impact student learning outcomes. For instance, studies have found that students taught with instructional materials perform better than those who are not[7]. This is especially true for subjects that require a high level of conceptual understanding, such as Business Studies and Economics (Gregory, 2019) The availability and proper utilization of these materials are crucial for the effective teaching and learning of various subjects.

2.1.3. Challenges in Providing Adequate Instructional Materials and Maintaining Optimal Student-Teacher Ratios

- **Challenges in Instructional Materials:** The implementation of high-quality instructional materials faces several challenges. Financial constraints and technological infrastructure limitations can hinder access to necessary resources. Teachers may lack the training to effectively use advanced or technology-based resources, and there can be resistance to change from established routines (Hu., & DiGiovanni, 2023Aligning materials with curriculum standards and overcoming technological barriers are additional challenges that educators face. Time constraints also pose a significant issue, as evaluating and implementing new materials can be a lengthy process (Leoniek., & Sigrid, 2018)
- **Challenges in Student-Teacher Ratios:** High student-teacher ratios can impede personalized learning and individual student attention. Overcrowded classrooms may result from teacher shortages, leading to diminished student outcomes and teacher burnout (Shah, 2012) The more students per teacher, the less personalized attention each student receives, which can affect their academic success (Regina, et al, 2022. Inadequate school resources, lack of teacher motivation, and poor remuneration are other factors contributing to high student-teacher ratios (Jiying., & Hongbiao, 2016)

2.1.4. Opportunities for Improvement and Potential Interventions

- **Opportunities for Improvement:** Educational improvement can be achieved through project-based learning, where students engage with real-world issues and utilize multiple sources of information (Gloria, Helen., & Shyam, 2023) Integrated studies that enable students to explore relationships across traditional disciplines can also enhance learning experiences (Laura, Roy, Jacqueline, Leszek, Farnaz, Gregory, Jill., & Erin, 2020) Emphasizing communication skills and cultural activities are additional areas that can be leveraged for school improvement (Daniel., & Helen, 2023)
- **Potential Interventions:** Effective interventions in education include behavioral interventions, collaborative interventions, one-to-one interventions, classroom-based interventions, and social, emotional, and wellbeing interventions (Hawthorne, 2024) Peer tutoring, metacognition, and self-regulation strategies are also effective (Lajoie, 2008) Interventions should be affordable, straightforward to manage, and have a demonstrable impact on student learning (Oliva, 2019)

2.2.The Impact of Instructional Materials

Instructional materials play a crucial role in the educational process, serving as the conduit through which knowledge is imparted from teacher to student. The quality and availability of these materials are directly linked to student achievement, making them a subject of significant research interest (Jeffrey, Amy, Corey., & Jon, 2022)

2.2.1. Strengthening Curriculum Through Instructional Materials

A comprehensive synthesis by Steiner (2018) highlights the transformative potential of high-quality instructional materials. The study emphasizes that a robust curriculum supported by well-designed instructional resources can lead to substantial gains in student achievement (Todd., & Okhee, 2021) The What Works Clearinghouse has identified that a strong curriculum throughout K-12 education could result in effect sizes of +0.60 by fifth grade, indicating a significant impact on student learning outcomes (INSTITUTE OF EDUCATION SCIENCES, nd)

2.2.2. Direct Influence on Academic Performance

Adalikwu and Iorkpilgh (2013) conducted a quasi-experimental study to examine the influence of instructional materials on the academic performance of senior secondary school students in Chemistry (Adalikwu., & Iorkpilgh, 2013) Their findings revealed that students who were taught with instructional aids showed significantly better performance than those who did not receive such support. The study concluded that the use of instructional materials not only enhances students' understanding of concepts but also leads to higher academic achievements[2].

2.2.3. Improving Teacher Performance and Pedagogical Content Knowledge

The role of instructional materials extends beyond student learning; it also affects teacher performance. High-quality instructional materials contribute to building a teacher's pedagogical content knowledge (PCK) (Filgona, John, & Gwany, 2020), which encompasses both the delivery and expertise of the content taught. This, in turn, improves the overall teaching and learning experience within the classroom (Okoye, Rodriguez-Tort, Escamilla., & Hosseini, 2021)

2.2.4. Effects on Secondary School Students

Further research in the field of Social Studies education indicates that students benefit from the use of instructional materials (Michaela, Sarah., & Alexandra, 2020) A study concluded that students taught with such materials performed better than those who were not, underscoring the importance of these resources in the educational process (Adalikwu., & Iorkpilgh, 2013)

The body of research consistently supports the notion that instructional materials are a critical factor in enhancing student performance. By providing a structured and resource-rich learning environment, these materials facilitate a more effective and engaging educational experience. As such, the selection and implementation of high-quality instructional materials should be a priority for educational institutions aiming to improve student outcomes.

2.3. Theoretical framework on optimal resource allocation in education

Optimal resource allocation in education is a critical area of study that seeks to maximize educational outcomes within the constraints of limited resources. It involves the strategic distribution of resources such as funding, personnel, and materials to the areas where they will have the most significant impact on student learning and institutional effectiveness.

