

# Domestic Linguistics and Gender on Pupils Achievement in Basic Science and Technology in Basic Schools

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**Abstract:** *The outcomes of this research has reaffirmed that domestic linguistics is an effective instructional medium for teaching and learning Basic Science and Technology (BST) in the first three years of basic education irrespective of the pupils gender and age in Delta State. The theoretical framework on which the study was anchored on was Vygotsky's Social Development Theory and Piaget's Cognitive Development Theory. The study employed a pre-test post-test quasi-experimental design. Two (2) research questions and two null hypotheses were tested at 0.05 level of significance. A sample size of two hundred and thirty-eight (238) Basic I – III BST pupils in public primary schools in Delta State participated in the intervention. They were taught BST concepts using Domestic linguistics in the intervention groups. The instruments used were Basic Science and Technology Achievement Test (BSTAT). The tool was validated by Basic Science and Technology, and Domestic linguistics experts, with reliability indices of 0.78. The data received were analyzed using 2-Way Analysis of Variance (2-way ANOVA). The outcomes exposed that domestic linguistics has a positive confirmatory effect on students' achievement in BST irrespective of their sex and age. The study specified that utilizing Domestic linguistics in teaching BST in Basic I-III is appropriate; due to the positive effect on achievement and the unbiased opportunity it offers to BST pupils with respect to gender and age.*

**Keywords:** Domestic linguistics, gender, age, achievement and Basic Science and Technology (BST).

## Introduction

### Background to the Study

Advancing scientific knowledge irrespective of gender and age in any society is vital due to its dynamics in catapulting economic, social, and individual advancement in the affected nation. Thus, the Federal Government of Nigeria emphasized the practical and purposeful implementation of BST subjects at the lower basic level, also known as the Primary School System. This government action enables learners to obtain the required knowledge of their environment, develop problem-solving skills, develop desirable scientific attitudes, and increase their understanding of the roles and functions of science in everyday life (NCCE, 2012). Though, BST is a singular subject, it is a cluster of linked science subjects, including the environment and mathematics; it is concerned with the study of numbers, quantity, shapes, and processes involved in solving a problem (Adodo & Gbore, 2012).

In Akinbote et al. (2010), BST is called basic education because it is the first level of education where formal instructional and knowledge-acquiring activities occur. The National Policy of Education FGN (2013) states that basic education is provided by learning institutions for children of age 6 to 11 plus. Every other educational arrangement is built upon it. Specifically, the objectives of the new Basic Education Curriculum in Science and Technology contains thus to enable learners:

- i. develop an interest in science and technology;
- ii. applying their basic knowledge and skills in science and technology to meet societal needs;
- iii. take advantage of the numerous career opportunities offered by studying science and technology, and
- iv. become prepared for further studies in science and technology.

The instruction and knowledge acquisition in BST allows citizens to explore, interpret and manage their environment. It is dynamic and concerned with the search and explanation of both regularities and irregularities in nature. It entails the expedition for activities and responses, reasons, and environmental concerns. Science knowledge generally alters our surroundings, including the atmosphere, to refine the entire value of existence, thereby ensuring a better habitable world for its inhabitants. Science is primarily concerned with the intellectualization of facts and values unbiasedly (Ulferts, 2019).

Gender denotes the natural peculiarity between males and females in all facets of life. The concept of gender is crucial concerning learning and achievement in science. social context (Filgona & Sababa, 2017). Therefore, gender is a severe problem, which has attracted the attention of science education researchers because gender parity is a concern in terms of learning achievement in education. As a result, this study has devoted much relevance to investigating the degree to which learners' academic achievement is gender biased. Basic Science and Technology learning and achievement requires innovative techniques that ensure and erase the achievement dichotomy between males and females as identified by certain researchers. There is every need for researchers in science education to provide alternative and innovative approaches to Basic Science and Technology learning and achievement opportunity that is not gender bias. We need to be able to design ways. Fabunmi (2004), in a study, exposed that gender configuration has an essential connection with students' academic achievement and that gender arrangement has a significant impact on secondary school student's academic achievement in science. Certain studies have reported achievement among science students in favour of

