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Evaluation of the Basic Science Curriculum at Basic Education in the North East, Nigeria

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Abstract
The study evaluates the Basic Science Curriculum at Basic Education within the North East, Nigeria. It posed two research questions and two hypotheses. The research used a descriptive survey research design, targeting a population of 146 Junior Secondary Schools, 105 teachers, and 10,157 students, with a sample size of 286 teachers and students. Data was collected by the use of a questionnaire for teachers and students titled "Basic Science Curriculum for Junior Secondary School (BSCJSS)". The instrument was validated by experts and pilot tested on a group of students and teachers. Reliability analysis showed a value of 0.87. Data analysis tool were mean, standard deviation, t-test and one-way ANOVA statistics. Findings indicated a significant achievement of basic science curriculum objectives at upper Basic Education Level (junior secondary schools) in the North East, Nigeria, yet it revealed deficiencies in some instructional materials which may likely impact students' interest. Hypotheses testing showed no significant differences in mean scores of students' performance. Recommendations made included providing adequate instructional materials, employment of qualified teachers, workshops and conferences for teachers on the implementation of effective teaching strategies to enhance students' performance toward achieving designed objectives.

Keywords: Curriculum, Basic Science Curriculum, Basic Education Level, Junior Secondary Schools, Instructional Materials

Introduction

There is no doubt even those that are not highly educated have agreed that education is the only key to success. Federal Republic of Nigeria (FRN, 2014) states that education is the key to civilization and human growth, as it can raise people out of poverty, intellectual and technological obscurity. It is acknowledged as a basic right for each and every child, vital to the acquisition of the knowledge, abilities, and attitudes required to make a contribution to society. Education provides a pathway for children to develop skills essential for exploring various professions, involving structured learning about the physical world and systematic inquiry into natural phenomena (Chukwunta, 2016).

It is commonly recognized that science and technology play a crucial role in national development, with their proficiency being vital for societal progress (Tabitha, Juliana & Haruna 2020). Science education comprises two essential components: scientific content and processes, with the quality of education in these fields being crucial for societal advancement (Chukwunta, 2016).

The concept of curriculum lacks a universally accepted definition, yet meaningful interpretations encapsulate its purpose and intended outcomes. Curriculum refers to the totality of student experiences that occur in the educational process. It includes the planned interaction of pupils with instructional content, materials, resources, and processes for evaluating the attainment of educational objectives (Kelly, 2019). Also, Foshay in Usman (2019) defined curriculum as 'all the experiences a learner has under the guidance of the school.' Although, for Oliva (2019), curriculum is defined as 'the planned sequence of learning experiences and intended outcomes, structured to foster the learner's continuous development in both personal and social competencies within the educational environment. In John Franklin Bobbitt's seminal work in 1918 as cited in Lui, 2017, he defines curriculum as a series of activities and experiences that children and youth must

undergo to develop the abilities essential for adult life, thereby emphasizing the role of schools as societal agents of socialization.

However, Bobbitt's definition focuses solely on children and youth, overlooking the broader scope of curriculum concerns, which extend to learners in adult literacy programmes, colleges, polytechnics, and universities. Furthermore, Bobbitt ignores the dynamic character of society and the changing goal of curriculum design by framing education in terms of things that make up adult life. The Federal Government of Nigeria (FRN, 2014) puts curriculum as a tool in the hands of the artist (teacher) to mold his or her material (pupils) according to his or her ideas (objects) in his or her studio (school). It is the curriculum through which the general aims of a school education receive concrete expression. The curriculum is, therefore, a planned sequence of instructions to ensure change in students' behavior and experiences. For instance, the curriculum in science education is composed of a logical arrangement of scientific experiences, knowledge, abilities, and tasks designed to assist students in becoming self-sufficient and contributing to members of the society as well as to get them ready for the workforce (Ogunleye, 2019).

Moreover, education in science is essential because it gives students the foundational skills and information needed in a range of fields, including telecommunications and healthcare (Bamikole & Elizabeth, 2020). Basic science education gives students a foundational understanding of science, which is crucial for human survival, social progress, and sustainable development (Akani, 2018). The new Basic Science curriculum aims to prepare students for advanced science and technology studies, explore career paths, develop foundational skills, apply knowledge to address societal needs, and cultivate an interest in science and technology, according to the Nigerian Educational Research and Development Council (NERDC, 2012).

