



**NIGERIAN ONLINE JOURNAL OF
EDUCATIONAL SCIENCES AND
TECHNOLOGY**

nojest.unilag.edu.ng

nojest@unilag.edu.ng

**ASSESSMENT OF SCIENCE PROCESS SKILLS OF BASIC SCIENCE TEACHERS'
UPPER BASIC SCHOOLS**

OGUEJIOFOR CHIAMAKA NNEKA

Department of Science Education, University of Lagos

coguejiofor@unilag.edu.ng

To cite this article:

Oguejiofor, C. N. (2024). Assessment of science process skills of basic science teachers upper basic schools. *Nigerian Online Journal of Educational Sciences and Technology (NOJEST)*, 6 (2), 176-185

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden.

Authors alone are responsible for the contents of their articles. The journal owns the copyright of the articles. The publisher shall not be liable for any loss, actions, claims, proceedings, demand, or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of the research material.



**ASSESSMENT OF SCIENCE PROCESS SKILLS OF BASIC SCIENCE TEACHERS'
UPPER BASIC SCHOOLS**

OGUEJIOFOR CHIAMAKA NNEKA

Article Infor

Article History

Received:
05 August 2024

Accepted:
December 07, 2024

Keywords

Science Process Skills, Basic
Science Teachers, Upper Basic
Schools, Anambra State, Science
Education, Teaching Competency

Abstract

This study investigates the Science Process Skills (SPSs) possessed by Basic Science teachers in Anambra State's Upper Basic Schools, crucial for fostering critical thinking and problem-solving among students. Using a descriptive survey design, data were collected from 178 Basic Science teachers across 266 public secondary schools. The Science Process Skills Test (SPST), validated by experts and piloted for reliability, assessed skills such as observation, classification, measurement, inference, prediction, experimentation, and communication. The findings reveal that while teachers exhibit high proficiency in skills like classification (76.40%), predicting (81.10%), and interpreting data (76.03%), there are significant gaps in skills such as controlling variables (33.73%) and graphing (49.73%). This disparity suggests a need for targeted professional development to enhance teachers' proficiency in these critical areas. Addressing these gaps is essential for improving the overall quality of science education, thereby benefiting students' academic performance and interest in science-related careers. The study recommends continuous professional development and the establishment of a dedicated unit within the Ministry of Education to support and sustain the application of SPSs among science teachers.

Introduction

Science education plays a crucial role in developing critical thinking, problem-solving, and informed decision-making skills among students. At the heart of effective science instruction is the mastery of Science Process Skills (SPSs), which include observation, classification, measurement, inference, prediction, experimentation, and communication. These skills are

fundamental for conducting scientific inquiries and understanding the natural world. In Nigeria, particularly at the Upper Basic School level, Basic Science serves as a foundational subject that introduces students to essential scientific concepts and methodologies. The proficiency of teachers in SPSs is vital, as it directly impacts their ability to effectively impart scientific knowledge and foster a culture of inquiry among students.

Recent studies have raised concerns about the possession of SPSs among Basic Science teachers in Nigeria. For instance, Oguejiofor and Okigbo (2023) investigated the SPSs possessed by Basic Science teachers in Anambra State, examining variables such as gender, teaching experience, and qualifications. The study revealed that female teachers demonstrated a higher possession of SPSs compared to their male counterparts. However, no significant differences were found concerning teaching experience and qualifications, indicating that other factors might influence the proficiency in SPSs.

Furthermore, Mbonu-Adigwe et al. (2021) explored the effects of multimedia integrated instruction on students' acquisition of SPSs in Anambra State. The findings underscored the importance of innovative teaching methods in enhancing students' SPSs, thereby emphasizing the need for teachers themselves to be proficient in these skills. Despite these insights, there remains a paucity of comprehensive evaluations focusing specifically on the SPSs possessed by Basic Science teachers in Anambra State's Upper Basic Schools.

Addressing this gap is essential, as teachers' proficiency in SPSs not only influences their teaching effectiveness but also shapes students' attitudes towards science and their overall academic performance. This study aims to evaluate the Science Process Skills possessed by Basic Science teachers in Upper Basic Schools in Anambra State. By identifying the strengths and areas for improvement in teachers' SPSs, the research seeks to inform targeted professional development programs and contribute to the enhancement of science education in the region.