female students against their male counterparts (Orabi, 2007; Dayioglu & Turut, 2007; Lai, 2010). Ghazvini and Khajehpour (2011) stated that gender difference exists at the level of cognitive functioning in the academic environment. Females are likely to be more adaptive in learning in different environments. The desired advancement of any society is to ensure learners' activities result in social, economic, and academic progress concerning learning and their natural habitat, irrespective of sex and age. These activities concern science and technological applications (Famakinwa, 2014).

Age in respect of the preoperational stage (2–7 years) and concrete operational stage (7-11 years) are among the four stages of development propounded by Piaget. Piaget advocated that all children move through the sensorimotor, preoperational, concrete operations, and formal operations stages of development (Moreno, 2010). While moving from one stage of development to another, the children's cognitive abilities are altered qualitatively (Sigelman & Rider, 2012). Piaget equally believed that cognitive development is a continuous process and that all children, even in different environmental settings and cultural diversity around the world, have the same sequence of cognitive development (Hockenbury & Hockenbury, 2011). This investigation is to uncover the effect of domestic linguistics, gender, and age (preoperational stage and concrete operational stage) on achievement in Basic Science and Technology.

Basic Science and Technology is an initiative required for every society to progress technologically. It is getting the required attention in primary education due to its relevance to life and culture. It is the basis of sciences and the requirement for many fields of learning, contributing immensely to society and scientific and technological growth. Its contribution comprises engineering, medicine, forestry, agriculture, biotechnology, and nursing. The teaching and learning of BST in lower primary schools prepare pupils with valuable skills, concepts, principles, and theories to face the challenges of science subjects for subsequent learning opportunities. BST learning is towards creating proficient persons who solve their challenges and that of their society. Such persons can become autonomous, confident, and self-reliant. Science and Technology constitute the basis of advancement in most human endeavours. Ensuring the delivery of Basic Science and Technology in the first three years of primary education, irrespective of gender and age, is a severe concern to science education researchers.

Domestic linguistics is the basic lingua-franca for the indigenous inhabitant of a specified environment; domestic linguistics is the medium for daily communication and business transactions. The most significant populace in Nigeria expresses themselves in their varying domestic linguistics. Nigeria was a British colony. Accordingly, the Nigerian Government made English the authorized means of interaction in numerous areas, including education. English is a language of influence since expertise in English gives such a person an advantage in obtaining lucrative positions in Government and other sectors. The high status concerning English is reflected in the Nigerian educational system, which aims to produce graduates proficient in English (Makinde, 2007).

Every traditional society possesses one or more indigenous forms of language. Domestic Linguistics in this study means Izon, Urhobo, Itsekiri, and Ukwuani languages spoken in Delta State, Nigeria. Domestic linguistics is functional even in the face of modern science and technological advancements. Instead of rendering them obsolete in modern society, domestic linguistics should be used in instructing and learning BST in the first three years of learning in primary school since this domestic linguistics constitutes a direct medium of communication with pupils and their immediate environment while enabling the learners to understand the natural world (Bebenimbo, 2012).

Using domestic linguistics instructional medium in Nigeria is very rare, particularly in Delta State. The nonuse of domestic linguistics in instruction could result from the different domestic linguistics spoken by the people in the state, and English usage in instruction undermined the policy that encouraged domestic linguistics in instruction for the first three years of the pupils' primary science education, as stated in the National Policy on Education (FGN, 2013).

### **Research Problem**

The controversies concerning an effective instructional medium and poor pupils' achievement that is not gender and age bias for BST learning is an ultimate challenge. Learning and practical achievement in BST should not be favourable to a particular gender or age to ensure equal access to educational opportunities and the technological development of society. Hence, this investigation seeks to resolve the controversies of BST learning and achievement regarding gender and age in the first three years of primary education. Thus, this investigation seeks to resolve whether domestic linguistics instructional medium affects pupils' achievement concerning gender and age in BST for the first three years of basic education.

