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Original Research Article

Teaching Science in Indigenous Languages: Evaluating Feasibility and Effectiveness in Nigerian Schools

Babangida Yusuf[1*], Hussaini Ibrahim Kaoje[2]

[1]Department of English and Literature, Federal University Gusau, Nigeria

***Corresponding Author:** Babangida Yusuf
Department of English and Literature, Federal University Gusau, Nigeria

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Abstract: This article explores the feasibility and effectiveness of using indigenous languages to teach science subjects in Nigerian junior and senior secondary schools. Guided by Cummins' Linguistic Interdependence Hypothesis, which posits that conceptual knowledge acquired in a first language can transfer to second language learning, the research investigates how mother-tongue instruction influences science comprehension. Both qualitative and quantitative methodologies were employed, including interviews with a selected number of teachers and students, focus group discussions, and classroom observations across linguistically diverse regions. Findings indicate that teaching science in indigenous languages enhances students' understanding, engagement, and participation by making abstract concepts more accessible. However, the study also identifies challenges, such as limited instructional resources and insufficient teacher training. The research concludes that while indigenous language instruction holds promise for improving science education, its success depends on policy support, curriculum development, and teacher capacity building.

Keywords: Indigenous Languages, Science Education, Nigerian Schools, Language Policy, Student Comprehension.

INTRODUCTION

Language plays a critical role in shaping students' access to knowledge, especially in content-heavy subjects like science. In Nigeria, English is the official language and the primary medium of instruction across all levels of education. While this policy aims to promote national unity and global competitiveness, it has also sparked considerable debate. Critics argue that relying heavily on English (a language that is not the mother tongue of the majority of students) can hinder effective learning, particularly in complex subjects such as science. As Sama & Sani (2018) there is argue, there is a deep connection between language and cognition. Many learners struggle with scientific vocabulary and abstract concepts when they are presented in a second language, which often results in poor comprehension and disengagement.

This issue is further compounded by the marginalisation of indigenous languages within the formal education system. Most teaching and learning materials are developed in English, and few resources exist for instruction in local languages. As a result, indigenous languages are rarely used in classroom settings, even though they may provide a more intuitive medium for learners to grasp difficult concepts.

This study investigates the feasibility and effectiveness of using indigenous languages to teach science subjects in junior and senior secondary schools in Nigeria. By drawing on Cummins' Linguistic Interdependence Hypothesis, which suggests that cognitive skills developed in a first language can support learning in a second, the research explores whether mother-tongue instruction in science can improve students' understanding and classroom participation. Through interviews, focus groups, and classroom observations, the study also seeks to uncover the practical challenges teachers and students face when implementing such an approach. In doing so, this research contributes to ongoing discussions about language policy, educational equity, and culturally responsive pedagogy in Nigeria.

Implications of Using a Second Language (L2) as the Medium of Instruction

The use of a second language (L2), such as English, as the medium of instruction in Nigerian schools has long been a subject of debate, especially in the context of science education. For many learners, English is not their first language (L1), and limited exposure to it can hinder their ability to grasp complex scientific concepts (Oyewo, 2015; Aremu, 2018). This challenge is compounded by the widespread underrepresentation of indigenous languages in the educational system, which restricts the development of students' L1 skills and potentially undermines academic performance (Nnodu & Owoaje, 2016).

Cummins' (1996) Interrelated Linguistic Hypothesis supports the importance of L1 in learning, arguing that proficiency in L1 can enhance the acquisition of L2. Thus, neglecting students' native languages may negatively impact their cognitive and academic development. Furthermore, the use of indigenous languages in education can promote cultural identity and pride, which has been linked to increased motivation, engagement, and academic success (Sani & Usman, 2018; Wright & Richardson, 2019; Sani & Abdullahi, 2020).

Despite these potential benefits, implementing indigenous languages in science education faces numerous challenges. Chief among these are a lack of teaching resources, limited teacher training, and insufficient institutional support (Adedapo, 2012). Although the Federal Ministry of Education has taken steps by developing science curricula in indigenous languages such as Hausa, Igbo, and Yoruba, the rollout has been limited and inconsistent (Onwuegbuzie & Udeaja, 2017). More investment is needed in training educators and producing instructional materials to make such initiatives viable on a national scale.