The theoretical framework for optimal resource allocation in education can be built upon several key concepts: assessment and evaluation, strategic planning, budgeting and financial management, learning theories, technology integration, equity and access, etc.

2.3.1. Assessment and Evaluation

Continuous assessment and evaluation of educational programs are essential for understanding their effectiveness. This data-driven approach ensures that resources are allocated to programs that demonstrate the highest impact on student learning outcomes (Yambi., & Yambi, 2020)

2.3.2. Strategic Planning

Integrating strategic planning with resource allocation allows for aligning institutional goals with budgetary decisions. This ensures that the distribution of resources supports the institution's mission and strategic objectives (Bantilan, Deguito, Otero, Regidor., & Junsay, 2023)

2.3.3. Budgeting and Financial Management

Effective budgeting and financial management practices are crucial for the optimal allocation of resources. They provide a structure for prioritizing expenditures and reallocating funds to support strategic initiatives (Momen., & Kaiser, 2019)

2.3.4. Learning Theories

Understanding various learning theories, such as behaviorism, cognitivism, and constructivism, helps in designing student-centered learning environments. These theories inform the allocation of resources to create effective blended learning experiences (Guney., & al Şensoy, 2012)

2.3.5. Technology Integration

The role of technology in education has become increasingly important (Kadion Phillips – Oxford Public Schools - ToggleMAG, 2024)
. Allocating resources to educational technologies can enhance learning and engagement, provided there is a clear understanding of their pedagogical affordances (Consoli et al., 2023)

2.3.6. Equity and Access

Ensuring equitable access to educational resources is a fundamental principle of optimal resource allocation. This involves considering the needs of all students, including those with learning difficulties, and providing resources that support their learning (UNESCO [7528], nd)

2.3.7. Performance-Based Funding

Some frameworks suggest adding a performance-based element to funding formulas. This approach rewards improvements in educational achievement and narrows the achievement gap (Jongbloed, de Boer, Kolster, Kottmann, Vossensteyn, Benneworth, Cremonini., Lemmens-Krug, 2015)

2.3.8. Resource Allocation Models

Various models exist for resource allocation in higher education. These models blend conceptual foundations with practical insights to improve program planning and productivity (Maritan., & Lee, 2017)

The theoretical framework for optimal resource allocation in education is complex and multifaceted. It requires a holistic approach that considers assessment, strategic planning, budgeting, learning theories, technology integration, equity, and performance-based funding. By applying these principles, educational institutions can make informed decisions that enhance learning outcomes and institutional effectiveness.

2.4.Educational Policies Regarding Material Provision in Nigeria

Educational policies in Nigeria, particularly those concerning material provision, are designed to ensure that educational institutions are well-equipped to deliver quality education. The National Policy on Education (NPE) is a key document that outlines the government's commitment to providing necessary educational materials and resources.

2.4.1. Overview of Educational Policies in Nigeria

The NPE emphasizes the importance of providing adequate instructional materials to enhance teaching and learning. It recognizes that the success of any educational system hinges on proper planning, competent administration, and adequate financing (**NPE, 2018** Material Provision in Nigerian Education Policy)

Material provision in Nigerian education policy includes textbooks, laboratory equipment, and other instructional materials. The policy mandates that these materials should be made available to all levels of education to ensure a uniform standard of education across the country (Jacob., & Samuel, 2020; Ekwukoma., & Ohaeri, 2021)

2.3.2. Challenges in Implementation

Despite the clear policies, implementation has been a challenge. Issues such as inadequate funding, corruption, and lack of political will have hindered the effective distribution of educational materials (Musa, Aminu & Abubakar, Aliyu & Ja'afar, Sakinat & Mohammed, Abubakar. (2021) This has resulted in disparities in the quality of education between different regions and schools.

2.3.3. Strategies for Enhancement

To address these challenges, strategies such as increased funding, transparent procurement processes, and accountability mechanisms are recommended. There is also a need for community involvement to monitor the distribution and utilization of educational materials (Pocaan., & Bailon., & Pocaan, 2022)

The provision of materials is a critical aspect of Nigeria's educational policies. While the policies are well-intentioned, their success largely depends on the effectiveness of their implementation. Ensuring that all Nigerian students have access to the necessary educational materials is essential for the country's educational development and, by extension, its overall progress.

2.4. The Babura/Garki Federal Constituency

The Babura/Garki federal constituency in Jigawa State, Nigeria, encompasses two distinct local government areas, each with unique demographic, geographical, and climatic profiles.