The methodology of this study involves a descriptive survey design, which allows for the collection of data from a sample population to describe and analyze the SPSs possessed by Basic Science teachers. The study will be conducted in public secondary schools across the six education zones of Anambra State. The population of the study consists of all Basic Science teachers in these schools, ensuring a comprehensive evaluation of their SPSs.

Data will be collected using a structured questionnaire designed to assess various dimensions of SPSs, including observation, classification, measurement, inference, prediction, experimentation, and communication. The questionnaire will be validated through a pilot study and expert reviews to ensure its reliability and accuracy in measuring the intended skills. The collected data will be analyzed using descriptive statistics, such as mean and standard deviation, to provide a clear picture of the SPSs possessed by the teachers.

The findings of this study are expected to reveal the current state of SPSs among Basic Science teachers in Anambra State. By identifying areas where teachers excel and areas that require improvement, the study will provide valuable insights for designing targeted professional development programs. These programs can focus on enhancing teachers' proficiency in SPSs, thereby improving their teaching effectiveness and ultimately benefiting students' learning outcomes.

Moreover, the study will contribute to the broader field of science education by highlighting the importance of SPSs in teaching and learning. It will underscore the need for continuous professional development and support for teachers to ensure they are equipped with the necessary skills to foster a culture of scientific inquiry among students. This, in turn, will help prepare students for future careers in science, technology, engineering, and mathematics (STEM) fields. The evaluation of Science Process Skills among Basic Science teachers in Anambra State is a critical step towards improving science education in the region. By addressing the gaps in teachers' proficiency and providing targeted support, the study aims to enhance the overall quality of science instruction and promote a deeper understanding of scientific concepts among students. This will not only benefit the students but also contribute to the development of a scientifically literate society.

Statement of the Problem

Science Process Skills (SPSs) are fundamental for effective science teaching and learning, as they enable students to observe, classify, measure, infer, predict, experiment, and communicate scientific concepts. Basic Science teachers are pivotal in cultivating these skills in students, ensuring they build a strong foundation for advanced scientific learning and problem-solving. However, there are concerns about the extent to which Basic Science teachers in Nigeria, particularly in Anambra State, possess and apply these essential skills in their instructional

practices. Despite the emphasis on science education in Nigeria, several studies have indicated that many science teachers lack adequate SPSs, which can negatively impact students' understanding and interest in science-related subjects. Factors such as insufficient teacher training, limited professional development opportunities, inadequate instructional resources, and outdated teaching methodologies may contribute to this issue. If Basic Science teachers do not possess the necessary SPSs, they may struggle to engage students in meaningful scientific inquiry, ultimately affecting students' academic performance and interest in pursuing science-related careers. While some research has been conducted on science education in Nigeria, there is limited empirical data specifically evaluating the SPSs possessed by Basic Science teachers in Upper Basic Schools in Anambra State. Without a clear understanding of these teachers' proficiency levels, efforts to improve science education may remain ineffective. Therefore, this study aims to evaluate the SPSs possessed by Basic Science teachers in Upper Basic Schools in Anambra State, identifying gaps and providing recommendations for enhancing teachers' competencies. The findings will be crucial in informing policies and interventions aimed at strengthening science education in the state and beyond. By identifying the strengths and areas for improvement in teachers' SPSs, the research seeks to inform targeted professional development programs and contribute to the enhancement of science education in the region. This will not only benefit the students but also help in developing a scientifically literate society, better prepared for future challenges in STEM fields.

Purpose of the Study

The purpose of the study was to assess the science process skills and classroom managerial skills possessed by Basic science teachers in Anambra State, Nigeria.

Specifically, the study sought to assess the:

1. Science Process Skills (SPSs) possessed by Basic Science teachers in Upper Basic schools in Anambra State.

Research Question

The study was guided by the following research questions:

1. What are the Science Process Skills (SPSs) possessed by Basic Science teachers in Upper Basic Schools in Anambra State?