Statement of the Problem

The basic science curriculum is expected to achieve certain objectives which the realization may be difficult without the effectiveness of instructional materials in teaching and learning process. The acquisition for skills and basic knowledge by the students for activities in teaching basic science requires instructional materials. Recent studies indicate that despite efforts to enhance the Basic Science Curriculum in Nigeria, the program's objectives are still not being fully met. Persistent low performance among students, particularly from 2019 to 2023, suggests issues in both curriculum implementation and student engagement (Ogundele et al., 2021).

The researchers thought probably, that non availability of instructional materials leads to students' failure and low achievement of the stated objectives in the National Policy on Education 2014 at Basic Education Level. The researchers are of the view that upon completing foundational studies within the Basic Science curriculum, students should be equipped with the knowledge and skills necessary to further explore science and technology fields. Therefore, it makes sense to assume that scientific literacy and critical thinking skills that will prepare students for more advanced studies in science and also encourage a deeper understanding of scientific principles are included in the curriculum.

These prompted the researchers to embark on this study titled evaluation of the basic science curriculum at Basic Education level in North East, Nigeria.

Purpose of the Study

This study was carried out to evaluate Basic Science curriculum at the Basic Education level in the North East, Nigeria, therefore, the specific objectives of the study were to:

i. determine the extent of the achievement of objectives of Basic Science Curriculum at the Basic Education level in some selected states in North East, Nigeria.
ii. ascertain the level of availability of instructional materials for teaching Basic Science curriculum contents at junior secondary schools in some selected states in the North East, Nigeria.

Research Questions

The following research questions guided the study:

i. To what extent have objectives of Basic Science Curriculum have been achieved in some selected states in North East, Nigeria?
ii. What is the level of availability of instructional materials for teaching Basic Science at junior secondary schools in some selected states in the North East, Nigeria?

Research Hypotheses

The researchers formulated two hypotheses to guide the study.

H_{O1}: There is no significant difference in the mean responses of male and female teachers on the extent of achievement of objectives of Basic Science Curriculum in some selected states in North East, Nigeria.

H_{O2}: There is no significant disparity on the level of availability of instructional materials for teaching Basic Science curriculum at junior secondary schools in selected states in the North East.

Methodology

Research Design

Descriptive Survey Research Design was employed, in line with Kabir's (2016) paradigm. Explanatory, exploratory, and descriptive goals are only a few of the uses for descriptive surveys. This design provides a useful and efficient means of gathering the exact data and statistics required for informed decision-making and the extrapolation of inferences from analysis results.

Population of the Study

The population of the study consists of all basic science teachers and JSS III students from 146 junior secondary schools from six states (Adamawa, Gombe, Yobe, Borno, Taraba and Bauchi) in the North East, Nigeria. This includes 10,157 students and 105 teachers in basic science. JSS III students were selected based on their exposure to basic science concepts for a minimum of two years, given that they are about graduating from junior secondary school.

Sample and Sampling Technique

The total sampled size of 286 respondents consisted of 40 Basic Science teachers (24 men and 16 females) and 246 JSS III students (114 males and 132 females). The sample selection procedure for the study included the use of both multistage sampling and purposeful sampling. Two local government areas each from four selected states (Adamawa, Gombe, Yobe and Borno) were first chosen at random from among the six states in the North East, Nigeria. Then, four schools with two streams of JSS III classes were specifically chosen from the each local government area. The primary focus of the selection criterion was schools with a significant JSS III students' population that were provided the necessary Basic Science curriculum contents from JSS I to JSS III. The study sample consisted of every student in the chosen intact classes.

Research Instruments

The instrument for data collection was a questionnaire titled "Basic Science Curriculum for Junior Secondary School (BSCJSS)". The questionnaire was divided into three sections, A to C and structured on a modified four-point Likert scale. Section A seeks for demographic information of the respondents. Section B contains items relating to the extent to which the basic science curriculum objectives have been achieved. Section C contains items on the level of availability of the instructional materials used in the teaching of basic science contents. The teachers and students were expected to respond according to their degree of agreement with the statement by ticking (√) the correct response option.