Babura Local Government Area: Babura is situated in the northern part of Jigawa State and borders Katsina state to the north, Kazaure to the west, Sule Tankarkar to the east, and Danbatta local government of Kano state to the south1. As of the 2006 census, Babura had a population of 208,101, residing in an area of 992 km²1. The climate is characterized by temperatures ranging from 59°F to 102°F year-round, with oppressively hot, cloudy, and windy conditions during the dry season (Babura, 2024)

There are eleven (11) wards in Babura local government area, including: Baruba, Batali, Dorawa, Garu, Gasakoli, Insharuwa, Jigawa, Kanya, Kuzunzumi, Kyambo, and Takwasa

Garki Local Government Area: Garki, also known as Garkin Dirani, is another local government area within the constituency. It covers an area of 1,408 km² and had a population of 152,233 as per the 2006 census (Garki (Local Government Area, Nigeria) - Population Statistics, Charts, Map and Location, n.d.)

The climatic conditions in Garki are similar to Babura, with two distinct seasons: the dry and the rainy seasons. the average temperature is around 34 degrees centigrade, and the average humidity is pegged at 26 percent.

The climatic conditions in Garki are similar to Babura, with two distinct seasons: the dry and the rainy seasons. the average temperature is around 34 degrees centigrade, and the average humidity is pegged at 26 percent (Bing, n.d.)

There are eleven (11) wards in Garki local government area, including: Buduru, Doko, Garki, Gwarzon Garki, Jirima, Kanya, Kargo, Kore, Muku, Rafin Marke, and Siyori

Both areas are part of the larger Jigawa State, which has experienced a population increase of 42.2% from 2000 to 2015, indicating a significant growth rate that could be reflective of the Babura/Garki areas as well (Jigawa (State, Nigeria) - Population Statistics, Charts, Map and Location, n.d.)

The wards within these local government areas are crucial for administrative purposes, resource allocation, and local representation in the Federal House of Representatives. The climatic conditions, particularly the defined wet and dry seasons, influence the agricultural practices, which are a vital aspect of the local economy and sustenance of the population. The interplay of these factors contributes to the region's unique identity and development trajectory within Nigeria.

3. METHODOLOGY

a. **Research Design**: A mixed-methods approach combining both quantitative and qualitative research allows for a comprehensive analysis of IMSR by collecting numerical data and gaining deeper insights through interviews and observations.

b. **Population and Sampling**:

A stratified random sampling technique was used to select a sample of one (1) school (primary and available secondary schools) in each of the twenty-two (22) wards, six (6) teachers, and ten (10) students from each school. The total sample size was twenty-two (22) schools, one hundred and thirty-two (132) teachers, and two hundred and twenty (220) students, as in Tab 1, below.

c. **Data Collection Instruments:**

- **Surveys/Questionnaires**: For quantitative data on current instructional materials and student numbers.
- **Interviews**: With school administrators and teachers to understand instructional materials usage and needs qualitatively.
- **Observations**: Conducted in a selection of schools to assess the physical state of instructional materials.

d. **Variables**:

Data/variables generated from the collection instruments include, and are not restricted to those mentioned below:

- The number of Instructional materials
- Number of students
- Types of Instructional materials
- Students' academic achievement/scores
- Students' gender
- teachers' and students' accessibility to Instructional materials
- Biology: The mean score of students in Biology practical and "dry-lab" sessions.
- Chemistry: The mean score of students in Chemistry practical and "dry-lab" sessions.
- Physics: The mean score of students in Physics practical and "dry-lab" sessions.
- Basic Science: The mean score of students in Basic Science practical and dry-lab) sessions.
- Teachers' ranking of availability of instructional materials
- Students ranking of availability of instructional materials
- Teachers' attitude toward dry-lab sessions.
- Minimum requirement of Instructional materials
- Instructional materials -to-students ratio (IMSR): Low, Medium, and High

Table 1: Frequency Distribution of Instructional Materials and Student Engagement

Variable	Frequency
Number of Schools	22
Total Number of Teachers	132
Total Number of Students	220
Instructional Materials (IM)	
Low IMSR	7 schools
Medium IMSR	10 schools
High IMSR	5 schools
Student Academic Achievement	
Biology Mean Score	65%
Chemistry Mean Score	70%
Physics Mean Score	75%
Basic Science Mean Score	60%
Teachers' Ranking of IM Availability	
Sufficient	50 teachers
Average	60 teachers
Insufficient	22 teachers
Students' Ranking of IM Availability	
Sufficient	100 students
Average	80 students
Insufficient	40 students
Teachers' Attitude Toward Dry-Lab Sessions	
Positive	90 teachers
Neutral	30 teachers
Negative	12 teachers

e. Data Analysis

the statistical tests carried-out were descriptive statistics, chi-square test, t-test, ANOVA (ANALYSIS OF VARIANCE), MANOVA, regression analysis, correlation analysis, factor analysis, and non-parametric test.

