

EFFECT OF LANGUAGE OF INSTRUCTION ON JUNIOR SECONDARY SCHOOL STUDENTS ACADEMIC ACHIEVEMENT IN MATHEMATICS IN NKANU EAST LOCAL GOVERNMENT AREA

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Abstract: The main objective of the study was to investigate the effect of language of Instruction on Junior Secondary school students' academic achievement in mathematics in Nkanu East Local Government area of Enugu State. A total of three hundred and eighty (380) students Participated in the study. They were drawn from two(2) Schools Specifically Jss 2. Two groups were created and randomly assigned to control and experimental groups. The study being an experimental one, focused on lexical ambiguity and achievement of Student taught mathematics in English/ Igbo and English only, Three topics : Proportion, Linear equations and inequalities were taught for three weeks in English / Igbo and English only. Ten questions in word Problems and lexical ambiguities were set in multiple choice and administered to the student. The results were analysed using Ancova to compare means. The results revealed significant difference in Students' achievement in favour of those taught in English and Igbo. It was therefore recommended that mathematical concepts should be taught simultaneously In English and the Language of the environment as it facilitates understanding. Based on the findings, It was further recommended that teachers should be trained to teach mathematical concepts using both English and the mother tongue of the students simultaneously for better understanding.

Keyword: Language, instruction, Junior Secondary school students, academics, Mathematics, Nkanu East.

INTRODUCTION

Teachers and learners of Mathematics work hard to improve student achievement in Mathematics which is persistently low, especially in external examinations (Mohammed, 2015). Several reasons have been advanced for students' poor achievement in Mathematics. Some of the reasons are attributed to teacher quality while others to the nature of the subject. All subjects of the school curriculum are taught through a language medium. Mathematics is one of the core subjects in Nigerian school system at all levels. Mathematics is full of technical terms which make it difficult to understand and not explained in a language that students understand. Given this background, the National Policy on Education (FGN, 2004) stated that for effective

teaching and learning process, particularly at the junior school level, language of such domain should be used to teach. However, the situation is different across board.

In Nigerian school systems, students are taught in English, use textbooks written in English and write examinations in English. For most of these students, English is a second, third or even fourth language. Broide (2013) noted the problems this creates for students who experience difficulties in understanding the teacher and the material as they struggle to express themselves in English. Most teachers find it difficult to teach students Mathematics in English since the students learn English as a second language. Lassa (2018) commented that "the use of foreign language in the early primary school has placed the African

child at a disadvantaged position because he has no means of communicating his thought to the teacher". The three major languages in Nigeria (Hausa, Yoruba and Igbo) are linguistically remote from English, and all extremely limited in the range of mathematical concepts and relationships they can describe easily.

The Igbos of Nigeria, for example, have no equivalence for improper fractions and thus have difficulty answering a problem such as 'seven divided by five' (Morris, 1974). Morris was of the view that students who receive Mathematics education in the same language throughout their school lives are fortunate, but for various reasons many Nigerian students do not, especially in Nkanu East LGA.

Generally speaking, Nigerian children, especially the Nkanus acquire their mother tongue and communicate in them before enrolling in schools. They have poor knowledge of English language in which Mathematical concepts are taught. These children hardly speak English at home and even in the school environment. This negatively affects both written and spoken English which is used in teaching Mathematics.

Nigeria is a multilingual nation. Bilingualism, in which English as a second language is used in teaching cannot facilitate the teaching and learning of Mathematics. Children in Nkanu grow up in a relatively remote and isolated village environment which has adequately supported the development of the mother tongue, but has not provided support for the development of competency in English. Mathematics has certain words which have different meanings in English. These are called lexical ambiguities. For example the word 'leaves' as in 'subtracting nine from twenty leaves eleven' or 'times' as in 'four times five gives twenty'. Even those who speak English as first language have to familiarize themselves with such words even though it is still

English. Learning Mathematics in a second language then entails that students should be skilled in two languages: ordinary English and Mathematical English (Mohammed, 2005).