Validity of the Instruments

The instrument was validated by 3 experts in the Department of Educational Foundations, Faculty of Education, Adamawa State University, Mubi. The validation procedure assessed the face and content validity of the instrument to ensure that it could measure the intended constructs with accuracy. The corrections pointed out by these experts were harmonized before the final copy of the instrument was produced.

Reliability of the Instruments

To ensure the reliability of the instrument, a pilot test was conducted outside the study area. The instruments were trial-tested by administering 40 copies to 30 students and 10 teachers. The

information obtained from the pilot testing was analyzed using Cronbach's alpha coefficient to determine internal consistency. The result revealed high levels of internal consistency, with teachers' and students' Cronbach's alpha coefficients being 0.87 and 0.81 respectively. These coefficients are above the internal consistency reliability threshold of 0.70 set by Edmonds and Kennedy (2014), thereby verifying the validity of both instruments. Therefore, it was concluded that the instruments are reliable and internally consistent.

Method of Data Collection and Analysis

The researchers administered copies of the Questionnaire to teachers and students on-site, with two research assistants who helped with the distribution and collection of the questionnaires. The administrators of the schools ensured that the questionnaires were delivered to the intended respondents. The data collected from the respondents were analyzed using mean and standard deviation, while the hypotheses were tested using t-test and one-way ANOVA statistics at a significance threshold of 0.05.

Results

Research Question 1: To what extent do objectives of Basic Science Curriculum have been achieved in some selected states in North East?

Table 1: Summary of the Mean Scores of Responses for Teachers and Students on the Achievement Objectives of Basic Science Curriculum in some selected states in North East

S/N	Item	$\bar{X}$	SD	Decision
1	Students are taught with appropriate instructional materials to enable them develop interest in basic science.	1.28	.877	Very Low
2	Students are exposed to practical classes which aids in the achievement of Basic Science curriculum objectives.	2.55	.815	High
3	Students receive basic knowledge and skills in basic science to help them think and reason in a logical manner.	2.85	.770	High
4	Teachers get prepared for the basic science lessons to be able to deliver well.	3.60	.496	Very High
5	Teachers cover syllabi of basic science contents to enable the students acquire adequate knowledge in basic science.	3.15	.700	Very High
6	Students do develop better understanding in science by giving them constant assignments.	1.88	.648	Low
	Grand Mean	**3.00**		**Very High**

The data in table 1 shows certain aspects of the curriculum being highly effective, while others show areas of concern. Notably, items like teacher preparedness and syllabus coverage received "Very High" ratings, with teachers reportedly well-prepared and able to cover the syllabus adequately.

However, the use of instructional materials and assignments raised concerns. The low rating for the use of instructional materials (1.28) indicates that students are not regularly exposed to the necessary resources that could foster a deeper interest in Basic Science, as recommended by educational theories on effective teaching tools. Similarly, the low score for assignments (1.88) suggests that students are not sufficiently challenged outside of the classroom to reinforce their learning, which is crucial for developing critical thinking skills in science subjects.

Despite these challenges, the overall grand mean score of 3.00, classified as "Very High," suggests that, on the whole, the curriculum is being implemented effectively. Students are exposed to practical classes, and the basic knowledge and skills in science are generally being imparted. These results underscore the importance of continuous improvements, particularly in areas like resource provision and assignment practices, to ensure that all components of the Basic Science curriculum are fully realized, as this would enhance the quality of science education in the region.

Research Question 2: What is the level of availability of instructional materials for teaching Basic Science at junior secondary schools in selected states in the North East?

Table 2 provides an analysis of the resources available for teaching Basic Science in junior secondary schools in the North East. The table

illustrates variations in availability across different items. Basic Science Laboratory, Models, Pictures, Diagrams, Real objects, and Wall charts are moderately available, with mean scores of approximately 2.26 and 2.25, indicating room for improvement in providing these resources. The grand mean of 1.80 indicates that, generally speaking, respondents consider the listed items to be "Not Available," implying a low perception of availability based on the provided scale.

