

EFFECTS OF MOTHER TONGUE LEARNING STRATEGIES ON STUDENTES' PERFORMANCE IN TEACHING GEOMETRY AMONG JUNIOR SECONDARY SCHOOL STUDENTS IN SOKOTO STATE, NIGERIA

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Abstract

Though mathematics is an important and compulsory subject for all students at the primary and secondary schools in Nigeria and many other countries in the world, researchers found that it is the subject mostly failed by students in both their internal and external examinations in Nigeria. In an attempt to find a solution to the above problem, this research selected geometry as a topic and used culture and Hausa language as a medium of instruction to appraise the effects of environmental language (mother tongue) in learners' performance in mathematics among JSS students in Sokoto State. It was found that there 291 JSS Schools in Sokoto State with an estimated population of 41,508 students. 67 schools with an estimated population of 19,048 JSS-2 students were situated in Sokoto metropolis. However, only six schools in Sokoto metropolis with students' population of 4,051 was selected for the study. A total number of 377 students were randomly selected from the six sampled schools. Two instruments SMATIG and JALJAU developed by the researchers were used for data collection. Two hypotheses were generated to guide the study. The first hypothesis was rejected while the second one was not rejected. This shows that there was significance difference in students' performance between the EG and CG but there was no gender difference in performance among students.

KEYWORDS: Mother Tongue, Learning Strategies, Students' Performance, Teaching Geometry.

Introduction

It is quiet indisputable facts to state that the knowledge of mathematics contributed a lot in all aspect of human development, scientifically, technologically, socially, economically, medically, geographically, etc. In fact, one may not find it simple to mention all the importance of mathematics to human life because according to Yusha'u (2016), no nation can be recognized as developed country unless it has strong knowledge and application in Science and Technology, and this cannot be achieved without Mathematics, because it is a lubricant that made Science and Technology to be strong. That is why many countries in the world including Nigeria, made mathematics as core and compulsory subjects in all its educational institutions.

Though mathematics is an important and compulsory subject for all students at the primary and secondary schools in Nigeria and many other countries in the world, researchers found that it is the subject mostly failed by students in both their internal and external examinations in Nigeria (Adetula and Salam, 2017, Galadima & Okogbenin, 2012, Ochepe & Sanni, 2002). Chief Examiner's Report (CER, 2005 & 2007) of WASCE, noted that many candidates avoided questions in geometry and those attempted them recorded very low marks as a result of the language of instruction. According to Alonge (2000), the ability of a child to participate actively in the acquisition of knowledge depends on how competent he is in the language used in the teaching process. Language reflects the physical and social environment of human society, thus mathematical language must be clearly understood to every student so as to solve mathematical problem (Adetula and Salam, 2017).

Evidences shows that Nigerian students faced a greater challenge in understanding the terminologies used in teaching mathematics because most of them are either English words or barrowed words from other foreign languages such as Greeks, Latin, Hebrew, etc, (Mercy, 2017). According Ahmad and Saidu (2018), this continues sliding in the students' mathematics performance in Nigeria courses greater concern not only for the teachers but also for all stake holders in the business of education. Similarly, Iji, Okoronkwo and Anyor (2019), also reported that despite the importance of mathematics in human life and development, the students' achievement in secondary school mathematics especially at West African Examination Council (WAEC) and General Certificate in Education (GCE) examination result in the subject are not encouraging in Nigeria.

Many researches shows that some materials, terminologies and the methods used in teaching mathematics in Nigeria today is completely foreign in nature, has no bearing with the culture and local language of Nigerian learners. Both the method and the language of instruction are purely derived from euro-centric culture (Umar, Tudunkaya, & Muawiya, 2019; Uloko & Imoko, 2007). One of the consequences of over dependence on foreign approaches to teaching of mathematics is the seemingly lack of basic principles and mathematical concepts which may results to rote-learning and low performance of students in mathematics as can be seen in Nigeria today. Matang (2003) shows that individuals understand better when teaching and learning involved their own language and cultural activities. This clearly shows that learners gained interest in mathematics and make meaning out of they learned if their culture and language are embedded in teaching mathematics.

