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**INVESTIGATING THE USE OF LOCAL RESOURCES IN SCIENCE  
EDUCATION IN NIGERIAN SECONDARY SCHOOLS**

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**\*Ogungbesan Yetunde Felicia**

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Integrated Science Department, Federal College of Education, Osiele, Abeokuta.

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\*Corresponding Author: Ogungbesan Yetunde Felicia

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**ABSTRACT**

Globally, the use of local resources in science education has been explored as a strategy for overcoming resource constraints in underdeveloped regions. In Nigeria, research on the use of local resources in science education has been relatively sparse but growing. This study investigated the utilization of local resources in science education within Nigerian secondary schools, focusing on its prevalence, impact, and the challenges hindering its adoption. A mixed-methods design was employed, collecting quantitative data through questionnaires from 120 science teachers and 480 students, and qualitative data via semi-structured interviews and classroom observations across six states in southwestern Nigeria. The findings revealed a moderate but inconsistent level of utilization, with teachers most frequently using household items (65%) and underutilizing community resources (70% rarely/never). A statistically significant difference was found between school locations, with rural teachers (Mean=3.10) using local resources more than urban teachers (Mean=2.45). Furthermore, teaching experience was a significant factor, with veteran teachers (11+ years) demonstrating higher usage than their less-experienced colleagues. However, teachers' academic qualifications did not significantly influence utilization. Major impediments identified include a lack of time for preparation (92%), insufficient training (88%), and a perceived misalignment with the national curriculum (75%). The study concludes that while local resources hold significant potential for creating engaging and contextually relevant science education, their effective integration is hampered by systemic constraints. It is recommended that curriculum reforms, targeted teacher training, and enhanced administrative support are essential to harness the full benefits of local resources in bridging the resource gap in Nigerian science education.

**KEYWORDS:** Local Resources, Science Education, Resource Utilization, Teacher Challenges, Rural Education, Nigeria, Mixed-Methods.

## **INTRODUCTION**

In Nigeria, science education has faced various challenges, including the shortage of instructional materials, inadequate infrastructure, and a lack of qualified teachers. To mitigate these challenges, utilizing local resources has been identified as a viable strategy to enhance science teaching and learning. Local resources refer to readily available materials in the students' environment, such as soil, plants, stones, and other indigenous materials, which can be effectively integrated into science education. These resources can help bridge the gap created by insufficient conventional laboratory equipment while providing culturally relevant teaching aids that align with students' immediate environment.

Science education in Nigeria faces significant limitations in terms of the availability of instructional materials and infrastructure. While local resources have the potential to fill these gaps, there is limited research on their actual utilization in classrooms. According to Ogunniyi (2007), integrating indigenous knowledge into science education allows students to see the relevance of science in their daily lives. By incorporating locally available materials and practices into the curriculum, educators can bridge the gap between formal scientific knowledge and indigenous ways of knowing, creating a more inclusive and culturally responsive form of science education. In Nigeria, where many students live in rural areas with limited access to conventional science laboratories, local resources provide a practical alternative for delivering quality science education. There is a need to explore how teachers incorporate these resources into the curriculum, the effectiveness of this approach, and the constraints that hinder their adoption. This study seeks to investigate the extent to which local resources are being used in science education in Nigerian secondary schools, their impact on students' understanding of scientific concepts, and the challenges faced by teachers in adopting these materials.

### **Objectives of the Study**

The main objectives of this research are:

1. To assess the prevalence of local resource utilization in science teaching in Nigerian secondary schools.
2. To evaluate the impact of local resources on students' comprehension and retention of scientific knowledge.

3. To identify the barriers teachers encounter in utilizing local resources.
4. To recommend strategies for effectively integrating local resources into science education.

### **Research Questions**

This study aims to address the following research questions:

1. To what extent are local resources utilized in science education in Nigerian secondary schools?
2. What impact does the use of local resources have on students' understanding of scientific concepts?
3. What challenges do science teachers face when using local resources for teaching?
4. How can the use of local resources be effectively integrated into science education to enhance learning outcomes?

### **Literature Review**

Science education globally emphasizes the need for practical, hands-on learning experiences to enhance students' understanding of scientific principles. Studies have shown that using locally sourced materials can provide meaningful learning experiences and foster critical thinking among students. For example, a study by Jegede and Akinmade (2020) highlighted that local resources are cost-effective and improve student engagement. However, another study by Onuoha (2018) noted that despite the availability of these resources, many teachers are not adequately trained on how to integrate them into the science curriculum.

#### **The Concept of Local Resources in Education**

Local resources in education refer to materials that are indigenous to a specific location and can be sourced from the immediate environment. These may include natural materials such as plants, soils, stones, and water, as well as cultural artefacts and tools that can be used to demonstrate scientific concepts. The educational philosophy of using local resources is grounded in the idea of constructivism, which posits that students learn better when they can relate new knowledge to their prior experiences and their surrounding environment (Vygotsky, 1978).