Table 2: Mean Responses and Standard Deviation of Teachers and Students on the Level of Availability of Instructional Materials for Teaching Basic Science Contents at Junior Secondary Schools

S/N	Item	$\bar{X}$	SD	Decision
1	Basic science laboratory	2.26	1.16	Moderately Available
2	Models, pictures, diagrams, real objects, wallchart.	2.25	1.09	Moderately Available
3	Microscope, hand lens, slides	1.14	1.12	Not Available
4	Chalkboard/whiteboard, Basic science textbook	3.78	1.06	Adequately Available
5	First aid box, safety goggles	1.60	1.04	Not Available
6	Computer, projector, film strip, Internet facilities	1.39	1.11	Not Available
7	Preserved animal specimens	0.25	1.17	Not Available
8	Chemicals, reagents, bases, acids	1.17	1.12	Not Available
9	Dissecting board, scissors	2.35	1.14	Moderately Available
10	Consumables (test tubes, funnels, beakers, conical flask)	2.30	1.14	Moderately Available
11	Retort stand and clamp, spring balance, wire guaze, tripod stand	1.30	1.13	Not Available
Grand Mean		**1.80**		**Not Available**

Hypothesis 1: There is no Significant difference in the mean responses of male and female teachers on the extent of achievement of objectives of Basic Science Curriculum in some selected states in North East, Nigeria.

Table 3: t-test Analysis of the Difference in the Responses of Male and Female Teachers on the Extent of Achievement of the Objectives of the Basic Science Curriculum at Junior Secondary Schools in some selected states in North East

Variable	N	$\bar{X}$	Mean Difference	Std. Deviation	df	t	Sig.(2-tailed)
Male	24	3.02					
			0.04	0.38	38	0.292	0.772**
Female	16	2.98					

**Not Significant; p > 0.05

Table 3 presents the results of a statistical test comparing the mean responses of male and female teachers about the achievement of Basic Science curriculum objectives in some selected states of North East Nigeria. The mean score for male teachers is 3.02, and for female teachers is 2.98. The statistical test results, with a t-value of 0.292 and a p-value of 0.772, indicate that this difference is not significant. Since the p-value is much higher than the significant level of 0.05, the null hypothesis is not rejected, which states there is no significant difference between male and female teachers' responses.

Hypothesis 2: There exists no statistically significant disparity on the level of availability of instructional materials for teaching Basic Science at junior secondary schools in selected states in the North East.

Table 4: One-way ANOVA Analysis of Differences in the Response of Teachers on the Availability of Instructional Materials and Facilities for Teaching Learning Processes of Basic Science Subject at Junior Secondary Schools in North East states

Sources of Variance	Sum of Squares	Mean Squares	df	F	Sig.(2-Tailed)
Between Groups	.017	.017	1	.046	.832**
Within Groups	13.801	.363	38		
Total	13.818		39		

**Not Significant, p > 0.05.

The hypothesis 2 show in table 4, with the goal of ascertaining if teacher comments regarding the facilities and resources available for teaching basic science in junior secondary schools in the North-East differ significantly. The computed F-statistic, 0.046, is obtained by dividing the mean squares between groups by the mean squares within groups. The corresponding p-value is 0.832. The ANOVA analysis leads to the conclusion that there is insufficient data to reject the null hypothesis, indicating that there are no appreciable differences in teachers' assessments of how accessible facilities and instructional resources are for teaching basic science to different groups in the North-East Nigeria.

Discussion

The main purpose of this study was to evaluate Basic Science curriculum contents at the Basic Education level in the North East, Nigeria. The results offer valuable information on the extent to which the Basic Science Curriculum's objectives are achieved and the level of availability of instructional materials used in the teaching basic science curriculum contents at Basic Education Level in the North East, Nigeria.