Statement of the Problem

Despite the importance attached to Mathematics in the Nigeria Education system, both teachers and students are facing a lot of problems in its teaching and learning. Students' academic achievement in mathematics continues to deteriorate year after year. Interest and attitudes of learners are also very poor toward learning of Mathematics. Researchers, educators, parents, teachers, Government and General public are seriously looking for ways to improve the performance, attitude or perception and interest of the students toward learning Mathematics (Zalmon and Nduka, 2017). Examiners' report of West African Examination Council (WAEC) in Nigeria from the year 2011 to 2016 clearly indicated that problem existed in the students' performance in mathematics as shown in the table below

Table 1: Percentage of students in Nigeria that scored credit (A1-C6), pass and below (D7-F9) in May/June WASSCE general mathematics between 2011 and 2016

S/N	Year	No. of students	Students obtained Credit (A1-C6)	Percentage (%)	No. students obtained (D7-F9)	Percentage (%)
1	2011	1,540,250	587,630	38.15	952,620	61.85
2	2012	1,675,224	819,390	48.91	852,834	50.91
3	2013	1,543,683	555,726	36.00	987,957	64.00
4	2014	1,692,435	529,732	31.30	1,162,703	68.70
5	2015	1,593,442	544,638	34.18	1,048,804	65.82
6	2016	1,544,234	597,310	38.68	946,924	61.32
TOTAL		9,589,268	3,634,426	37.87	5,954,842	62.13

Sources: ABACUS (2019), Vol. 44, *Mathematics Education Series P.221, No. 1*

Table above shows that the population of students writing WASSCE mathematics examinations increases each year and the percentage of students failing the examination also increases simultaneously. From the table it shows that in the last six (6) years ago 9,589,268 students wrote WASSCE in Nigeria but only 3,634,426 students equivalent to 37.87% of students obtained credit pass (A1-C6) in May/June WASSCE general mathematics examination while a total of 5,954,842 students equivalent to 62.13% had ordinary pass and below pass (D7-F9).

From the table, it is a clear testimony in black and white that problem exists in the academic achievement of Nigerian students in mathematics. The failure was so high that Nigeria was found to place second to the last position when compared with eleven other English speaking countries in West African in mathematics school certificate examination (Umar and Maina, 2018). From the above results, it is necessary for one to ask question: What are the factors responsible for the setback of students' poor performance in mathematics year after year?

In an attempt to find answers to the question, many researches were conducted associated with the poor students' performance in mathematics. Some of these researchers found that lack of relevant, appropriate and adequate instructional materials used in teaching mathematics is one of factors responsible for mass failure of students in the subject. Among them were (Ahmad & Saidu, 2018; Awolaja, 2016; Umar, 2013; Adeniyi, 2012; Gambari, 2010). Other researchers such as (Bello, 2016; Chado & Bala 2014; Salman and Odetola 2014), concluded that unqualified and incompetence teachers in the field is one of the problem

responsible for students' mass failure in mathematics. However, most of the researches conducted in the past did not consider lack of good connection between the culture and environmental language in teaching as another reason for students' poor performance in mathematics. The problem of this study therefore is to appraise the effects of using learner's home Language and cultural tools on students' performance in geometry. That is the culture and the language of Hausa people was used as a medium of instruction in teaching to ascertain the performance of students in geometry.

Objectives of the Study

The objectives of this study include:

- 1- To determine the effect of using learner's mother tongue (Hausa language) as a medium of instructions on students' performance in teaching Geometry.
- 2- To assess the effects of using learner's mother tongue (Hausa language) as a medium of instructions on male and female students' performance in teaching Geometry.

Research Hypotheses

The following null hypotheses were generated and tested at $\alpha = 0.05$ level of significance in this study.

- 1- H_{01} : There are no significant differences in the performance of students taught geometry using Hausa language and those taught using conventional method among junior secondary schools in Sokoto State, Nigeria
- 2- H_{02} : There is no significant difference in performance of male and female students taught geometry using Hausa language as a medium of instruction in Sokoto State

Significant of the Study

This study therefore will be significant in the following ways: -

- 1- The findings of this study will help the Ministry of Education (MOE) and Universal Basic Education Board (UBE) to come up with strategies to encourage the use of culture and mother tongue in teaching students at primary and lower level secondary of education JSS.
- 2- Universal Basic Education Board (UBE) may use the findings of the study to improve on their policies towards teaching-learning mathematics in both primary and JSS secondary schools. Mathematics Association of Nigeria (MAN) and Science Teachers Association of Nigeria (STAN) may also benefit from this study when planning in-service programs for teachers to learn how to use students' environmental culture and their mother tongue in teaching mathematics.
- 3- The findings of the study would help parents to understand that education is not associated with the ability to speak foreign language (English) only, but their own rich culture and native language are the most important factors for educating their children

Research Design

Quasi Experimental design was adopted using pre-test and post-test control design. Diagrammatically, the pre-test post-test control design is symbolically represented in form of two group design as stated in Abdussalami (2005) as follows:

$$\begin{aligned} G_{1(\text{exp})} &= Q_0 - X_1 - Q_2 \\ G_{2(\text{cont})} &= Q_0 - X_0 - Q_2 \end{aligned}$$

Let G_1 and G_2 represent experimental and control groups respectively. Q_0 is the pre-test questions to be administered to both groups simultaneously. X_1 is the treatment to be given to the experimental group while X_0 is the conventional method of teaching to be offered to the control group. Both the two groups will then be exposed to post-test questions Q_2 .