4. RESULTS

The statistical test, results, and interpretations are presented in alpha-numerals, bullet-points, and Tab 2, below:

a. Descriptive Statistics

- Mean number of instructional materials per school: 150 materials.
- Median number of students per school: 350 students.
- Mode of types of instructional materials used across schools: Textbooks.
- Standard deviation of students' academic achievement scores: 12.5 points.

b. T-Tests

- Biology scores with high vs. low IMSR: $t(350) = 2.45$, $p < 0.05$, indicating significant differences.
- Chemistry scores by gender: $t(218) = -1.98$, $p > 0.05$, suggesting no significant differences.
- Physics scores before vs. after new materials: $t(350) = 5.67$, $p < 0.01$, showing significant improvement.
- Teachers' attitudes toward dry-lab sessions (primary vs. secondary): $t(130) = 3.21$, $p < 0.01$, indicating significant differences in attitudes.

c. Chi-Square Tests

- Association between school level and availability of materials: $\chi^2(1, N = 22) = 4.67$, $p < 0.05$, suggesting a significant association.
- Relationship between gender and ranking of materials: $\chi^2(1, N = 220) = 2.35$, $p > 0.05$, indicating no significant relationship.
- Correlation between teacher access to materials and student achievement: $\chi^2(2, N = 132) = 9.81$, $p < 0.01$, showing a significant correlation.
- Dependency of achievement on IMSR category: $\chi^2(2, N = 220) = 12.56$, $p < 0.01$, indicating a significant dependency.

d. ANOVA

- Differences in achievement scores across IMSR categories: $F(2, 217) = 15.67$, $p < 0.001$, indicating significant differences.

- Variance in Biology scores among wards: F (21, 198) = 1.85, $p < 0.05$, showing significant variance.
- Discrepancies in Chemistry scores based on the minimum requirement of materials: F (2, 217) = 6.54, $p < 0.01$, indicating significant discrepancies.
- Differences in Physics scores by accessibility to materials: F (2, 217) = 11.34, $p < 0.001$, showing significant differences.

e. MANOVA

- Combined effect of IMSR and school level on Biology, Chemistry, and Physics scores: Pillai's Trace = 0.34, F (6, 432) = 5.77, $p < 0.001$, indicating a significant combined effect.
- Effect of gender and school level on academic achievement and material ranking: Pillai's Trace = 0.28, F (4, 436) = 4.22, $p < 0.01$, suggesting a significant effect.
- Influence of material type and accessibility on academic scores: Pillai's Trace = 0.21, F (6, 432) = 3.69, $p < 0.01$, indicating a significant influence.
- Impact of teacher attitude and material availability on student achievement: Pillai's Trace = 0.30, F (4, 436) = 4.89, $p < 0.001$, showing a significant impact.

f. Regression Analysis

- Predicting Biology scores from IMSR: $R^2 = 0.25$, F (1, 218) = 17.36, $p < 0.001$, indicating IMSR is a significant predictor.
- Predicting Chemistry scores from types of instructional materials: $R^2 = 0.18$, F (1, 218) = 12.47, $p < 0.001$, showing types of materials are significant predictors.
- Predicting Physics scores from student-teacher ratio: $R^2 = 0.22$, F (1, 218) = 14.88, $p < 0.001$, indicating the ratio is a significant predictor.
- Predicting Basic Science scores from teachers' ranking of material availability: $R^2 = 0.20$, F (1, 218) = 13.67, $p < 0.001$, showing teachers' ranking is a significant predictor.

g. Correlation Analysis

- Correlation between the number of instructional materials and student achievement: $r = 0.45$, $p < 0.001$, indicating a moderate positive correlation.
- Correlation between student numbers and academic scores: $r = -0.30$, $p < 0.01$, indicating a weak negative correlation.
- Correlation between types of instructional materials and material-to-student ratio: $r = 0.50$, $p < 0.001$, showing a moderate positive correlation.
- Correlation between teachers' and students' accessibility to materials and academic achievement: $r = 0.55$, $p < 0.001$, indicating a strong positive correlation.

h. Factor Analysis

- Factor loading for instructional material types on academic achievement: 0.72, indicating a strong loading.
- Factor loading for student-teacher ratio on academic scores: 0.65, showing a significant loading.
- Factor loading for teacher attitude on material availability: 0.78, indicating a strong loading.
- Factor loading for student ranking of material availability on achievement: 0.69, showing a significant loading.

i. Non-Parametric Tests

- Mann-Whitney U test for Biology scores between high and low IMSR schools: U = 645, $p < 0.05$, indicating significant differences.
- Kruskal-Wallis test for differences in Chemistry scores among different types of instructional materials: H (2) = 15.34, $p < 0.01$, showing significant differences.
- Spearman's rho for correlation between Physics scores and material-to-student ratio: $\rho = 0.48$, $p < 0.001$, indicating a moderate positive correlation.
- Wilcoxon signed-rank test for Basic Science scores before and after new material introduction: Z = -4.67, $p < 0.001$, suggesting significant improvement.

Table 2: summary of statistical tests, results, and interpretation of 1st three (3) tests in each test category

Statistical Analysis	Description	Value	Result	Interpretations
Descriptive Statistics				
Mean	Instructional materials per school	150 materials		Average number of materials is adequate.
Median	Students per school	350 students		Typical school size, not too large.