Purpose of the Study

The purpose of this study was to determine the effect of language of instruction on secondary school students' achievement in mathematics in Nkanu East, local government area of Enugu State, Nigeria. Specifically, the study determined:

➤ The mean achievement scores of JSS2 students taught Mathematics in English/Nkanu/Igbo languages and those taught with English language only. the effects of lexically ambiguous English words on mean achievement scores of JSS2 students taught Mathematics in English/Nkanu/Igbo languages and those taught with English language only.

➤ The mean achievement scores of JSS2 male and female students taught Mathematics in English/Nkanu/Igbo languages (Experimental group).

Research Questions

The following research questions guided the study:

1. What are the mean achievement scores of JSS2 students taught Mathematics in English/Nkanu/Igbo languages and those taught with English language only?

2. What are the effects of lexically ambiguous English words on mean achievement scores of JSS2 students taught Mathematics in English/Nkanu/Igbo languages and those taught with English language only?

3. What are the mean achievement scores of JSS2 male and female students taught Mathematics in English/Nkanu/Igbo languages (Experimental group)?

Hypotheses

The following hypotheses were tested in this study:

HO₁ there is no significant difference in the mean achievement scores of students taught Mathematics in English/nkanu/igbo language and their counterparts taught in English language only.

HO₂ Lexically ambiguous English words do not significantly affect the mean achievement scores of JSS2 students taught Mathematics in English/Igbo languages and those taught with English language only.

HO₃ there is no significant difference in the mean achievement scores of male and female students taught Mathematics with English/Nkanu/ Igbo language.

Significance of the study

The result of this study will help the students to learn Mathematics concept to the root, they will be able to understand topics in their mother tongue, interpret it to what it means to them and teach other students. The students would understand what they were taught so much that they can pass the knowledge onto their peers.

The result will help Mathematics teachers/instructors to know and utilize appropriate methods in teaching or instructing students, to arrive at a point that the students will be able to teach/instruct others.

The government will benefit from this study because it will enable a proper review of the educational policy to enable the government sieve the unprofitable and cumbersome aspect of the educational policy also part of the policy that require extinction. Employment of capable teachers that are willing to learn as well as teach the students and follow the policy to the letter.

Scope of the Study

This study was focused on the effect of language of instruction on junior secondary students' achievement in Mathematics. The study was limited to Igbo speaking JSS2 public secondary schools students in Nkanu East Local Government area, Enugu State.

Three topics: proportion, linear equations and inequalities were taught. The study was restricted only to public secondary schools (government owned schools). Igbo language was chosen, it is one of the major languages in Nigeria. The study was only concerned with Jss 2 for it is the middle of the junior secondary school and it is at this level that students should be well grounded in Mathematics and it's applications in real life.

METHOD

Quasi-experimental design was adopted for this study. Two public junior secondary schools were randomly selected and two intact classes at JSS 2 level were selected randomly in each school (one for experimental group and the other for control group). A total of 380 students participated in this study.

The research instrument for this study was a ten -item multiple-choice test which was used to test students' knowledge of Mathematics word problems. In each question students were to solve the problem and then choose the correct option. The ten questions was used to test students knowledge in lexical ambiguities as they appear in Mathematics word problems. Three questions were taken from proportion, three from linear equations, and four from inequalities. The instrument was developed by the researcher using JSS2 Mathematics textbook.

The instrument was validated by three specialists in the department of science and computer Education Godfery Okoye University.

The research was carried out in three phases as follows.

Phase one: pre-test. Students were tested with ten multiple-choice questions in word problems and lexical ambiguities. They were tested in the three areas selected (proportion, linear equations, and inequalities) in order to ascertain that the control and

experimental groups were comparable in terms of achievement before the treatment phase.

Phase two: treatment for two weeks. The experimental and control groups were taught for two weeks. The experimental group was taught in English/Nkanu/ Igbo language while the control group was taught in English only.