International examples offer valuable insights. In South Africa, the Indigenous Knowledge System Education (IKSE) project has successfully integrated indigenous languages and knowledge into science education, enhancing student outcomes (Stroud *et al.,* 2014). Similarly, New Zealand's Maori-medium education system has effectively promoted indigenous language use and cultural identity while achieving strong academic performance in science (Pihama & Bishop, 2016). These cases demonstrate that with a comprehensive and well-supported approach, encompassing curriculum development, teacher training, and community engagement, science education in indigenous languages can succeed.

In the Nigerian context, these findings suggest that teaching science in indigenous languages could offer several advantages:

a. It can increase student engagement and comprehension, as learners are more likely to understand content when taught in a familiar language. Studies in Southwest Nigeria have shown that students perform better in science when taught in Yoruba than in English (Oyewo, 2015).
b. It makes science education more culturally relevant, grounding scientific concepts in the lived experiences and knowledge systems of local communities.
c. It can foster a sense of cultural pride and identity, which contributes to learners' motivation and academic success, critical in post-colonial societies where indigenous languages and cultures have been historically marginalized.
d. Using indigenous languages in science education has the potential to challenge the linguistic dominance of English and promote a more inclusive and equitable education system. By validating local languages and cultures within academic spaces, Nigeria can work toward an educational model that truly reflects its linguistic and cultural diversity.

Flexibility and Effectiveness of Indigenous Languages in Accommodating English Scientific Terminologies: A Review

Many scholars such as Tsaure & Sani (2024) recognise the potential benefits of incorporating indigenous languages into the curriculum. Stroud and Spaull (2014) argue that Indigenous Knowledge Systems Education can promote academic achievement and cultural pride among students. In addition, other academics have advocated for the use of indigenous languages in science education. For instance, Adedapo (2012) argues that using indigenous languages in Nigerian schools can promote national unity and integration by affirming the value of diverse linguistic and cultural traditions.

Ogunniyi (2019) further emphasizes the importance of language policy in education planning, highlighting the potential of indigenous languages to promote educational equity and inclusion. Some attempts have been made in the past, particularly by some Yoruba scholars (Fafunwa, 1975; Alabi, 1976; Bangbose, 1984; Olanrewaju, 1988, 1991), to develop scientific terminologies in their native language through borrowing, coining, and changing the coverage of words, in addition to identifying some Yoruba words that can be effectively used in science.

Olanrewaju (1991) has also shown how expressions in Yoruba can be used to enhance the learning of science and technology in schools and other Nigerian languages as well, for the benefit of our pupils and students who are willing to study and understand science to boost technology. Tsaure & Sani (2016) have a similar view with regards to the Hausa

language, which they argue can answer the national question regarding the language policy. Savory (1967) presented a sample of comparative scientific nomenclature in some world languages and, in particular, our indigenous languages as modified with little changes by the researchers:

Table A: The Feasibility of Translating Scientific words of Elements into Nigerian Indigenous languages

English	Yoruba	Igbo	Hausa
Copper	Kupa	Kopa	Azirfa
Gold	Wura	Olaedo	Zinare
Iron	Irin	Igwe	Karfe
Lead	Leedi	Igwearo	Darma
Mercury	Kiwi	Makurdi	Zaiba
Silver	Fadaka	Olaocha	Tasa

Source: Savory (1967 p. 123)

It can be learned from the table above that, with adequate effort, English scientific terminologies can be interpreted into our native languages to ease the learning of science, rather than relying solely on English, which is a borrowed language.

Table B: The Feasibility of Translating Scientific Names of Compounds into Nigerian Indigenous languages

English	Yoruba	Igbo	Hausa
Chalk	Efun	Nzu	Alli
Clay	Amo	Uro	Laka
Glass	Diigi	Ugugo	Galabi
Marble	Mabu	Okwutene hulomma	
Salt	Iyo	Nnu	Gishiri
Vinegar	Finiga	Nsinwu	

Source: Savory (1967 p. 123)

The table above shows that our vernacular or indigenous languages are flexible enough to accommodate scientific terms from foreign languages.

Table C: The Feasibility of Translating Scientific words of Invertebrates into Nigerian Indigenous languages

English	Yoruba	Igbo	Hausa
Bee	Oyin	Anu	Zuma
Fly	Esinsin	Ijiji	Kuda
Snail	Igbin	Ejula	Dodonkodi
Spider	Alantakun	Ududo	Gizogizo
Wasp	Agbon	Ebu	Zanzaro
Ant	Era	Aruru	Tururuwa

Source: Savory (1967 p. 123)

Scientific terminologies from all sectors and sub-fields can be translated into African native languages for our students to understand science subjects and practice well for the progress of our nation in technology as indicated by the table above.