Regarding the achievement of basic science curriculum objectives, the findings show that students benefit from practical classes, building knowledge and logical thinking abilities (Table 1). This aligns with a study by Olagunju and Abiona (2022) which highlighted the value of practical lessons in boosting entrepreneurial interest and skills among secondary school students in science subjects. The finding also corroborate that of Akpan, Unung and Usoroh (2014) as they revealed that students develop entrepreneurial skills through the teaching of Home Economics in schools and thereby increase the students' performance in the subject. However, the lack of constant assignments for better understanding contrasts the findings of Ukpong and George (2019) that giving continuous assignments develop students' entrepreneurial skills.

The inquiry found that educational resources are generally scarce, yet some are somewhat available, as Table 2 shows. This finding align with the findings of Akinbobola's (2021) investigation, which discovered discrepancies in the resources made accessible in various schools during a related assessment of basic science instruction. Akinbobola emphasized the significant influence that varying resource availability has on student learning outcomes and educational quality. These findings demonstrate how critical it is to resolve resource distribution disparities in order to ensure that all children have equitable access to educational opportunities and resources, which will ultimately enhance the efficacy of instruction and boost academic achievement.

There was a documented lack of technical resources, indicating a serious shortfall in the resources' availability, in contrast to the findings of Anih and Anikweze's (2020). The study's goal was to assess how successfully the Basic Science curriculum was helping junior high school pupils in the North East States develop their entrepreneurial skills. The study's conclusions about the insufficient use of the available resources are consistent with past studies conducted by Johnson (2020) and Smith et al. (2019), which showed challenges in utilizing the resources for science education effectively. This restricted use may be the result of factors such as inadequate teacher preparation, inadequate instructional

support, and subpar curriculum objectives and resources. Moreover, Yakubu (2021) as well as Adejoh, (2018). found that course materials were not fully integrated. These findings emphasize the need for targeted interventions to enhance material utilization and optimize the impact of scientific education materials on student learning outcomes.

In hypothesis 1, the t-test results indicated no significant difference between the responses of male and female teachers in terms of achieving curriculum objectives. In The finding is in line with the results of Adeola and Adesina (2020), who also observed no significant difference in the perceptions of male and female teachers regarding curriculum implementation in basic science education. Their study found that both male and female teachers exhibited similar levels of commitment and perspectives on curriculum goals, concluding that gender did not play a significant role in influencing teachers' views on educational outcomes. This alignment with the present findings suggests that male and female teachers might be equally invested in achieving the objectives of the Basic Science curriculum and share comparable views on its implementation, regardless of gender.

However, the results contrast with the findings of Musa and Garba (2023), who observed significant gender differences in perceptions of curriculum achievement among science teachers in North Central Nigeria. This divergence from the current findings implies that while gender-based differences may not be prevalent across all regions, they could emerge in contexts where professional resources or support systems differ significantly between male and female teachers, leading to varied perceptions of curriculum achievement.

In hypothesis 2, the one-way ANOVA results revealed no significant difference in teachers' response on instructional materials availability. This corroborates Sunday and Ajani's (2018) study, which found congruent views between teachers on resource availability. However, Ogar and Asama (2019) found variance between teachers of different experience levels regarding the adequacy and accessibility of instructional materials, with more experienced teachers often perceiving them as insufficient compared to their less experienced counterparts.

Conclusion

The findings from this study indicate that while the Basic Science curriculum in North East Nigeria offers valuable learning opportunities, there are significant challenges in resource availability. Students benefit from practical components in the curriculum, yet the uneven distribution of materials and insufficient regular assessments hinder optimal learning. Additionally, the study found no significant gender-based differences in teachers' perspectives on achieving curriculum objectives or the availability of instructional materials. Implementing targeted interventions and increasing resource availability would enhance the effectiveness of Basic Science education and promote better students' performance.

Recommendations

1. Government and curriculum planners should prioritize the provision of practical science materials in schools to support the hands-on learning that enhances students' knowledge and logical thinking abilities.
2. Teachers should incorporate continuous assignments into the curriculum to help students reinforce their understanding and improve their entrepreneurial skills, as this approach has been shown to be beneficial.
3. Policymakers must address disparities in resource availability across schools by ensuring that all institutions, especially in underserved regions, have equal access to instructional materials for effective science education.
4. Teachers should receive specialized training on how to better integrate and utilize available instructional resources, ensuring that the materials are used to their full potential to improve learning outcomes

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