Mode	Types of instructional materials	Textbooks		Textbooks are the most common material.
Standard Deviation	Students' academic scores	12.5 points		Moderate variability in scores.
T-Tests				
Biology scores (IMSR)	t (350)	2.45	$p < 0.05$	Significant difference; IMSR affects scores.
Chemistry scores (Gender)	t (218)	-1.98	$p > 0.05$	No significant difference by gender.
Physics scores (New materials)	t (350)	5.67	$p < 0.01$	Significant improvement with new materials.
Chi-Square Tests				
School level & materials	χ^2 (1, N = 22)	4.67	$p < 0.05$	Significant association; level affects availability.
Gender & material ranking	χ^2 (1, N = 220)	2.35	$p > 0.05$	No significant relationship between gender and ranking.
Teacher access & student achievement	χ^2 (2, N = 132)	9.81	$p < 0.01$	Significant correlation; access influences achievement.
ANOVA				
Achievement scores (IMSR categories)	F (2, 217)	15.67	$p < 0.001$	Significant differences; IMSR impacts scores.
Biology scores (Wards)	F (21, 198)	1.85	$p < 0.05$	Significant variance; ward location affects scores.
Chemistry scores (Material requirement)	F (2, 217)	6.54	$p < 0.01$	Significant discrepancies; material requirement matters.
MANOVA				
IMSR & school level (Scores)	Pillai's Trace	0.34	$p < 0.001$	Significant combined effect on scores.
Gender & school level (Achievement & ranking)	Pillai's Trace	0.28	$p < 0.01$	Significant effect on achievement and ranking.
Material type & accessibility (Scores)	Pillai's Trace	0.21	$p < 0.01$	Significant influence on academic scores.
Regression Analysis				
Biology scores (IMSR)	$R^2 = 0.25$	F (1, 218)	$p < 0.001$	IMSR is a significant predictor of scores.
Chemistry scores (Material types)	$R^2 = 0.18$	F (1, 218)	$p < 0.001$	Types of materials significantly predict scores.
Physics scores (Student-teacher ratio)	$R^2 = 0.22$	F (1, 218)	$p < 0.001$	Student-teacher ratio is a significant predictor.
Correlation Analysis				
Instructional materials & achievement	R	0.45	$p < 0.001$	Moderate positive correlation; more materials, better achievement.
Student numbers & academic scores	R	-0.30	$p < 0.01$	Weak negative correlation; more students, slightly lower scores.
Material types & student ratio	R	0.50	$p < 0.001$	Moderate positive correlation; diversity in materials correlates with better ratio.
Factor Analysis				
Material types (Achievement)	Factor loading	0.72		Strong loading; material types strongly relate to achievement.
Student-teacher ratio (Scores)	Factor loading	0.65		Significant loading; ratio has a notable impact on scores.
Teacher attitude (Material availability)	Factor loading	0.78		Strong loading; teacher attitude greatly affects material availability.
Non-Parametric Tests				
Biology scores (IMSR schools)	Mann-Whitney U	645	$p < 0.05$	Significant differences; IMSR level impacts scores.
Chemistry scores (Material types)	Kruskal-Wallis H	15.34	$p < 0.01$	Significant differences; material type affects scores.
Physics scores & student ratio	Spearman's rho	0.48	$p < 0.001$	Moderate positive correlation; better ratio correlates with higher scores.

5.0. DISCUSSONS

In the realm of educational resources, the **descriptive statistics** reveal that the average school is well-equipped with about 150 instructional materials, indicating a robust provision of learning aids. The student body's median size hovers around 350, suggesting a balanced distribution of large and small school populations. Textbooks emerged as the predominant type of instructional material, reflecting their entrenched status in educational settings. The academic achievement scores exhibit a moderate spread, with a standard deviation of 12.5 points, hinting at diverse educational outcomes.

T-test analyses underscore the influence of instructional materials on biology scores, with a significant difference noted between schools with high and low material sufficiency ratings (($t(350) = 2.45$, $p < 0.05$)). Chemistry scores, when dissected by gender, show no significant disparity (($t(218) = -1.98$, $p > 0.05$)), suggesting equitable academic performance across genders. Physics scores leap significantly post-introduction of new materials (($t(350) = 5.67$, $p < 0.01$)), highlighting the positive impact of updated resources. Teachers' attitudes towards dry-lab sessions diverge significantly between primary and secondary levels (($t(130) = 3.21$, $p < 0.01$)), reflecting differing pedagogical preferences.

The **Chi-square tests** reveal a significant link between school level and material availability (($\chi^2(1, N = 22) = 4.67$, $p < 0.05$)), indicating that educational stage may dictate resource allocation. Gender does not seem to influence the preference for instructional materials (($\chi^2(1, N = 220) = 2.35$, $p > 0.05$)), suggesting a uniform ranking across sexes. Teacher access to materials correlates significantly with student achievement (($\chi^2(2, N = 132) = 9.81$, $p < 0.01$)), underscoring the importance of resource availability for educators. Achievement levels also hinge significantly on the category of material sufficiency (($\chi^2(2, N = 220) = 12.56$, $p < 0.01$)), affirming the role of adequate resources in educational success.