Table D: The Feasibility of Translating Scientific words of Vertebrates into Nigerian Indigenous languages

English	Yoruba	Igbo	Hausa
Cat	Ologbo	Nwaologbo	Kenwa
Dog	Aja	Nkita	Kare
Horse	Esin	Ehoro	Doki
Sheep	Agutan	Aturu	Tunkiya.

Source: Savory (1967 p. 123)

The tables listed above indicate that it is possible for many, if not all, scientific terminologies in foreign languages (including English) covering various sub-fields such as elements, compounds, invertebrates, vertebrates, among others, to have interpretations and equivalents in our native languages. Therefore, efforts should be made toward this goal for us to advance and progress in science and technology.

METHODOLOGY

To collect relevant and reliable data, a number of science teachers and students of science subjects were selected as a sample representing the larger population from three schools in Zamfara State, where the research took place: Al-Mufida International Academy, Gusau (co-educational), Government Day Secondary School, Samaru (boys only), and Government Girls Day Secondary School, Damba (girls only). Nine (9) science teachers, three from each school, and thirty (30) students, ten (10) from each of the selected schools, were interviewed. The interviews were conducted with the respondents regardless of their gender, ethnicity, or religious affiliation. The data obtained may also be applicable to other schools and regions of the nation.

The research uses focus groups with representatives from various stakeholder groups to explore the challenges and opportunities of using indigenous languages in science education. In addition, observations were made in science classrooms to assess the use of indigenous languages in teaching and learning, along with the analysis of relevant documents such as school policies and curriculum materials.

Data Presentation and Analysis

This section analyses the data obtained from the interviews conducted to both teachers and students of science education from the sample schools.

Section A: Interview for Teachers

Table 1: Challenges Faced by Teachers teaching Science Subjects in English

S/N	Responses	Respondents	Percentage
1	Difficulty in communication	05	55.5%
2	Limited understanding	04	44.4%
Total		**09**	**100%**

Table 1 illustrates that teachers face difficulties in communication, as well as limited understanding from their students, when using the English language to teach science lessons.

Table 2: Teachers Needs for Teaching Science Subjects

S/N	Responses	Respondents	Percentage
1	Provision of resources	04	44.4%
2	Training	05	55.5%
Total		**09**	**100%**

Table 2 indicates that teachers handling science subjects need the provision of necessary resources and adequate training to effectively teach these subjects.

Table 3: The Impact Teachers realize when teaching Science subjects Using Indigenous languages

S/N	Responses	Respondents	Percentage
1	Students' participation	03	33.3%
2	Good understanding of lessons	03	33.3%
3	Paying much attention	03	33.3%
Total		**09**	**100%**

Table 3 explicitly shows that teachers observe full student participation, good understanding of the lessons, and greater attention when students are taught in indigenous languages.

Table 4: Support teachers require for Effective Teaching of Science subjects in Indigenous languages

S/N	Responses	Respondents	Percentage
1	Provision of resources	04	44.4%
2	Adequate training	05	55.5%
Total		**09**	**100%**

Table 4 above explains that science subject teachers need support in the form of both materials and teacher training workshops to effectively teach science using indigenous languages.

Table 5: Teachers' opinions on Using Indigenous languages to teach Science subjects

S/N	**Responses**	**Respondents**	**Percentage**
1	It enhances students' learning	05	55.5%
2	It encourages teacher-student relationship	04	44.4%
Total		**09**	**100%**

Table 5 clearly shows that science teachers believe using indigenous languages to teach science subjects improves students' understanding of the lessons and strengthens the relationship between teachers and students.

Section B: Interview for Students

Table 6: Students' opinions on understanding science lessons Through English language

S/N	**Responses**	**Respondents**	**Percentage**
1	It is quite uneasy	10	33.3%
2	Difficult to understand the words	**20**	66.6%
Total		**30**	**100%**

Table 6 above illustrates that students in science classes find it difficult to understand English scientific terminologies, let alone the entire lessons.

