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Methods Of Teaching Science In Primary School

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ABSTRACT
This study critically examines the methods and materials used in teaching science at the primary school level, with specific reference to schools in Ughelli South Local Government Area, Delta State, Nigeria. The paper evaluates the efficacy of various teaching strategies and instructional resources and analyses their impact on student comprehension and engagement. Using descriptive statistics and thematic analysis, the study reveals that inquiry-based and activity based learning methods, when supported by adequate instructional materials, significantly enhance learning outcomes. The paper concludes with recommendations to improve primary science education, suggesting systematic investment in training, resources, and curriculum reform.
Keywords: Primary Science Education, Teaching Methods, Instructional Materials, Inquiry-Based Learning, Activity-Based Learning, Pedagogy

INTRODUCTION

Science education plays a crucial role in shaping the intellectual and technological advancement of any nation. It serves as a cornerstone for developing scientific literacy, promoting innovation, and cultivating critical thinking and problem-solving abilities among learners (Achor et al., 2020). In primary education, science acts as a vehicle through which young learners are introduced to systematic inquiry, experimentation, and evidence-based reasoning. This foundational level of education is critical because it not only establishes early interest and curiosity about the natural world but also forms the bedrock upon which further scientific learning is built (Osuafor & Okonkwo, 2022). It is at this stage that learners begin to form attitudes toward science, which can have lasting implications for their future academic and career pursuits.

In the global context, primary science education is increasingly recognized for its role in equipping future citizens with competencies to engage with scientific issues and contribute meaningfully to societal development. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2021), early exposure to science improves students' problem-solving skills, encourages lifelong learning, and enhances their capacity to engage in informed decision-making. Developed nations have capitalized on these insights by reforming curricula, investing in teacher training, and integrating modern teaching tools to enhance science learning from the earliest stages. In contrast, many developing countries, including Nigeria, face persistent challenges that undermine the quality and effectiveness of science education at the foundational level (Okafor & Emeka, 2021).

In Nigeria, the educational system is structured into six years of primary education, followed by six years of secondary education and four years of tertiary education. The National Policy on Education recognizes science and technology as indispensable tools for national development and mandates the inclusion of science subjects in the primary school curriculum (Federal Ministry of Education [FME], 2020).

However, despite policy recognition, the implementation of effective science education at the primary level remains fraught with challenges. These challenges are particularly pronounced in marginalized and under-resourced areas such as the Ughelli South Local Government Area, Delta State, Nigeria.

Ughelli South Local Government Area, Delta State, Nigeria located in the oil-rich Niger Delta region, represents a microcosm of the systemic issues affecting science education in many parts of Nigeria. Despite the region's economic potential, its educational institutions often suffer from neglect, poor infrastructure and adequate funding. Many primary schools in Warri lack basic laboratory facilities, teaching aids, and adequately trained science teachers (Ezeudu et al., 2021) These deficiencies are compounded by outdated pedagogical practices that fail to engage learners or develop their scientific skills meaningfully. As a result, students are frequently exposed to rote memorization and teacher-centered instruction, rather than inquiry-based and learner-centered methodologies that have been shown to enhance science learning outcomes (Oguniyi et al., 2029).

Science education at the primary level should not be viewed in isolation from the broader socio-cultural and political context in which it occurs. Factors such as community attitudes towards science, language of instruction, government policies, and stakeholder involvement all influence how science is perceived and taught in schools. In the Niger Delta, environmental degradation, political instability, and socio-economic tensions often overshadow educational priorities. The contextual realities must be considered in efforts to reform science teaching practices in Ughelli South Local Government Area, Delta State, Nigeria. Given this complex background, the present study aims to examine the teaching of science at the primary school level in Ughelli South Local Government Area, Delta State, Nigeria. Specifically, it explores the extent to which current teaching methods and instructional materials align with established pedagogical standards and best practices in science education. The study also investigate the challenges faced by teachers and schools in delivering effective science instruction, as well as the potential opportunities for improvement.

Science education at the primary level serves as a critical determinant of a nation's scientific and technological future. While the Nigerian government has made commendable efforts to integrate science into the primary curriculum, significant gaps remain in the implementation process, particularly in marginalized areas like Ughelli South Local Government Area, Delta State, Nigeria. These gaps manifest in poor teaching methods, inadequate instructional materials, and insufficient teacher training all of which compromise students' learning experiences and outcomes. By examining these issues through the lens of pedagogical alignment, this paper seeks to provide evidence based recommendations for improving science education in the region and fostering a generation of scientifically literate and empowered citizens.

