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Prof. Ibitamuno Mitchell Aminigo
Department of Educational Foundations
Faculty of Education, P.M.B. 5323
University of Port Harcourt.
Mobile: +234 703 652 8254
Email: imaminigo@yahoo.com

Technical/Associate Editor:

Dr. Abdulrahman Yusuf M.
Department of Educational Foundations
Faculty of Education, P.M.B. 5323
University of Port Harcourt.
Mobile: +234 803 234 5719
Email: yusuf.abdulrahman@uniport.edu.ng

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List of Contributors

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13. [illegible] of Curriculum Studies, Faculty of Education, University of Lagos, Akoka, Yaba.
14. **Iya Aliyu Gana**, Department of Education, University of Maiduguri.
15. **Dr Ekpo, G.U.A**, Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt and **Ogunleye A. Victor**, *Ph.D*, Department of Human Kinetics and Health Education, University of Port Harcourt, Nigeria.
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17. **Abali, Soala Obadiah**, Department of Educational Management, Faculty of Education, University of Port Harcourt.

18. **Njoku Chimezie**, *Ph.D and* **Anyanwu Jerome**, *Ph.D;* Dept. Of Curriculum Studies and Educational Technology, Faculty of Education, University Of Port-Harcourt.

19. **Adediran, Olusola Akintunde**, *Ph.D;* Department of Educational Psychology, Emmanuel Alayande College of Education, Oyo and **Adediran, Mary Adejoke**, Department Of Primary Education Studies, Emmanuel Alayande College Of Education, Oyo.

20. **Dr. Jerome Anyanwu**, Department of Curriculum Studies and Educational Technology, University of Port Harcourt, Rivers State, Nigeria.

21. **Johnson E. Maciver**, *Ph.D;* Department of Educational Foundations, Niger Delta University Wilberforce Island, Bayelsa State.

22. **Ojokheta, K.O**. *Ph.D* and **Nwogu, G.A.** *M.Ed*; Department of Adult Education, University Of Ibadan, Nigeria.

23. **Busari Atinuke Rashidat** (Mrs), Department of Educational Psychology, Guidance and Counselling, Faculty of Education, University of Port Harcourt, Port Harcourt Rivers State.

24. **Prof. [Dame] N. C. Okorie, Assor Blessing** and **Ihua Jonathan N.**; Department of Educational Management, Faculty of Education, University of Port Harcourt.

25. **Comfort Achama Malik M.**; Department of Educational Management, Faculty of Education, University of Port Harcourt.

26. **Sam Zibo Porbeni**, *Ph.D* and **Omgbou Augustine Victor**, Dept. of Educational Foundations, Niger Delta University, Wilberforce Island, Bayelsa State.

27. **Dr. Pac Ordu**, School of Business Education, Federal College of Education (Technical), Omoku, Rivers State, Nigeria.

28. **Amosa Abdulganiyu Alasela**, Department of Science Education, Faculty of Education, University Of Ilorin, Ilorin, Nigeria.

29. **Ukwuije Chinedu Kelechi**, *NCE, B.Ed, M.Sc.,* Department of Educational Psychology, Guidance & Counselling, University of Port Harcourt.

30. **Dr. Ibrahim I. Abdulrahaman**, Kwara State College of Education, Ilorin, Kwara State, Nigeria.

31. **Kebbi Janet Amasinghna**, *Ph.D;* Department of Educational Foundations, Faculty of Education, Niger Delta University, Wilberforce Island, Bayelsa State – Nigeria.

32. **Joshua O. Adeleke** and **Catherine B. Ogunremi**, Institute of Education, University Of [illegible]

33. **Dr. (Mrs.) G. I. Osa-Edoh**, Department of Educational Psychology and Curriculum Studies, Faculty of Education, University of Benin, Benin-City- Nigeria.

34. **Paulley, F. Godgift**, *Ph.D; mnim*, Department of Educational Foundations, Faculty of Education, Niger Delta University, Wilberforce Island, Bayelsa State.