Table 7: Students' Perceptions on the use of Indigenous languages in Science Education

S/N	**Responses**	**Respondents**	**Percentage**
1	More interesting	08	26.6%
2	Easier to understand	22	73.3%
Total		**30**	**100%**

Table 7 indicates that 26.6% of the total respondents are of the view that science lessons conducted in indigenous languages are more interesting to them than those in English, while 73.3% of the respondents find it easier to understand science lessons in their native languages.'

Table 8: Students' Participation in Discussions when taught in Indigenous languages

S/N	**Responses**	**Respondents**	**Percentage**
1	More encouraging	17	56.6%
2	More comfortable	13	43.3%
Total		**30**	**100%**

Table 8 above shows that students find it more comfortable and quite encouraging to participate in lessons and discussions with their science teachers when taught in indigenous languages.

Table 9: Students' opinions on their performances in Sciences when Taught in Indigenous languages

S/N	**Responses**	**Respondents**	**Perception**
1	Improves performance	23	76.6%
2	Adds teacher-student relationship	07	23.3%
Total		**30**	**100%**

About 76.6% of the respondents in the above table believe that science lessons in indigenous languages improve their performance, while the remaining 23.3% believe it enhances the teacher-student relationship.

Table 10: Students' Feelings while Interacting with Science Teachers using Indigenous languages

S/N	**Responses**	**Respondents**	**Percentage**
1	More relaxed	24	80%
2	Quite interesting	06	20%
Total		**30**	**100%**

Eighty percent (80%) of the respondents in the table above expressed that they feel more relaxed during science lessons conducted in indigenous languages, while the remaining twenty percent (20%) believe that it is more interesting to have science lessons in indigenous languages compared to English.

Summary of Major Findings

Teachers reported significant challenges in using English for science education, including communication barriers and limited comprehension among students. Many expressed interest in incorporating indigenous languages into science teaching, noting that it could enhance students' understanding, participation, and engagement. However, they also raised concerns about inadequate resources, lack of training, and possible resistance from parents and the wider community. Some teachers highlighted the importance of cultural relevance in science instruction, emphasizing the benefits of integrating indigenous knowledge systems and practices. Overall, teachers showed a strong desire for increased institutional support and access to materials that would enable them to teach science effectively using indigenous languages.

Students shared that they often struggle to understand science content when it is taught in English, especially scientific terms and abstract concepts. A large number expressed enthusiasm for the use of indigenous languages, stating that it would simplify learning and make them more confident and comfortable in the classroom. Those who spoke indigenous languages as their mother tongue felt more engaged and reported improved communication with their teachers when these languages were used. Additionally, students believed that incorporating cultural and traditional knowledge alongside indigenous languages could enrich science education, making it more relatable and strengthening their grasp of scientific ideas.

Recommendations

Based on the findings of this study and their wider relevance to language policy and educational equity in Nigeria, the following recommendations are made:

a. Policy Development: Policymakers should prioritise the integration of indigenous languages into science education through the creation of relevant resources, curricula, and teacher training programs.
b. Community Engagement: Communities should be actively involved in promoting indigenous languages by supporting language learning at home and advocating for linguistic diversity in schools.
c. Collaborative Partnerships: Educational authorities should explore partnerships with international organizations and academic institutions to share best practices and gain insights into effective models for using indigenous languages in science education.
d. Ongoing Research: Continued research is essential to understand the long-term effects of using indigenous languages in science education, particularly regarding student achievement, engagement, and retention.
e. Innovative Teaching Practices: Teachers should be encouraged to experiment with innovative strategies that incorporate indigenous languages into science lessons, including the integration of traditional knowledge and culturally relevant practices.

CONCLUSION

Based on the findings from teacher and student interviews, it is evident that the use of indigenous languages in science education in Nigeria has the potential to enhance student understanding and participation, while also fostering cultural pride and identity. However, successful implementation of this approach requires careful attention to resource availability, teacher training, and stakeholder attitudes to support effective instruction.

The study suggests that incorporating indigenous languages into science education could be a meaningful step toward creating a more inclusive and culturally relevant education system that reflects Nigeria's rich linguistic and cultural diversity. Beyond these specific findings, the broader implications point to the need for systemic changes in language policy and educational equity.

As a post-colonial nation, Nigeria continues to grapple with the enduring influence of colonialism in its education system, particularly the dominance of the English language and Western knowledge paradigms. Promoting the use of indigenous languages in science education represents a critical move toward decolonizing the education system and fostering a more equitable and inclusive learning environment.

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