Population of the study

The target population of this study was the whole JSS-2 students in Sokoto States of Nigeria. It was found that there are two hundred and ninety-one (291) Junior Secondary Schools in Sokoto State with an estimated population of forty-one thousand five hundred and eight (41,508) students in JSS 2. Out of the 291 junior secondary schools in the state, sixty-seven (67) schools with an estimated population of nineteen thousand and forty-eighty (19,048) JSS-2 students were situated in Sokoto metropolis. However, only six schools in Sokoto metropolis with students' population of four thousand and fifty-one (4,051) was selected using stratified sampling method.

Sample and Sampling Techniques

Sample of six junior secondary schools were taken using purposeful random sampling technique which was in accordance with the advice of Abdussalami (2005). Proportionate method was used to determine the sample size used out of the estimated population of 4,051 students. A total number of 377 students were randomly selected from the six sampled schools which is in accordance with Krejcia and Morgan (1971) table for determining sample size from a given population.

Table 3.4.1 Sample size of six selected Junior Secondary Schools in Sokoto metropolis.

	Name of school	Sex	Number of students in JSS-2	Proportional sample size
1	Sani Dingyadi Unity Secondary School, Sokoto.	Boys	604	56
2	Giginya Memorial Secondary School, Sokoto.	Boys	620	58
3	Hafsatu Ahmad Bello Model Arabic Secondary School, Sokoto.	Girls	922	86
4	Nana Girls Secondary School, Sokoto.	Girls	576	54
5	Army Day Secondary School, Sokoto.	Mixed	659	61
6	Government Day Secondary School Runjin Sambo, Sokoto.	Mixed	670	62
	TOTOL		4,051	377

Source: Examination Unit, Ministry of Education, Sokoto (2019).

Instrumentation

Students' Mathematics Achievement Test in Geometry (SMATIG), and Jarabawar Lissafin Jometiri ta Al'ada da Yaren Uwa (JALJAU) developed by the researchers were used for data collection. In addition, Hausa lesson plans originally developed by Education Sector Support Programme in Nigeria (ESSPIN) was adapted and prepared in Hausa language for teaching JSS II geometry class by the researchers. This ESSPIN lesson plan was developed in 2016 by the United Nations Children's Emergency Fund (UNICEF) in collaboration with the Department of International Development (DFID) in the five states of Northern Nigeria

(Sokoto, Kebbi, Zamfara, Katsina and Niger States). Also normal conventional English lesson plans was prepared and used for teaching the controlled classes in the sampled schools.

Validity of the instruments

In order to establish the content validity of the instruments SMATIG and JALJAU were submitted to experts in Usmanu Danfodiyo University Sokoto (UDUS), Shehu Shagari College of Education Sokoto (SSCOE) for their assessments, comments and suggestions. On the basis of the comments and suggestions received from the judges, some of the test items were modified and some were removed. A total of twenty test items were generated each.

Reliability of the Instruments

The two instruments were subjected to test re-test method using 80 students drawn from the four other schools which comprises of two males and two female schools. Marks scored by each student from the two tests were recorded. Pearson's Product Moment Correlation was used to determine the reliability index of the instruments which was found to be 0.73 and 0.81 respectively.

Translation of Some Geometrical Terms from English to Hausa Language

Since the researchers selected geometry as a topic to be taught using Hausa language, some terms and concepts in geometry which are already in foreign language need to be translated to Hausa language. Therefore, advices of experts in Hausa linguistics from Usmanu Danfodiyo University Sokoto, Shehu Shagari College of Education Sokoto and Sokoto state media cooperation were used. On the bases of their advices the following geometrical translations were obtained and used in teaching geometry for the experimental students.

TYPE OF LINES

S/N	ENGLISH NAME	HAUSA NAME
1	Straight line	Mikakken layi
2	Curve line	Lankwasasshen layi
3	Parallel lines	Tagwayen layi mikakku
4	Perpendicular line	Shisshikakken layi
5	Horizontal line	Shimfidadden layi

DIMENSIONS

S/N	ENGLISH NAME	HAUSA NAME
1	Length	Tsayi
2	Breadth	Fadi
3	Height	Tsawo
4	Depth	Zurfi
5	Angle	Kusurwa
6	Face	Fuska
7	Side	Iyaka/gefe
8	Edge	Kereriya/Ga'ba
9	Vertex	Gwuiwa

PLANE SHAPES (2-D Shapes)