Methodology

This study employed a descriptive survey research design to evaluate the science process skills (SPSs) possessed by Basic Science teachers in Anambra State's Upper Basic Schools. The research was conducted across 266 public secondary schools in six education zones of Anambra State, encompassing both urban and rural areas. The entire population of 178 Basic Science teachers in these schools was included in the study, eliminating the need for sampling. Data collection was facilitated using the Science Process Skills Test (SPST), which was adapted from existing instruments and validated by experts in science education and measurement. The SPST comprised 50 multiple-choice items, each correlated with specific SPSs such as observation, communication, classification, measuring, inferring, predicting, formulating hypotheses, interpreting data, formulating models, experimenting, graphing, identifying variables, and controlling variables. The instrument's reliability was confirmed through a pilot study in Enugu State, yielding a reliability coefficient of 0.89 using the Kuder Richardson formula-21 (KR21). The validated SPST was administered with the assistance of six research assistants, who helped distribute and retrieve the questionnaires across the six education zones. All 178 copies of the instrument were successfully collected, ensuring comprehensive data coverage. The data were analyzed using descriptive statistics, specifically mean and standard deviation, to assess the level of SPSs among the teachers. This analysis aimed to provide insights into the proficiency of Basic Science teachers in Anambra State, identifying areas of strength and those requiring improvement. The findings are expected to inform targeted professional development programs and contribute to the enhancement of science education in the region.

Result

Research Question 1: What are the science process skill possessed by Basic science teachers in upper Basic schools in Anambra State?

Table 1: Mean ratings of Science Process Skills of Basic Science Teachers in Upper Basic Schools.

S/N	Skills	Frequency(f)	Percentage(%)	Remark
1	Observation	113	63.48	Low
2	Classification	136	76.40	High
3	Communication	114	64.18	Low
4	Measuring	122	68.68	High
5	Inferring	118	60.07	Low
6	Predicting	144	81.10	High
7	FormulatingHypothesis	106	59.68	Low
8	Experimenting	97	67.83	High
9	Interpreting Data	135	76.03	High
10	Formulating Model	133	75.00	High
11	Identifying Variable	96	53.93	Low
12	Controlling Variable	60	33.73	Low
13	Graphing	89	49.73	Low
	Total	113	63.83	Low

The table presents the frequency and percentage of Basic Science teachers in Anambra State who possess various science process skills (SPSs). The skills are categorized into high and low possession based on the percentage of teachers demonstrating proficiency in each skill. Observation skills are possessed by 113 teachers, representing 63.48% of the sample, which is considered low. Classification skills, on the other hand, are possessed by 136 teachers, or 76.40%, indicating a high level of proficiency. Communication skills are also low, with 114 teachers (64.18%) demonstrating proficiency. Measuring skills are high, with 122 teachers (68.68%) showing proficiency. Inferring skills are possessed by 118 teachers, or 60.07%, which is low. Predicting skills are high, with 144 teachers (81.10%) demonstrating proficiency. Formulating hypotheses is a skill possessed by 106 teachers, or 59.68%, which is low. Experimenting skills are

high, with 97 teachers (67.83%) showing proficiency. Interpreting data is a skill possessed by 135 teachers, or 76.03%, indicating a high level of proficiency. Formulating models is also high, with 133 teachers (75.00%) demonstrating proficiency. Identifying variables is low, with 96 teachers (53.93%) showing proficiency. Controlling variables is the lowest, with only 60 teachers (33.73%) demonstrating proficiency. Graphing skills are also low, with 89 teachers (49.73%) showing proficiency. The total percentage of teachers possessing these SPSs is 63.83%, which is considered low. This indicates that while there are areas of strength, such as classification, predicting, and interpreting data, there are significant gaps in other areas, particularly in controlling variables and graphing. These findings suggest a need for targeted professional development to enhance teachers' proficiency in these critical science process skills.