### **Research Questions**

These have been raised to guide this investigation.

1. Is there any difference in the achievement mean scores of male and female pupils that were taught BST in domestic linguistics (Izon, Urohobo, Itsekiri and Ukwuani)?
2. Is there any difference in the achievement mean scores of male and female pupils in preoperational stage and concrete operational stage that were taught BST in domestic linguistics (Izon, Urohobo, Itsekiri and Ukwuani)?

### **Hypotheses**

The following null hypotheses were tested at 0.05 level of significance.

Ho1. There is no significant difference in the achievement mean scores of male and female pupils that were taught BST in domestic linguistics (Izon, Uhrobo, Itsekiri and Ukwuani).

Ho2. There is no significant difference in the achievement mean scores of preoperational stage and concrete operational stage that were taught BST in domestic linguistics (Izon, Uhrobo, Itsekiri and Ukwuani).

### **Methodology**

The investigation applied a non-equivalent pre-test and post-test quasi-experimental design. This design was used to investigate the effect of Domestic Linguistics on pupils' achievement in BST considering gender and age. The study involved four interventionist groups, consisting of primary one to primary three Basic Science and Technology pupils. A pre-test was administered to the groups before the treatment and ensured the groups' comparative effects on achievement in BST concerning gender and age. The pupils in the interventionist groups were taught BST concepts utilizing Domestic Linguistics (Izon, Uhrobo, Itsekiri, and Ukwuani) languages. A post-test was administered to the interventionist groups after the treatment period of six (6) weeks to establish the effect of the treatment on the dependent variable.

### **Population and Sampling Technique**

The population of this investigation involved One Thousand One Hundred and Thirteen (1,113) Public Primary Schools in Delta State. The study utilized two hundred and thirty-eight (238) Primary 1-3 Basic Science and Technology pupils of basic public schools that were randomly selected. The study utilized primary one-three (1-3) whole class sessions from four (4) designated schools. The stages of selection were carried out through a simple random sampling technique. Firstly, a simple random sampling was applied to designate a locality where domestic linguistics was predominant in a Local Government Area from each senatorial district. Secondly, simple random sampling was utilized to designate one (1) primary school from each of the Local Government Areas chosen. Thirdly, designated basic school 1-III classes as the intact (whole) classes among the selected schools were assigned as the interventionist groups through the "hat and draw" method. This method was randomly applied and eradicated any bias in the selection.

### **Instruments of the Study**

The study utilized four (4) research instruments, Basic Science and Technology Achievement Test-I (BSTAT-I), Basic Science and Technology Achievement Test-II (BSTAT-II), Basic Science and Technology Achievement Test-III (BSTAT-III), and Basic Science and Technology Achievement Test-IV (BSTAT-IV). BSTAT-I was used to retrieve responses from Domestic linguistics (Izon interventionist group), BSTAT-II was used to retrieve responses from Domestic linguistics (Uhrobo interventionist group), BSTAT-III was used to retrieve responses from Domestic linguistics (Itsekiri interventionist group), and BSTAT-IV was used to retrieve response from Domestic linguistics (Ukwuani interventionist group) classes respectively.

### **Validity and Reliability of the Study**

The Instruments were validated through face, content, and construct validity. Reliability Indices of 0.77 for BSTAT-I; 0.75 for BSTAT-II; 0.81 for BSTAT-III and 0.79 for BSTAT-IV respectively, were obtained through Kuder-Richardson formula 21.