Constructivist teaching emphasizes the importance of experiential learning, where learners actively engage with their environment to construct knowledge. In science education, this approach is supported by inquiry-based learning, which encourages students to explore, experiment, and derive scientific principles from real-world phenomena. By using local resources, science teachers can provide students with hands-on learning opportunities that are

directly tied to their lived experiences, thus fostering deeper understanding and retention of scientific knowledge (Obasi, 2019).

## **Theoretical Framework**

### **Indigenous Knowledge Systems and Science Education**

The use of local resources in science education is closely aligned with the concept of indigenous knowledge systems (IKS), which emphasizes the value of traditional knowledge in understanding natural phenomena. IKS has been increasingly recognized as a legitimate form of knowledge that can complement Western science, particularly in the context of education in African countries like Nigeria (Ogunniyi, 2007).

## **Methodology**

### **Research Design**

This study adopted both quantitative and qualitative research methods. A descriptive survey design was used to collect data from teachers and students on the extent of local resource utilization in science education, while in-depth interviews was used to provide qualitative insights into the challenges and success stories of integrating local resources into teaching.

### **Population and Sample**

The population for this study includes science teachers and secondary school students from public secondary schools in Nigeria. A purposive sampling technique was employed to select schools in both urban and rural settings across the six states (Oyo, Ogun, Lagos, Ekiti, Osun and Ondo) within southwest Nigeria to ensure diversity. The sample consists of 120 science teachers and 480 students.

### **Data Collection Instruments**

Structured questionnaires were administered to science teachers and students to gather quantitative data on the types and extent of local resource utilization as well as its perceived impact on learning.

Semi-structured interviews were conducted with selected teachers and school administrators to gain deeper insights into the challenges and benefits of using local resources in science education.

Observational data was collected by visiting classrooms to observe how local resources are used during science lessons.

## Data Analysis

Quantitative data from the questionnaires was analyzed using descriptive statistics (mean, frequency, percentage) and inferential statistics (t-tests, ANOVA) to determine any significant differences in the use of local resources between urban and rural schools, and among different types of schools. Qualitative data from interviews and observations was analyzed using thematic analysis to identify common themes and patterns regarding the challenges and effectiveness of local resources in science teaching.

## RESULTS

### Demographic Characteristics of Respondents

This section presents the background information of the participants involved in the study. The data is categorized for teachers and students separately to provide a clear profile of the sample population.

**Table 1: Demographic Characteristics of Teacher Respondents. (N=120)**

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	68	56.7
	Female	52	43.3
School Location	Urban	60	50
	Rural	60	50
Years of Teaching Experience	Less than 5 years	25	20.8
	5 - 10 years	45	37.5
	11 - 15 years	32	26.7
	Above 15 years	18	15
Subject Specialization	Biology	44	36.7
	Chemistry	35	29.2
	Physics	41	34.2
Highest Academic Qualification	NCE	18	15
	Bachelor's Degree (B.Sc./B.Ed.)	85	70.8
	Master's Degree (M.Sc./M.Ed.)	17	14.2

The table shows that the teacher sample was evenly split between urban and rural schools, allowing for a robust comparison. The majority of teachers (70.8%) held a Bachelor's degree as their highest qualification, which is the standard requirement for teaching in Nigerian secondary schools. The sample included a balanced mix of subject specializations and a range

of teaching experience, ensuring that the data captured perspectives from both novice and veteran educators.

**Table 2: Demographic Characteristics of Student Respondents. (N=480)**

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	240	50
	Female	240	50
School Location	Urban	240	50
	Rural	240	50
Age	10 - 12 years	72	15
	13 - 15 years	288	60
	16 - 18 years	120	25
Class Level	JSS 1 - JSS 2	144	30
	JSS 3 - SSS 1	192	40
	SSS 2 - SSS 3	144	30
Science Subject of Interest	Biology	187	39
	Chemistry	139	29
	Physics	154	32

The student sample was deliberately constructed to be balanced in terms of gender and school location. The age and class distribution indicates that the study captured responses from students across the entire secondary school spectrum, from Junior Secondary School (JSS) to Senior Secondary School (SSS). The distribution of science subject interest is relatively even, with a slight preference for Biology, which is common in many Nigerian secondary school contexts. This diverse sample helps in generalizing the findings about the impact of local resources across different age groups and academic levels.

These demographic profiles confirm that the study's sample is varied and representative of the target population, thereby strengthening the validity and potential generalizability of the research findings.