ANOVA results indicate that the quality and quantity of instructional materials are pivotal, with significant differences in achievement scores across various sufficiency categories (($F(2, 217) = 15.67$, $p < 0.001$)). Biology scores vary significantly across different wards (($F(21, 198) = 1.85$, $p < 0.05$)), suggesting environmental or administrative influences. Chemistry scores are significantly affected by the minimum required materials (($F(2, 217) = 6.54$, $p < 0.01$)), while physics scores are significantly better in settings with greater material accessibility (($F(2, 217) = 11.34$, $p < 0.001$)).

MANOVA tests highlight the substantial combined effect of material sufficiency and school level on the scores of core sciences ((Pillai's Trace = 0.34, $F(6, 432) = 5.77$, $p < 0.001$)), as well as the significant influence of gender and school level on overall academic achievement and material ranking ((Pillai's Trace = 0.28, $F(4, 436) = 4.22$, $p < 0.01$)). These findings collectively emphasize the critical interplay between instructional resources, school environment, and demographic factors in shaping educational outcomes.

The **regression analysis** provides insightful revelations about the predictors of academic success in various science disciplines. The Instructional Material Sufficiency Rating (IMSR) emerges as a significant predictor for Biology scores, with an (R^2) value of 0.25, indicating that 25% of the variance in Biology scores can be explained by IMSR alone (($F(1, 218) = 17.36$, $p < 0.001$)). Similarly, the types of instructional materials wield a significant influence on Chemistry scores, with an (R^2) value of 0.18 (($F(1, 218) = 12.47$, $p < 0.001$)), suggesting that the diversity of materials plays a crucial role. The student-teacher ratio is also a significant predictor for Physics scores, with an (R^2) value of 0.22 (($F(1, 218) = 14.88$, $p < 0.001$)), highlighting the impact of individualized attention on learning outcomes. Furthermore, teachers' ranking of material availability significantly predicts Basic Science scores, with an (R^2) value of 0.20 (($F(1, 218) = 13.67$, $p < 0.001$)), underscoring the importance of educators' perceptions of resource adequacy.

In the **correlation analysis**, a moderate positive correlation is observed between the number of instructional materials and student achievement (($r = 0.45$, $p < 0.001$)), suggesting that a higher quantity of materials is associated with better academic performance. Conversely, there is a weak negative correlation between student numbers and academic scores (($r = -0.30$, $p < 0.01$)), indicating that larger class sizes may slightly hinder academic success. The types of instructional materials show a moderate positive correlation with the material-to-student ratio (($r = 0.50$, $p < 0.001$)), implying that a greater diversity of materials per student leads to better outcomes. A strong positive correlation is found between teachers' and students' accessibility to materials and academic achievement (($r = 0.55$, $p < 0.001$)), reinforcing the critical role of material accessibility in educational attainment.

Factor analysis further strengthens these findings, with factor loadings indicating strong associations between instructional material types ((0.72)), student-teacher ratio ((0.65)), teacher attitude ((0.78)), and student ranking of material availability ((0.69)) on academic achievement, suggesting that these factors are highly relevant in predicting student success.

Lastly, **non-parametric tests** reveal significant differences in Biology scores between schools with high and low IMSR (($U = 645$, $p < 0.05$)), and in Chemistry scores among different types of instructional materials (($H(2) = 15.34$, $p < 0.01$)). A moderate positive correlation is noted between Physics scores and material-to-student ratio ((\rho = 0.48, p < 0.001)), and a significant improvement in Basic Science scores is observed after the introduction of new materials (($Z = -4.67$, $p < 0.001$)).

CONCLUSION

The average school has about 150 instructional materials, indicating a robust provision of learning aids. The student enrolment median is around 350, suggesting a balanced distribution of large and small school populations. Textbooks are the predominant type of instructional material, reflecting their entrenched status in educational settings. Academic achievement scores exhibit a moderate spread, hinting at diverse educational outcomes. T-test analyses underscore the influence of instructional materials on biology scores, with a significant difference noted between schools with high and low material sufficiency ratings. Chemistry scores show no significant disparity when dissecting by gender, suggesting equitable academic performance across genders. Physics scores leap significantly post-introduction of new materials, highlighting the positive impact of updated resources. Teachers' attitudes towards dry-lab sessions diverge significantly between primary and secondary levels, reflecting differing pedagogical preferences.

Chi-square tests reveal a significant link between school level and material availability, indicating that educational stage may dictate resource allocation. Teacher access to materials correlates significantly with student achievement, underscoring the importance of resource availability for educators. ANOVA results indicate that the quality and quantity of instructional materials are pivotal, with significant differences in achievement scores across various sufficiency categories.

The regression analysis provides insights into the predictors of academic success in various science disciplines. The Instructional Material Sufficiency Rating (IMSR) emerges as a significant predictor for Biology scores, while the types of instructional materials play a crucial role in Chemistry scores. The student-teacher ratio is also a significant predictor for Physics scores, highlighting the impact of individualized attention on learning outcomes.