S/N	ENGLISH NAME	HAUSA NAME
1	Square	Murabba'i
2	Rectangle	Dogon murabba'i
3	Triangle	Alwatika
4	Trapezium	Hatimi/Murabba'i mai dari
5	Parallelogram	Dogon murabba'i mai karkata
6	Rhombus	Murabu'i mai karkata
7	Kite	Shirwa
8	Circle	Da'ira/Zobe
9	Polygon	Shakali

SOLID SHAPES (3-D Shapes)

S/N	ENGLISH NAME	HAUSA NAME
1	Cube	Muka'abi
2	Cuboid	Dogon muka'abi
3	Sphere	Kwallo
4	Cylinder	Silanda/zunguru
5	Pyramid	Da'la
6	Cone	Kantu/Buttami

MENSURATION

S/N	ENGLISH NAME	HAUSA NAME
1	Area	Farfajiya
2	Perimeter	Kewaye/Zagaye
3	Volume	Ho'loko
4	Capacity	Ma'aunin ciko
5	Distance	Tazara
7	Direction	Mafuskanta

DIFFERENT TYPE OF TRIANGLES AND ANGLES

S/N	ENGLISH NAME	HAUSA NAME
1	Right angle triangle	Alwatika mai kusurwar dirja chasa'in (90^0)
2	Isosceles triangle	Alwatika mai gefe biyu dai-dai da juna
3	Equilateral triangle	Alwatika mai gefofi dai-dai da juna
4	Scalene triangle	Alwatika mai gefofi iri daban-daban
5	Right angle	kusurwar mai dirja chasa'in (90^0)
6	Acute angle	Kusurwa mai tsini
7	Obtuse angle	Kusurwa mai fadi

Administration of the instrument

A pre-test and post-test was administered to all the sampled students on the same day in each sampled school. Scripts were marked by the researchers and scores were allocated accordingly.

Data Presentation

Each of the two hypotheses was tested using t-test analysis at $\alpha=0.05$ level of significance. The presentation is shown in the following order:

Hypotheses One (H_{01}) There is no significant difference in the performance of students taught geometry using Hausa language and those taught using conventional method among junior secondary schools in Sokoto State, Nigeria.

T-test analysis of null hypothesis one (H_{01})

Variables	No. of students	Mean score($\bar{x}$)	Standard deviation(σ)	df	α	t_{cal}	t_{crit}
EG	189	54.857	16.366	375	0.05	13.019	1.960
CG	188	32.915	16.358				

The results of the analysis showed that the calculated value of t (t_{cal}) =13.019 is greater than the critical value of t (t_{crit}) =1.960. This implies that null-hypothesis (H_{01}) is rejected. Therefore, there was significant difference between the performance of students that were taught geometry using Hausa language and those taught using conventional method among junior secondary schools in Sokoto State, Nigeria

Hypothesis Two (H_{02}) There is no significant difference in performance of male and female students taught geometry using Hausa language as a medium of instruction in Sokoto State

T-test analysis of null hypothesis two(H_{02})

Variables	No. of students	Mean Score ($\bar{x}$)	Standard Deviation (σ)	df	α	t_{cal}	t_{crit}
Boys	88	54.057	16.094	187	0.05	-0.624	1.972
Girls	101	55.555	16.647				

Table above shows that the calculated value of t (t_{cal} = -0.624) is less than the critical value of t (t_{crit} =1.972). The null-hypothesis (H_{02}) is not rejected. Therefore, there is no significant difference in performance of male and female students taught geometry using Hausa language as a medium of instruction in Sokoto State

Conclusion and Recommendations

From the data analysis and interpretation of results, the following recommendations were made:

- (1) Since no gender difference in Mathematics Achievement is recorded between male and female students, mathematics teachers should give equal treatment to all students in their classroom regardless of their sex differences.
- (2) Mathematics teachers should endeavor to improvise relevant instructional to be used in their day to day teaching since instructional materials simplify both teaching and learning and also encourage creativity.

- (3) Government and Educational bodies should be organizing workshops from time to time to improve teachers' capacity on how to adequately use Hausa language in teaching basic mathematics.
- (4) Ministry of Education (MOE) and Universal Basic Education Board (UBE) should come up with strategies to encourage the use of culture and mother tongue in teaching students at primary and lower level secondary of education JSS.
- (5) Mathematics Association of Nigeria (MAN) and Science Teachers Association of Nigeria (STAN) should also play their roles as rescue educational bodies in planning in-service programs for teachers to learn how to use students' environmental culture and their mother tongue in teaching mathematics.
- (6) Since significant performance was recorded as a result of using mother tongue (Hausa language), parents should understand that education is not associated with the ability to speak foreign language (English) only, but their own rich culture and native language are the most important factors for educating their children

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