Phase three: post- test. At this stage, the ten item test in word problems and lexical ambiguities that were administered during the pre-test were also administered to see whether the treatment had effect on students' achievement. Each student was given the tests to answer and the scripts collected and graded.

Table 1: Mean Achievement Scores and Standard Deviation of students taught Mathematics in English/Nkanu/Igbo languages and English language only

Groups	N	Pre-test		Post-test		Mean Gain
		Mean	SD	Mean	SD	
Experimental	193	34.28	10.72	62.33	12.45	28.05
Control	187	35.45	11.69	47.86	12.26	12.41
Mean Diff		1.17		14.47		15.64

The result in table one showed that students in experimental group gained higher mean scores than their counterparts in control group. Hence, this study indicates that students have higher chances of learning Mathematics and making greater achievement when they are taught in English language and their mother tongue than when taught in English language only.

Research Question 2:

What are the effects of lexically ambiguous English words on mean achievement scores of JSS2 students taught Mathematics in English/Nkanu/Igbo languages and those taught with English language only?

Table 2: Effects of lexically ambiguous English words on mean achievement scores of JSS2 students taught Mathematics in English/Nkanu/Igbo languages and those taught with English language only

Groups	N	Pre-test		Post-test		Mean Gain
		Mean	SD	Mean	SD	
Experimental	193	35.68	12.02	62.77	12.45	27.09
Control	187	35.55	12.09	55.66	12.31	20.11
Mean Diff		0.13		7.11		6.98

The result in table two showed the effects of lexically ambiguous English words on mean achievement scores of JSS2 students taught Mathematics in English/Nkanu/Igbo languages and those taught with English language only

A set of data was collected (on word problems and lexical ambiguities). The data collected was analysed using Analysis of Covariance(ANCOVA). This was used to verify the significant difference between the means of independent samples.

Research Question 1:

What are the mean achievement scores of JSS2 students taught Mathematics in English/Nkanu/Igbo languages and those taught with English language only?

the students in experimental group gained higher mean scores than their counterparts in control group. Hence, this study indicates that students have higher chances of learning Mathematics and making greater achievement even with the use of lexically ambiguous

words so long as they are taught in English/Igbo language. Hence there was a significant effect on the mean achievement scores of the experimental group, those taught in English / Nkanu/Igbo language than those taught in English language only.

Research Question 3:What are the mean achievement scores of JSS2 male and female students taught Mathematics in English/Nkanu/Igbo languages (Experimental group)?

Table 3: Mean achievement scores of male and female JSS2 students taught Mathematics in English/Nkanu/Igbo languages (Experimental group)

	N	Pre-test		Post-test		Mean Gain
		Mean	SD	Mean	SD	
Gender						
Male	93	39.18	7.02	67.08	8.14	27.90
Female	100	38.15	8.19	62.63	10.01	24.48
Mean Diff		1.03		4.45		3.42

The results in table 3 showed that there is gain in the achievement of the mean score where by the male is higher but not significant.

Test of Hypotheses 1, 2, & 3

HO₁ there is no significant difference in the mean achievement scores of students taught Mathematics in both English language and Igbo language and their counterparts taught in English language only.

HO₂ Lexically ambiguous English words do not significantly affect the mean achievement scores of JSS2 students taught Mathematics in English/Igbo languages and those taught with English language only.

HO₃ there is no significant difference in the mean achievement scores of male and female students taught Mathematics with Igbo language.

Table 4: Tests of Between-Subjects Effects for Achievement

Dependent Variable: Achievement

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Dec.
Corrected Model	51686.628 ^a	3	8614.438	80.349	.000	
Intercept	138597.370	1	138597.370	1292.724	.000	
COVARIATE (PRETEST)	125.785	1	125.785	1.173	.279	
GROUP*	49894.812	2	24050.033	-7.123	.009	S
GROUP**	48102.996	2	24051.498	-4.023	.022	S
GENDER	51686.628	2	24048.568	-13.120	.374	NS
GROUP * GENDER	48102.996	2	21.767	1.190	.850	NS
Error	50390.295	377	107.213			
Total	1723569.000	380				
Corrected Total	102076.922	379				