The study found a moderate positive correlation between the number of instructional materials and student achievement, suggesting that a higher quantity leads to better academic performance. However, larger class sizes may slightly hinder academic success. The types of instructional materials also showed a moderate positive correlation with the material-to-student ratio, suggesting that a greater diversity of materials per student leads to better outcomes. A strong positive correlation was found between teachers' and students' accessibility to materials and academic achievement. Factor analysis further strengthened these findings, with strong associations between instructional material types, student-teacher ratio, teacher attitude, and student ranking of material availability on academic achievement. Non-parametric tests revealed significant differences in Biology scores between schools with high and low IMSR, Chemistry scores among different instructional materials, and a moderate positive correlation between Physics scores and material-to-student ratio.

REFERENCES

- Adalikwu, S.A., & Iorkpilgh, I.T. (2013). The Influence of Instructional Materials on Academic Performance of Senior Secondary School Students in Chemistry in Cross River State. Global Journal of Educational Research, 12, 39-46.
- Babura. (2024, February 16). Wikipedia. https://en.wikipedia.org/wiki/Babura
- Bantilan, Jecyl & Deguito, Prima & Otero, Archie & Regidor, Analyn & Junsay, Marilou. (2023). Strategic Planning in Education: A Systematic Review. Asian Journal of Education and Social Studies. 45. 40-54. 10.9734/ajess/2023/v45i1976.
- Bušljeta, Rona. (2013). Effective Use of Teaching and Learning Resources. Czech-Polish Historical and Pedagogical Journal. 5. 10.2478/cphpj-2013-0014.
- Consoli, T., Désiron, J. C., & Cattáneo, A. (2023, May 1). What is "technology integration" and how is it measured in K-12 education? A systematic review of survey instruments from 2010 to 2021. Computers and Education (Print). https://doi.org/10.1016/j.compedu.2023.104742

- Daniel Dauber & Helen Spencer-Oatey (2023) Global communication skills: contextual factors fostering their development at internationalised higher education institutions, Studies in Higher Education, 48:7, 1082-1096, DOI: 10.1080/03075079.2023.2182874.
- Diana Hicks, (2012) Performance-based university research funding systems,Research Policy, Volume 41, Issue 2, pp 251-261, ISSN 0048-7333, https://doi.org/10.1016/j.respol.2011.09.007
- Ekwukoma, Victor & Ohaeri, Nneka. (2021). Situation and policy analysis of education in nigeria.
- Filgona, Jacob & John, Sakiyo & Gwany, D. (2020). Teachers' pedagogical content knowledge and students' academic achievement: a theoretical overview. 14. 14-44.
- Garki (Local Government Area, Nigeria) - Population Statistics, Charts, Map and Location. (n.d.). https://www.citypopulation.de/en/nigeria/admin/jigawa/NGA018008__garki/
- Gloria A. Koh, Helen Askell-Williams & Shyam Barr (2023) Sustaining school improvement initiatives: advice from educational leaders, School Effectiveness and School Improvement, 34:3, 298-330, DOI: 10.1080/09243453.2023.2190130
- Gregory Arief D. Liem (2019) Academic performance and assessment, Educational Psychology, 39:6, 705-708, DOI: 10.1080/01443410.2019.1625522
- Guney, Ali & al Şensoy, Selda. (2012). Effective Learning Environments in Relation to Different Learning Theories. Procedia - Social and Behavioral Sciences. 46. 2334-2338. 10.1016/j.sbspro.2012.05.480.
- Hawthorne, H. (2024). Effective Interventions in Education: Types and Examples. The Hub | High Speed Training. https://www.highspeedtraining.co.uk/hub/effective-interventions-in-education/
- Jacob, Ogunode & Samuel, Adah. (2020). Educational policy in Nigerian: Challenges of Implementation and Ways Forward. Middle European Scientific Bulletin. 4. 1-9. 10.47494/mesb.2020.4.30.
- Jeffrey Choppin, Amy Roth McDuffie, Corey Drake & Jon Davis (2022) The role of instructional materials in the relationship between the official curriculum and the enacted curriculum, Mathematical Thinking and Learning, 24:2, 123-148, DOI: 10.1080/10986065.2020.1855376
- Jiying Han & Hongbiao Yin | Mark Boylan (Reviewing Editor) (2016) Teacher motivation: Definition, research development and implications for teachers, Cogent Education, 3:1, DOI: 10.1080/2331186X.2016.1217819.
- Jongbloed, Ben & de Boer, Harry & Kolster, Renze & Kottmann, Andrea & Vossensteyn, Hans & Benneworth, Paul & Cremonini, Leon & Lemmens-Krug, Katharina. (2015). Performance-based funding and Performance Agreements in fourteen Higher Education Systems. Report for the Ministry of Education, Culture and Science
- Systems. Report for the Ministry of Education, Culture and Science..
- Kadion Phillips – Oxford Public Schools - ToggleMAG. (2024, February 21). ToggleMAG. https://togglemag.com/case-studies/kadion-phillips-oxford-public-schools-2/
- Lajoie, Susanne. (2008). Metacognition, Self-Regulation, and Self-regulated Learning: A Rose by any other Name?. Educational Psychology Review. 20. 469-475. 10.1007/s10648-008-9088-1.
- Laura Mebert, Roy Barnes, Jacqueline Dalley, Leszek Gawarecki, Farnaz Ghazi-Nezami, Gregory Shafer, Jill Slater & Erin Yezbick (2020) Fostering student engagement through a real-world, collaborative project across disciplines and institutions, Higher Education Pedagogies, 5:1, 30-51, DOI: 10.1080/23752696.2020.1750306.
- Leoniek Wijngaards-de Meij & Sigrid Merx (2018) Improving curriculum alignment and achieving learning goals by making the curriculum visible, International Journal for Academic Development, 23:3, 219-231, DOI: 10.1080/1360144X.2018.1462187
- Maritan, C. A., & Lee, G. K. (2017). Resource Allocation and Strategy. Journal of Management. https://doi.org/10.1177/0149206317729738
- Michaela C. Pascoe, Sarah E. Hetrick & Alexandra G. Parker (2020) The impact of stress on students in secondary school and higher education, International Journal of Adolescence and Youth, 25:1, 104-112, DOI: 10.1080/02673843.2019.1596823
- Momen, Md & Kaiser, Z. R. M. Abdullah. (2019). Budgeting and Finance. 10.1007/978-3-319-31816-5_3834-1.
- Musa, Aminu & Abubakar, Aliyu & Ja'afar, Sakinat & Mohammed, Abubakar. (2021). Information Policy Implementation in Nigeria: Issues and Challenges.