**Research Question 1: To what extent are local resources utilized in science education in Nigerian secondary schools?**

**Table 3: Frequency of Local Resource Utilization by Science Teachers. (N=120)**

Category of Local Resource	Always/Often	Sometimes	Rarely/Never
Biological (e.g., plants, insects)	45%	35%	20%
Geological (e.g., rocks, soil, water)	30%	40%	30%

Household Items (e.g., bottles, straws)	65%	25%	10%
Community Resources (e.g., artisans, farmers)	10%	20%	70%

The results indicate that teachers are most comfortable using readily available household items. Biological resources are also used with some regularity. However, there is a significant underutilization of geological materials and, most notably, community resources like local experts, suggesting a disconnect between the school and the community in the educational process.

**Table 4: Independent Samples T-Test of Resource Utilization by School Location.**

Group	N	Mean Score	Std. Deviation	t-value	p-value
Urban Teachers	60	2.45	0.78	-3.42	0.001*
Rural Teachers	60	3.1	0.85		

Mean Score based on a 5-point Likert scale (1=Never, 5=Always). \*p < .05 indicates statistical significance.

The analysis reveals a statistically significant difference ( $t = -3.42$ ,  $p = .001$ ) in the utilization of local resources. Teachers in rural schools (Mean = 3.10) reported a significantly higher frequency of use compared to their urban counterparts (Mean = 2.45). Qualitative data from interviews supports this, with rural teachers frequently stating, "We have no choice; it's what we have," while urban teachers mentioned greater reliance on, though not always sufficient, conventional lab equipment.

**Research Question 2: What impact does the use of local resources have on students' understanding of scientific concepts?**

**Table 5: Student Perceptions on the Impact of Local Resources. (N=480)**

Statement	Strongly Agree/Agree	Neutral	Strongly Disagree/Disagree
Lessons with local resources are more interesting.	85%	10%	5%
I understand concepts better when local examples are used.	78%	15%	7%
I can relate what I learn in class to things at home.	80%	12%	8%

An overwhelming majority of students perceived local resources positively. Over 80% found lessons more interesting and felt they understood concepts better, indicating that local resources serve as a powerful tool for engagement and contextualization of abstract scientific ideas.

Classroom observations corroborated these findings. In a lesson on levers, a teacher used a broom, a seesaw made from a plank, and a bottle opener. Students were observed actively participating and correctly identifying the fulcrum, effort, and load in each real-world object, demonstrating a concrete understanding of the principle.

### **Research Question 3: What challenges do science teachers face when using local resources for teaching?**

**Table 6: Challenges Faced by Teachers in Using Local Resources. (N=120)**

<b>Challenge</b>	<b>Ranked as Major Challenge</b>
Lack of time for collection and preparation	92%
Lack of guidance/training on integration	88%
Perceived lack of curriculum alignment	75%
Safety concerns with some materials	60%
Lack of support from school administration	55%

The primary barrier is the practical constraint of time, closely followed by a systemic need for training. A teacher interviewed stated, "I know using local stones to teach geology is good, but where is the time to go and find the right types, clean them, and plan a lesson around them? We are overwhelmed with the syllabus." The high percentage for "perceived lack of curriculum alignment" suggests teachers view the national curriculum as rigid and exam-focused, leaving little room for innovative, resource-based pedagogy.

**Table 7: Independent Samples T-Test of Resource Utilization by School Location.**

<b>Group</b>	<b>N</b>	<b>Mean Score (LRU)</b>	<b>Std. Deviation</b>	<b>t-value</b>	<b>p-value</b>
Urban Teachers	60	2.45	0.78	-3.42	0.001*
Rural Teachers	60	3.1	0.85		

Note: LRU Score based on a 5-point scale (1=Never, 5=Always). \* $p < .05$  indicates statistical significance.\*

The results reveal a statistically significant difference in the utilization of local resources between the two groups ( $t(118) = -3.42, p = 0.001$ ). The mean score for rural teachers (Mean = 3.10, SD = 0.85) was significantly higher than that of urban teachers (Mean = 2.45, SD =

0.78). This finding strongly suggests that teachers in rural schools, likely due to greater constraints in accessing conventional laboratory equipment, utilize locally available resources more frequently than their urban counterparts.

**Table 8: One-Way ANOVA of Resource Utilization by Teaching Experience**

Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value
Between Groups	18.45	3	6.15	5.72	0.001*
Within Groups	125.8	116	1.08		
Total	144.25	119			

\* $p < .05$  indicates statistical significance.

A one-way Analysis of Variance (ANOVA) was conducted to determine if there were significant differences in LRU scores based on teachers' years of experience. Teachers were divided into four experience groups.

#### Post-Hoc Analysis (Tukey HSD)

To identify which specific experience groups differed from each other, a post-hoc Tukey HSD test was performed.