Statement of the Problem

Although the primary school curriculum in Nigeria underscores the importance of science education, pupils in the Ughelli South Local Government Area, Delta State, Nigeria continue to demonstrate low achievement levels and limited in science-related subjects. This persistent underperformance is attributed to a combination of interrelated challenges, including the widespread use of ineffective teaching methodologies, inadequate availability and utilization of instructional materials, overcrowded classrooms, and a general lack of continuous professional development for teachers. These systematic issues have undermined the delivery of quality science education, impeding the development of scientific literacy and critical thinking skills among learners in the region. As a result, there is an urgent need to investigate how these factors interact to affect science teaching and learning outcomes at the primary school level in Ughelli South Local Government Area, Delta State, Nigeria.

Objectives of the Study

1. To identify the teaching methods used in primary science education in Ughelli South Local Government Area, Delta State, Nigeria.
2. To examine the instructional materials available and their usage
3. To evaluate the effectiveness of these methods and materials in enhancing student learning outcomes.

Research Questions

1. What methods are commonly used to teach science in primary schools in Ughelli South Local Government Area, Delta State, Nigeria.
2. What instructional materials are available, and how are they utilized?
3. How effective are these methods and materials in improving students' science learning outcomes?

Hypotheses

Ho_1 (Null Hypothesis): There is no significant difference in the teaching methods commonly used for science instruction in primary schools in Ughelli South Local Government Area, Delta State, Nigeria.

Ho_2: The availability and utilization of instructional materials do not significantly influence the teaching of science in primary schools in Ughelli South Local Government Area, Delta State, Nigeria.

Ho3: There is no significant relationship between the teaching methods and instructional materials used and students' learning outcomes in science.

METHODOLOGY

Research Design

This study adopted a descriptive survey research design, which is appropriate for gathering detailed information on current practices, conditions, and perceptions related to the teaching of science in primary schools. The design facilitated the collection of both quantitative and qualitative data to examine teaching methods, the use of instructional materials, and their impact on student learning outcomes.

Population

The target population for this study comprised all primary schools located within Ughelli South Local Government Area, Delta State, Nigeria. This included both public and private institutions, along with their respective science teachers and pupils.

Sample Size and Sampling Technique

A sample of 60 primary school students and 15 science teachers was drawn from 10 randomly selected public and private schools across the constituency. The schools were selected through stratified random sampling to ensure proportional representation of school types, while the participants (students and teachers) were selected using simple random sampling techniques to reduce bias.

Instruments for Data Collection

The primary instrument (1) Okwagbe Primary School, Okwagbe (2) Etako Primary School, Okpara (3) Ophorighala Primary School, Ophorigbala were employed to gather data for this study.

- **Structured Questionnaires:** Separate sets of questionnaires were administered to both teachers and students to gather quantitative data on instructional practices and perceptions.

Data Analysis Techniques

Quantitative data obtained from the questionnaires were analyzed using descriptive statistical tools, including frequency counts. The techniques helped identify common trends and practices among respondents.

RESULTS

Table 1: Teaching Methods used in Primary Science Classes (N = 15 Teachers)

Method	Frequency	Percentage
Lecture method	10	66.7%
Activity-Based Learning	6	40.0%
Inquiry-Based Learning	5	33.3%
Demonstration	7	46.7%
Use of ICT	2	13.3%

Table 1 presents the distribution of teaching methods employed by primary school science teachers in Ughelli South Local Government Area, Delta State, Nigeria. The data reveals a strong reliance on the

lecture method, which was reported by 10 out of the 15 teachers, representing 66.7% of the sample. This indicates that a traditional, teacher-centered approach dominates science instruction in the region. While this method is efficient for covering curriculum content, it often limits student engagement, critical thinking, and hands-on learning skills essential for effective science education (Abonyi et al., 2020).

On the other hand, demonstration was reported by 46.7% of the teachers (7 respondents). Although this method provides visual and practical explanations of scientific concepts, the frequency of use suggests it is supplementary rather than a core instructional strategy. Demonstrations are effective in simplifying complex ideas and enhancing retention, but their full benefits are only realized when used interactively rather than passively (Ezeudu & Obi, 2019).