### **Treatment Procedure**

#### **1. Training of Research Assistants for Interventionist Groups**

This investigation engaged four Basic Science & Technology teachers used as Research Assistants who were trained in the techniques of using Domestic linguistics. This activity lasted for five days. Day one involved the researcher requesting approval from the designated schools' Headmasters to allow their Basic Teachers and pupils to participate in the study. On the second day, the researcher exposed the four basic science and technology instructors to the theories of Vygotsky's Social Development Theory and Piaget's Cognitive Development Theory. On the third day, the teachers were trained using the training manuals prepared by the researchers on the Domestic linguistics involved. The fourth day was spent on practice and the generation of ideas regarding the application of Domestic linguistics in instructing Basic Science and Technology concepts. The trained Research Assistants were evaluated and were seen to have received the required understanding of implementing Domestic linguistics in Basic Science and Technology contents.

2. The Step-by-Step Treatment Procedure of Domestic linguistics (Izon, Uhrobo, Itsekiri, and Ukwuani) languages were applied as the treatment.

The treatment lasted for six weeks. During the pre-treatment week, the researchers circulated the instructional units to the four (4) research assistants. The instructional units contained Basic Science and Technology contents, involving: For Primary (Basic) One: (1) Revision of First Term Work (2) Air: Existence of air and Creation of air (3) Demonstrating Air in Space (4) Soil – Discover soil as other part of the surrounding (5) Soil – Things found in the soil and importance of soil (6) Light – Light Energy: Uses of Light and Colour; For Primary (Basic) Two (1) Revision of First Term Work (2) Loamy Soil – Meaning, Organism in the sample of the soil and Properties of Sandy soil (3) Clay Soil – Meaning, Organism in the sample of the soil and Properties of clay soil (4) Clay Soil – Meaning, Materials and procedures and Uses of clay molding (5) Clay – Practical by Molding with clay (6) Plants - Features of plants and Groups of plants based on features, and for Primary (Basic) Three (1) Revision of First Term Work (2) Air in Motion I – Wind, Meaning of Wind and Effects of Wind (3) Air in Motion II – Harmful Effects of Wind and Bad effects of wind

(4) Water – Uses of water, Sources of water and Composition of water (5) Water – Qualities of water, Meaning of water, Qualities of good/pure water, Contamination of water and Dangers of drinking lousy water (6) Water – Purifying water, Reasons for purifying water and Methods of purifications correspondingly as contained in Delta State Primary (Basic) Basic Science and Technology plan of action. Intervention materials that were circulated earlier were based on these two reasons: (i) to familiarize research assistants with the contents of the lessons and (ii) to ensure unbiased instructional delivery by ensuring that the endorsed medium for the designated classes was observed. Two days before the commencement of treatment, the interventionist groups were pretested with the 25 items of the Basic Science and Technology Achievement Test (BSTAT-I, BSTAT-II, BSTAT-III, and BSTAT-IV) so that any observed change resulted from the treatment. Domestic linguistics usage as an instructional medium should provide an accommodating environment for learning for the pupils. Conclusively the posttest was administered after the treatment during the following lesson period with reshuffled 25 items of the Basic Science and Technology Achievement Tests (BSTAT-I, BSTAT-II, BSTAT-III, and BSTAT-IV).

**Data Analysis**

The data retrieved from the administered Basic Science and Technology Achievement Tests (BSTAT-I, BSTAT-II, BSTAT-III and BSTAT-IV) were analyzed utilizing mean and 2-Way Analysis of Variance (ANOVA). It was used to test hypotheses one and two. The significant level at which a hypothesis is rejected or rejected is 0.05.

**Hypothesis (HO<sub>1</sub>)**

There is no significant difference in the achievement mean scores of male and female pupils that were taught BST in domestic linguistics (Izon, Uhrobo, Itsekiri and Ukwuani)

**Table 1**

**Two-Way ANOVA on the Posttest Mean Achievement Scores of Male and Female Basic Science and Technology Pupils that were Taught Using Domestic Linguistics**

Source	Type III Sum of Squares	df	Mean Squares	F	Sig	Remark
Corrected Model	479.374a	7	68.482	1.462	.182	Not Significant
Intercept	884493.773	1	884493.773	18876.737	.000	
Groups	335.408	3	111.803	2.386	.070	
Sex	9.483	1	9.483	.202	.653	
Groups * Sex	143.256	3	47.752	1.019	.385	
Error	10776.946	230	46.856			
Total	902720.000	238				
Corrected Total	11256.319	237				