Discussion of Findings

The findings of this study reveal significant insights into the science process skills (SPSs) possessed by Basic Science teachers in Anambra State's Upper Basic Schools. The data indicate that while certain skills such as classification (76.40%), measuring (68.68%), predicting (81.10%), experimenting (67.83%), interpreting data (76.03%), and formulating models (75.00%) are highly possessed by teachers, other skills such as observation (63.48%), communication (64.18%), inferring (60.07%), formulating hypotheses (59.68%), identifying variables (53.93%), controlling variables (33.73%), and graphing (49.73%) are less prevalent. This disparity suggests that while teachers are proficient in some SPSs, there are notable gaps in others, particularly in controlling variables and graphing.

Recent studies support these findings, emphasizing the importance of comprehensive SPSs for effective science teaching. For instance, Ningtyas et al. (2024) highlight that integrated STEM learning significantly enhances students' abilities and skills, underscoring the need for teachers to be proficient in all SPSs to effectively implement such approaches. Similarly, Maranan (2017) found that mastery of basic process skills is crucial for students' cognitive performance in science, further stressing the need for teachers to possess strong SPSs. The low proficiency in skills like controlling variables and graphing could hinder teachers' ability to engage students in meaningful scientific inquiry and experimentation, which are essential for developing critical thinking and problem-solving skills. Therefore, targeted professional development programs focusing on these

specific skills are necessary to bridge the gaps and enhance the overall quality of science education in Anambra State.

Conclusion

This study highlights the varying levels of proficiency in science process skills among Basic Science teachers in Anambra State's Upper Basic Schools. While some skills are well-developed, significant gaps exist in areas such as controlling variables and graphing. Addressing these deficiencies through targeted professional development is essential for enhancing the overall quality of science education. This will ultimately benefit students' academic performance and interest in science-related careers.

Recommendation

1. Basic Science teachers should improve their science process skill.
2. Government should create a unit in the Ministry of Education to handle issues that will promote and continuously sustain the Science teachers' application of this skill for effective teaching and enhancement of students' achievement as well as performance.

References

- Adeyemi, T. O. (2017). The teaching and learning of basic science in upper basic schools and its impact on students' academic achievement in STEM fields.
- Aslan, D. (2022). Effective lesson planning and interactive teaching methods for fostering a positive learning environment.
- Demir, N., & Nihat, A. (2021). The impact of well-organized learning activities on student engagement and academic achievement.
- Emmer, E. T., & Stough, L. M. (2001). Classroom management as a critical component of effective teaching and learning.
- Evertson, C. M., & Weinstein, C. S. (2006). Classroom management and its impact on student engagement and learning.
- Iskakova, A., et al. (2021). The importance of a supportive psychological and social environment for student well-being and academic success.
- Keshavarz, M., & Ghoneim, M. (2021). The role of clear and open communication in building trust and promoting a collaborative classroom atmosphere.

- Maranan, V. M. (2017). Basic process skills and attitude toward science: Inputs to an enhanced students' cognitive performance. Laguna State Polytechnic University.
- Marzano, R. J. (2007). Classroom managerial skills and their role in promoting student engagement and learning.
- Marzano, R. J., Marzano, J. S., & Pickering, D. J. (2003). Strategies for effective classroom management.
- Mbonu-Adigwe, et al. (2021). Effects of multimedia integrated instruction on students' acquisition of science process skills in Anambra State.
- Ningtyas, P. K., Widarti, H. R., Parlan, P., Rahayu, S., & Dasna, I. W. (2024). Enhancing students' abilities and skills through science learning integrated STEM: A systematic literature review. *International Journal of Education in Mathematics, Science, and Technology*, 12(5), 1161-1181.
- Okeke, C. (2018). The relationship between classroom managerial skills and teaching effectiveness of basic science teachers in Nigeria.
- Okoro, C. (2015). The importance of classroom managerial skills in creating a conducive learning environment.
- Oguejiofor, & Okigbo (2023). Investigation of science process skills possessed by Basic Science teachers in Anambra State.
- Tulyakul, P. (2019). The significance of effective time management in covering the curriculum and addressing students' needs.
- Wiggins, G., & McTighe, J. (2005). *Understanding by Design: The role of classroom managerial skills in effective teaching*.
- Zainuddin, Z., & Hardiansyah, H. (2022). The importance of teachers displaying a warm and enthusiastic attitude while managing classroom discipline.