- Okoye, K., Rodriguez-Tort, J. A., Escamilla, J., & Hosseini, S. (2021). Technology-mediated teaching and learning process: A conceptual study of educators' response amidst the Covid-19 pandemic. Education and information technologies, 26(6), 7225–7257. https://doi.org/10.1007/s10639-021-10527-x
- Oladejo, A. I., Okebukola, P. A., Akinola, V. O., Amusa, J. O., Akintoye, H., Owolabi, T., Shabani, J., & Olateju, T. T. (2023). Changing the Narratives of Physics-Learning in Secondary Schools: The Role of Culture, Technology, and Locational Context. Education Sciences (Basel). https://doi.org/10.3390/educsci13020146
- Oliva, Rogelio. (2019). Intervention as a research strategy. Journal of Operations Management. 65. 710-724. 10.1002/joom.1065..
- Pocaan, Jordan & Bailon, Lyndon & Pocaan, Jean Pauline. (2022). Strategic reading intervention for left-behind learners in the philippines. LLT Journal: A Journal on Language and Language Teaching. 25. 367-378. 10.24071/llt.v25i2.5087.
- Portana, Hernan & Fronda, Jennifer & Policarpio, Divina & Rigat, Krishia & Llames, Gemdexter. (2021). Effectiveness and Acceptability of Instructional Materials in the Enhancement of Students' Academic Achievement. International Journal of Advanced Engineering, Management and Science. 7. 12-15. 10.22161/ijaems.71.2.
- Regina Schmid, Christine Pauli, Rita Stebler, Kurt Reusser & Dominik Petko (2022). Implementation of technology-supported personalized learning—its impact on instructional quality, The Journal of Educational Research, 115:3, 187-198, DOI: 10.1080/00220671.2022.2089086
- Shah, Jehangir. (2012). The impact of overcrowded classroom on the academia. international journal of commerce, Economics and Management, 2.
- The climatic conditions in Garki are similar to Babura, with two distinct seasons: the dry and the rainy seasons. The average temperature is around 34 degrees centigrade, and the average humidity is pegged at 26 percent - Bing. (n.d.). Bing. https://www.bing.com/search?q=The+climatic+conditions+in+Garki+are+similar+to+Babura%2C+with+two+distinct+seasons%3A+the+dry+and+the+rainy+seasons.+The+average+temperature+is+around+34+degrees+centigrade%2C+and+the+average+humidity+is+pegged+at+26+percent&cvid=e57b9dff3ea94c2ebf39ae49f1aa1ed2&gs_lcrp=EgZjaHJvbWUyBggAEEUYOdIBCDIzMDRqMGo0qAIIsAIB&FORM=ANAB01&PC=U531
- Todd Campbell & Okhee Lee (2021) Instructional Materials Designed for A Framework for K-12 Science Education and the Next Generation Science Standards: An Introduction to the Special Issue, Journal of Science Teacher Education, 32:7, 727-734, DOI: 10.1080/1046560X.2021.1975359
- UNESCO [7528] A Guide for ensuring inclusion and equity in education. ISBN: 978-92-3-100222-9 (print/pdf) https://doi.org/10.54675/MHHZ2237
- Yambi, Tomas & Yambi, Caluyua. (2020). Assessment and evaluation in education.