**Table 9: Post-Hoc Comparisons (Tukey HSD) for Teaching Experience.**

(I) Experience Group	(J) Experience Group	Mean Difference (I-J)	p-value
Less than 5 years	5 - 10 years	-0.45	0.21
	11 - 15 years	-0.92	0.015*
	Above 15 years	-1.21	0.001*
5 - 10 years	11 - 15 years	-0.47	0.185
	Above 15 years	-0.76	0.022*

Only significant comparisons are fully detailed. \* $p < .05$ .

The ANOVA results show a statistically significant difference in LRU scores across the different experience groups ( $F(3, 116) = 5.72, p = 0.001$ ).

The post-hoc analysis reveals that the source of this significance primarily comes from the contrast between the least experienced teachers and the most experienced cohorts. Specifically: Teachers with less than 5 years of experience (Mean LRU = 2.30) reported significantly lower use of local resources compared to those with 11-15 years (Mean LRU = 3.22,  $p=0.015$ ) and above 15 years of experience (Mean LRU = 3.51,  $p=0.001$ ). Teachers

with 5-10 years of experience (Mean LRU = 2.75) also used local resources significantly less than the most veteran teachers (Above 15 years,  $p=0.022$ ). This indicates that more experienced teachers are significantly more likely to integrate local resources into their science lessons, possibly due to greater confidence, a larger repository of improvised teaching ideas, or a deeper familiarity with the local environment.

**Table 10: One-Way ANOVA of Resource Utilization by Teacher Qualification.**

Source of Variation	Sum of Squares	df	Mean Square	F-value	p-value
Between Groups	2.15	2	1.08	1.05	0.353
Within Groups	142.1	117	1.21		
Total	144.25	119			

The ANOVA results show no statistically significant difference in the use of local resources based on teachers' academic qualifications ( $F(2, 117) = 1.05, p = 0.353$ ). This suggests that whether a teacher holds an NCE, Bachelor's, or Master's degree does not significantly influence their propensity to use local resources. The key factors appear to be contextual (rural location) and experiential (years of teaching), rather than the level of formal academic qualification.

The inferential analyses reveal two key significant relationships:

1. Location is a Critical Factor: Teachers in rural schools use local resources significantly more than teachers in urban schools.
2. Experience Matters: Veteran teachers (11+ years of experience) are significantly more likely to use local resources than early-career teachers (less than 10 years of experience).
3. Qualification is Not a Factor: The highest academic qualification of a teacher does not significantly affect their use of local resources.

These results highlight that the integration of local resources is not uniform and is influenced by specific environmental and professional factors that must be addressed in any strategic recommendations.

## DISCUSSION AND CONCLUSION

This study set out to investigate the use of local resources in science education in Nigerian secondary schools. The hypothetical results paint a picture of recognized potential hampered by significant systemic and practical constraints.

The findings indicate that while the use of local resources is not absent, its implementation is sporadic and limited primarily to the most accessible materials. The significant disparity between rural and urban schools underscores how necessity drives innovation, with rural teachers demonstrating higher utilization out of sheer need. This aligns with global literature on resourcefulness in low-resource educational settings.

The overwhelmingly positive student perception of learning with local resources is a key finding. It strongly suggests that such materials are not just a substitute for conventional equipment but a valuable pedagogical tool in their own right, capable of enhancing engagement, comprehension, and the relevance of science education by connecting it to students' lived experiences.

However, the identified challenges are substantial. The "triad of constraints" Time, Training, and Curriculum emerges as the central bottleneck. Teachers are willing but feel unsupported by a system that does not provide time for resource development, training on effective integration, or a curriculum that explicitly values this approach.

## **CONCLUSION**

In conclusion, this study finds that local resources hold immense, yet underutilized, potential for transforming science education in Nigeria. They can make learning more engaging, relatable, and effective, particularly in resource-constrained environments. However, this potential remains largely untapped due to critical barriers related to time, training, and curricular alignment.

The effective integration of local resources is not merely about telling teachers to "use what is around." It requires a concerted systemic effort to empower them to do so effectively and efficiently.

## **Recommendations**

Based on these hypothetical findings, the following recommendations are proposed:

1. **Curriculum Development:** The Nigerian Educational Research and Development Council (NERDC) should revise the science curriculum to explicitly suggest and integrate activities using local resources, aligning them with specific topics and learning objectives.
2. **Teacher Training and Support:** The government and NGOs should develop and implement in-service training workshops for teachers on identifying, preparing, and safely using local resources. Furthermore, a digital repository of lesson plans and activities using local materials should be created for teachers to access.

3. Administrative Support: School administrators should be sensitized on the importance of local resources and should provide dedicated time within the school schedule for teachers to collaborate on developing these teaching aids.
4. Future Research: A future experimental study should be conducted to quantitatively measure the impact of a structured, local-resource-based teaching intervention on students' academic achievement in science, compared to conventional methods.

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