P > 0.05

Table 1 indicated the 2-Way Analysis of Variance (ANOVA) on the posttest mean achievement scores of male and female Basic Science and Technology pupils taught using Domestic Linguistics. From table 1, it can be observed that an F-value of 1.02 and a p-value of 0.39 were obtained. Testing the significant effect at an alpha level of 0.05, with an F-value of 1.02 and a p-value of 0.39, which are higher than the alpha level of 0.05, it can be deduced that the null hypothesis was retained. This implied that no significant difference effect was observed among Domestic linguistics medium of instruction and sex on Basic Science and Technology pupils' achievement.

**Hypothesis (HO<sub>2</sub>)**

There is no significant difference in the achievement mean scores of preoperational stage and concrete operational stage that were taught BST in domestic linguistics (Izon, Uhrobo, Itsekiri and Ukwuani)

**Table 2**

**Two-Way ANOVA on the Posttest Mean Achievement Scores of Pre-operational and Concrete Operational Stages Basic Science and Technology Pupils that were Taught Using Domestic Linguistics**

Source	Type III Sum of Squares	df	Mean Squares	F	Sig.	Remark
Corrected Model	716.713a	7	102.388	2.234	.032	Not Significant
Intercept	781030.496	1	781030.496	17043.997	.000	
Groups	340.246	3	113.415	2.475	.062	
Age	72.551	1	72.551	1.583	.210	
Groups * Age	311.297	3	103.766	2.264	.082	
Error	10539.606	230	45.824			
Total	902720.000	238				
Corrected Total	11256.319	237				

P > 0.05

Table 2 shows a 2-Way Analysis of Variance (ANOVA) based on the posttest mean achievement scores of Pre-operational and Concrete Operational Ages of Basic Science and Technology pupils taught using Domestic Linguistics. From the above table, it can be observed that an F-value of 2.26 and a p-value of 0.08 were obtained. Testing the significant effect at an alpha level of 0.05, with an F-value of 2.26 and a p-value of 0.08, which are higher than the alpha level of 0.05, it can be deduced that the null hypothesis was not rejected. This result implied that no significant difference effect was observed among Domestic linguistics medium of instruction and sex on Basic Science and Technology pupils' achievement.

## Discussion

Hypothesis one (HO<sub>1</sub>) result has shown no significant difference among the pupils taught BST using Domestic linguistics (Izon, Uhrobo, Itsekiri, and Ukwuani) languages. The observed no significant difference in the achievement of pupils taught BST using domestic linguistics (Izon, Uhrobo, Itsekiri, and Ukwuani) languages indicates that these languages are practically impactful for BST delivery in Primary I-III and enhanced achievement while being gender friendly. A conceivable clarification for this finding is that the Domestic linguistics medium of instruction holds the potential to enable pupils to comprehend, arouse and sustain learners' participation in learning and help them understand BST concepts without being gender biased because domestic linguistics has bridged the language and gender barrier between school and home (Ajai and Imoko (2015). Domestic linguistics allowed pupils to participate effectively in the teaching-learning situation. It has encouraged them to build self-confidence in relating BST concepts concerning events of the environment irrespective of the pupils' gender. This investigation has observed the effectiveness of Domestic linguistics on pupils' achievement in BST irrespective of the pupils' gender, which agrees with the work of Bebenimi bo (2012), where he observed that pupils exposed to domestic linguistics (Izon Language) achieved higher learning outcomes in basic science than those taught using the English language without being gender bias. This study concurred with the study of Filgona and Sababa (2017), who agreed that pupils' achievement in science is not gender-based with the application of appropriate instructional medium irrespective of the subject. However, the present finding is inconsistent with Mutai (2011) conclusion, which concluded that gender is strongly associated with academic achievement in mathematics, indicating that boys performed better than their girls' counterparts. In further supporting this study, Faisal, Shinwari, and Hussain (2017) noted that with a suitable instructional medium utilization in teaching science subjects' learners' interaction potentials were improved and ensured effective achievement in science subjects irrespective of the pupils' gender or sex. The finding of this study reaffirmed that effective achievement means scores of pupils taught BST in Domestic linguistics were not gender bias. As such, this Domestic linguistic medium of instruction in the first three years of basic education is an appropriate alternative to gender bias medium of instruction as advocated by science education researchers.