Activity-based learning, which encourages learners to participate in hands-on tasks and real-life applications, was utilized by 40% of the respondents (6 teachers). This method aligns with contemporary constructivist pedagogies that promote student involvement, yet its relatively low usage indicates a missed opportunity for engaging pupils in experiential learning. The low adoption may stem from resource constraints or lack of training in implementing learner-centered strategies effectively.

Inquiry-based learning, cited by only 33.3% of teachers (5 respondents), is another learner-centered approach that involves students in the process of scientific questioning and problem-solving. Its limited use reflects a gap in the implementation of modern pedagogical best practices. Inquiry-based methods have been shown to foster deeper understanding and critical thinking skills among learners to integrate this approach more widely.

Notably, the use of Information and Communication Technology (ICT) in science teaching was reported by only 13.3% (2 teachers). This figure highlights a significant underutilization of digital tools in primary science education, despite global trends emphasizing technology integration in classrooms. This limited ICT adoption may be attributed to inadequate infrastructure, limited access to digital devices, or insufficient teacher training in ICT-based instruction (Okonkwo et al., 2022). Considering the transformative potential of ICT in making science lessons more interactive and accessible, this trend is a cause for concern.

Overall, the findings suggest that while some progressive methods such as demonstration and activity-based learning are in use, the predominant reliance on traditional lecturing indicates lag in pedagogical innovation. The data underscores the urgent need for teacher training, resource provision, and policy reforms that promote active, inquiry-driven, and technologically-supported science instruction at the primary school level.

Table 2: Availability of Instructional Materials (N = 10 Schools) Material

Method	Frequency	Percentage
Textbooks and workbooks	10	100%
Visual aids	6	60%
Science lab equipment	3	30%
ICT tools, (tablets, TVs)	2	20%
Improvised materials	7	70%

Table 2 presents data on the availability of various instructional materials in ten primary schools within Ughelli South Local Government Area, Delta State, Nigeria. The findings highlights significant disparities in the provision of essential teaching resources, which have direct implications for the quality of science education delivered in these schools. All surveyed schools reported the availability of textbooks and workbooks, indicating a universal provision of basic print resources for science instruction. While this is a positive finding, reliance solely on textbooks may limit the scope of learning as effective science education often requires interactive and practical experiences beyond textual materials.

Visual aids were available in 60% of the schools. These tools, such as charts, diagrams, and models, play a crucial role in enhancing students' understanding by providing concrete representations of abstract scientific concepts. The absence of visual aids in 40% of the schools suggests that a significant number of students may be deprived of these beneficial learning tools, potentially hindering their comprehension and retention of scientific information. Only 30% of the schools had access to science laboratory equipment.

The lack of laboratory facilities severely restricts opportunities for hands-on experimentation, which is essential for fostering scientific inquiry and critical thinking skills among students. This deficiency may contribute to students' limited practical understanding of scientific principles and processes. A mere 20% of the schools reported having Information and Communication Technology (ICT) tools, such as tablets and televisions. The integration of ICT in education has been shown to enhance learning by providing interactive and engaging content. The minimal presence of ICT tools indicates a significant gap in leveraging technology to support science education, which could affect students' digital literacy and their ability to access diverse learning resources. Improvised materials were available in 70% of the schools, reflecting teachers' efforts to create teaching aids using locally available resources. While improvisation demonstrates resourcefulness and adaptability, it also underscores the inadequacy of standard instructional materials. Dependence on improvised tools may lead to inconsistencies in the quality and effectiveness of science instruction across different schools.

CONCLUSION

Teaching methods and instructional materials in primary science classrooms in Ughelli South Local Government Area, Delta State, Nigeria remains inadequate. While teachers show willingness to adopt learner-centered approaches, lack of training and resources hinder full implementation. For science education to be effective, both innovative pedagogy and sufficient material support are necessary.

RECOMMENDATIONS

1. Organize workshops for teachers on inquiry-based and activity-driven science teaching.
2. Improve school funding to support procurement of science kits and ICT tools.
3. Encourage the development and use of improvised local materials.
4. Reduce class sizes to allow interactive teaching.
5. Establish science corners or mini-labs in all primary schools.

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