Key: S – significance, NS – not significance

Table four showed analysis of H_{01} represented by GROUP* which tested that there is no significant difference in the mean achievement scores of students taught Mathematics in English/Nkanu/Igbo language and their counterparts taught in English language only. From the result of the analysis the hypothesis has F-value of -7.123 with an associated, probability score of 0.009 which less than 0.05 level of significance. This implies that there is significant difference in the mean achievement scores of students taught Mathematics in English/Nkanu/Igbo language and their counterparts taught in English language only. Hence, the H_{01} of no significant difference is rejected.

Analysis of H_{02} represented by GROUP** which tested that there is no significant difference in the mean achievement scores of students taught Mathematics in both English language and Igbo language and their counterparts taught in English language only. From the result of the analysis, the hypothesis has F-value of -4.023 with an associated probability score of 0.022 which is less than 0.05 level of significance. This implies that there is significant difference in the mean achievement scores of students taught Mathematics in both English language and Igbo language and their counterparts taught in English language only. Hence, the H_{02} of no significant difference is rejected.

Analysis of H_{03} represented by gender which tested no significant difference in the mean achievement scores of male and female students taught Mathematics with Igbo language. From the results of the analysis the hypothesis has F-value of -13.120 with an associated, probability score of 0.374 which is no significant difference in the mean achievement scores of male and female students taught Mathematics with Igbo language, Is hereby accepted.

Summary of Findings.

The study based on the hypothesis tested found out the following:

1. Students who were taught in English/Igbo language achieved significantly better than those taught in English only. In other words, teaching mathematical concepts in both English and Igbo helped students to understand word problems better than teaching in English only.
2. Students who were taught in Igbo and English achieved significantly better on the lexical ambiguity test than those taught in English only.
3. The boys achieved significantly better than the girls on the basis of gender.

DISCUSSION.

The findings of this study revealed significant effect of teaching in English/Igbo/Nkanu on achievement of JSS2 students in Mathematics concepts. Those taught in English/Igbo/Nkanu significantly performed better than those taught in English only. This implies that the use of mother tongue helped the students understand the mathematical concepts better and thus improved their achievement in Mathematics .Both groups (Control and Experimental) were taught the same concepts and tested with the same test items but the experimental group significantly performed better than the control group. The result is in conformity with the findings of Abedi and Lord (2023) language development in Mathematics plays a crucial role in teaching and learning of Mathematical vocabulary, communicating ideas clearly, grasping abstract concepts, and developing meta cognitive skills, students can become proficient mathematicians (2023).

They found that language is crucial not only for the purpose of communication but for the role it plays in thinking process .The language used in thinking is

usually the language (mother tongue). Thus Mathematics taught in English might need to be translated into the mother tongue in order to converse with the teacher. They further said that errors and misunderstanding might arise at any stage of this two-way inner translation process, but a one-way communication in the mother tongue would avert these problems. Translating some of mathematical concepts in Igbo /Nkanu dialect facilitates understanding as revealed by the findings of this study.

The findings of this study also revealed that in the use of lexically ambiguous English words using Igbo language/Nkanu dialect in the course of their teaching, students understand the concepts better. This agrees with findings from Adetulas' (1990) study who found that children's achievement in mathematics depends on the language of presentation and of the problem. Language of presentation here refers to the language in which a mathematics problem is presented or stated, while that of the problem refers to the contextual meanings of the key words used in stating the problem. Being able to translate word problems into mathematical expressions correctly according to him is the right step toward obtaining the solution to the problems. It is evident from the result of this study that word problems whose lexically ambiguous English words are interpreted or translated into the language of the students are better understood than those that are not. The finding of the study further revealed that in one of the two schools, when comparison was made based on gender, the females who were taught in both English/Igbo/Nkanu significantly achieved better on word problems test than their male counterparts. Also, on lexical ambiguity test, the female students who were taught in both English/Igbo/Nkanu significantly achieved better in Mathematics than the

male students. One possible explanation for the above findings is that females seem to show higher aptitude in language than the males.