The result of this study, concerning hypothesis two (HO<sub>2</sub>), confirmed that no significant difference existed among Pre-operational and Concrete Operational Ages of Basic Science and Technology pupils taught BST using the Domestic linguistics (Izon, Uhrobo, Itsekiri, and Ukwuani) languages. This intervention noticed insignificant differences in achievement irrespective of the pupils' age who were taught BST using domestic linguistics could be attributed to the localization of teaching and learning of the subject. While recognizing and utilizing domestic linguistics instructional medium is paramount to effective achievement for pupils irrespective of their age, the power of language on achievement is more considerable when pupils learn in the language of their

immediate environment (Ricablanca, 2014). Another conceivable clarification to this finding should be that the Domestic linguistics medium of instruction adhered to the latent preference of the pupils to comprehend, arouse and sustain their participation in learning irrespective of their age. Domestic linguistics has helped them understand BST concepts because the language barrier between school and home, irrespective of age as represented by pre-operational and concrete operational ages, was bridged. It cut the various individual domestic linguistic peculiarities as defined by the locality. The findings of this study on the effectiveness of Domestic linguistics and age on pupils' achievement in BST agree with the work of Bebenimibo (2012), who conducted a quasi-experiment on Izon language and Pupils' Achievement in Basic Science. His study observed that pre-operational and concrete operational pupils exposed to Izon language achievement were not based on age. This study harmonized with Eze, Ezenwafor, and Obi (2015), who stated that age and gender had no linear relationship with academic performance and that their joint influence was insignificant in academic performance in science subjects. This impact, according to them, was attributed to the involvement of Mathematics, Science, and ICT in the content of the VTE courses. Ebeonuwa-Okoh, (2010) concluded that gender, age, and financial status were not significant predictors of academic performance among undergraduate students. Conversely, John, Jackson & Simiyu (2015) stated that the chronological age of students had a significant bearing on his/her academic performance, such that the youngest one had the potential to have a higher score than his/her oldest counterpart in the teacher-made test. Nevertheless, this investigation outcome harmonized with Pena (2017), who argued that appropriate teaching strategies guaranteed successful understanding and improved achievement in Mathematics and English language subjects irrespective of age.

### **Conclusion**

Accordingly, this investigation outcome has revealed that the Domestic linguistics instructional medium is effective in instructing BST in the first three years of learning and achievement irrespective of age as represented by pre-operational and concrete operational stages of development. Due to its impact, Domestic linguistics has the required experimental endorsement and can facilitate pupils' effective learning while meaningfully organizing knowledge content irrespective of age. Consequently, this study has revealed that BST contents taught using domestic linguistics (Izon, Urhobo, Itsekiri, and Ukwuani) languages have improved the pupils' knowledge base in BST concepts without age bias. Domestic linguistics ensured a smooth transition from home school in terms of means of communication and pupils' age, which has eradicated the traditional obstacle in teaching and learning in BST and subsequently enhanced achievement irrespective of age at this level of Basic Education.

### **Recommendations**

Following the outcome of this investigation, the following recommendations were necessitated:

1. Government agencies responsible for teachers' employment should ensure that teachers' language backgrounds should be considered in posting teachers to localities where Domestic linguistics is predominant.
2. Government should monitor and make sure that pupils in Basic 1 - III are taught using domestic linguistics rather than the English language under Nigerian Policy on Education (NPE).

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