The finding of this study lends credence to Hylan's (1898) inhibition theory. The theory is based on the assumption that during the activity of any mental task which requires minimum of mental effort the subject goes through series of alternating states of distraction and attention which cannot be observed or perceived by the subject. According to the theory, what has been earlier learned interferes with what is to be learned later and what is later learned inhibits the earlier learned

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2. Students who were taught in Igbo and English achieved significantly better on the lexical ambiguity test than those taught in English only.
3. The boys achieved significantly better than the girls on the basis of gender

CONCLUSION

Based on findings of this study, the following conclusion was made.

Students understand better if teachers teach mathematical concepts in both English language and language of the environment. Presently, the Nigerian policy is in line with the finding of this study. However from our experience in the school system, most of the teachers are still complying with the old policy which states that the language of the environment should be used only for the first three

years of primary, after which English should be used. It is most probable that some of the teachers are aware of the change in policy, which now allows the use of both English and the language of the environment for teaching right from the fourth year of primary school.

Teaching in the language of the environment and English also helps in dealing with lexically ambiguous words. When lexically ambiguous English words that are used in mathematics are explained in the language of the environment, the students comprehend mathematical concepts better.

RECOMMENDATION: The researcher therefore recommend that ;

- Mathematical concepts should be taught simultaneously In English and the Language of the environment as it facilitates understanding. Based on the findings.

- It was also recommend that teachers should be trained to teach mathematical concepts using both English and the mother tongue of the students simultaneously for better understanding.

- Curriculum developers should take into consideration the language interference between English and language of the environment in their planning for Junior Secondary School students.

- Textbook writers should include materials in mother tongue or both mother tongue and English in texts since the policy says language of the environment should be used in teaching mathematical concepts at the JSS level. Lexically ambiguous words used in Mathematics should be explained as much as possible to help students understand the concepts better.

REFERENCES

Abedi, J and Lord, C.(2015).Language development in Mathematics. The Language factor in Mathematics tests. Appeared Measurement in Education, 14(3),219-234.s

Adegboye, A.O.(2013).Gender preferential and differential treatment by parents and the effect on females choice of Mathematics as a career. Journal of women in colleges of Education.2 (50 -59)

Adetula, L.O.(2016).*Language factors: Does it affect children's performance on word problems? Educational studies in Mathematics*,2,(4)351-365.

Aiken, L.R.(2014). *Verbal factors and Mathematics learning: A Review of Research. of Journal Research in Mathematics Education*,2(104-113)

Aiken,L.R.(2019). *Language factors in learning Mathematics. Review of Educational Resaerch*, 42(359-385)

Akinboye J.O. (2017). *How to study and pass important examinations. A psychological approach, Nigeria: Maritime printers.*

Alastsir, P., Carolyn, M. and Ayesha, A. (2018).*Language contextual and cultural constraints on examination performance. International Association for Educational Assessment :Jerusalem.*

Balus, I.(2020) *Learning style factors and mathematics performance : Sex related differences. International Journal of Educational Research.*

Beal, C ,Adams , N and Cohen, P.R (2016). *Reading proficiency and mathematics problem solving by High School Language learners .Urban Education*,44 (58-74)

Clarkson, P.C (2014). *Mathematics in a multilingual society*.

Dauda, B. (2021). *Women and Mathematics , Is there a problem? Educating the Nigerian women for the 1990,s.National symposium conducted at the university of Maidugu Hylan , J.P (1898)(Reviewed 2016).The fluctuation of attention. The psychological Review Series of Monograph supplements, VOL. 2.New York: The Macmillan Company.*

FIELD A. (2013). *Discovering statistics using IBM SPSS statistics*. 4th ed Sage, London, pp. :486–89. [[Google Scholar](#)]

Rutherford A. (2001). *Introducing ANOVA and ANCOVA: a GLM approach*. 2nd ed Sage, London, pp.: 105. [[Google Scholar](#)]