35. **Kpolovie, Peter James**, Department of Educational Psychology, Guidance And Counselling, Faculty of Education, University of Port Harcourt and **Obilor, Isaac Esezi**, Department of Finance, Rivers State College of Arts and Science, Port Harcourt

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EFFECT OF LANGUAGE OF INSTRUCTION AND PUPILS' ATTITUDE ON THE PERFORMANCE OF PRIMARY SCHOOL PUPILS IN MATHEMATICS

By

JOSHUA O. ADELEKE
Institute of Education, University of Ibadan, Nigeria.
+2348033510688
joadeleke@yahoo.com

&

CATHERINE B. OGUNREMI
Institute of Education, University of Ibadan, Nigeria.
+23480540271129
shalomoluwaremi@yahoo.com

Abstract

This study investigated the effects of language of instruction, numerical ability and pupils' attitudes on the achievement of primary school pupils in mathematics. The study is quasi-experimental, using a 3 x 2 x 2 factorial design. Multistage sampling technique was adopted in selecting six Primary schools from three randomly selected Local Government Areas in Oyo central Senatorial zone of Oyo state where intact class of primary five pupils were used. The data collected were analysed using Analysis of Covariance. Seven research questions were stated and answered with significance level set at 0.05. The findings showed that there is significant main effect of treatment on pupils' achievement in mathematics, the pupils that were taught with Yoruba language performed better in Mathematics than the group that was taught with English language only and the group taught with combination of Yoruba and English languages. However, numerical ability and pupils' attitude did not significantly contribute to students' mathematics achievement in this study. It is therefore recommended that government should formulate and enforce a policy that, mother tongue or the [illegible] for all primary school pupils in order to lay good foundation for this subject right from primary school. Mathematics textbooks should be written either in the pupils' mother tongue (MT) or language of immediate community (LIC).

Keywords: Language of Instruction, Attitude , Performance in Mathematics.

Introduction

Mathematics has been an indispensable subject in the school curriculum right from the time of early educators such as Plato and Aristotle. Then literacy was viewed as acquisition of 3Rs: that is Reading, Writing and Arithmetic. Even a stack illiterate is expected to have the knowledge of simple calculations to be able to cope effectively with activities in the society.

Furthermore, mathematics is a powerful tool in providing means in understanding engineering, science and technology, e. t. c. (Mohammed, 2000). No wonder the Federal Government of Nigeria (2004, section 5; pg19 & 20) in the National Policy on Education includes mathematics among the core subjects in the junior secondary school certificate examination (JSSCE) and at the senior secondary school level. The new trend in the Nigerian Universities especially Federal University of Technology, Yola, whereby all undergraduates' students, no matter the field must have credit in mathematics before admissions could be granted such students, attest to the fact that the case of mathematics in our society could not be treated with just a wave of hand (Ogunremi, 2006).

Despite the indispensability of mathematics in all human endeavours, the larger ratios of learners in all institutions of learning have always been looking at mathematics as a 'god' that can never be pleased. They see mathematics as a 'master' that can never be satisfied. On the contrary, a handful of students see mathematics as a simple subject which is not difficult than any other subject on the school curriculum. The above observation is correct as the yearly SSCE and NECO mass failure in mathematics all over the country testifies to this truism.

A lot of factors have been attributed to this general poor performance of students in mathematics in this country. This ranged from the blames directed to the teachers of mathematics, students' negative attitudes towards the subject due to their naive on the importance of the subject in human endeavours, lack of encouragement by the parents and the governments, the abstract nature of mathematics etc. The areas where scholars have not researched much into are the attitudes of pupils towards the subject and impact of the language of instruction being used to disseminate knowledge to the learners especially in the primary schools which constitutes the first rung of ladders in academic institutions. These are the focus of this research.

Language is a major means of expression for man and it is through language that social influences are felt. If there is no good communication between teacher and pupils, the chances of an effective education is little. It is generally believed that a child learns better in his mother tongue. (Bamgbose, 2003; Walter, 2008) Teaching a child in his mother tongue makes things concrete to him and he can reason along with his teacher. Skutnabb–Kangas (2000) stressed that instruction through a language that learners do not speak has been called 'submersion' because it is analogous to holding learners under water without teaching them how to swim. Heugh (2006) in the study carried out discovered that, the language models used in Africa fail the majority of students and early change to English/French/Portuguese/Spanish medium (language) of school instruction is a primary cause of failure and drop-out rate.

Also, pupils' attitude towards mathematics is very crucial as it determines their performance in the subject. Odual (2010) asserts that student's lack of interest in science and mathematics makes it difficult for the teachers to impact science knowledge to them. He further said that student attitude towards a school subject determines his disposition to the subject. Numerical ability is the ability to understand and work with numbers and with ideas related to numbers. According to Adegoke (2000) numerical ability is widely applied in the study of science. He stressed that numerical ability appears to be major determinant of students' cognitive achievement in physics.

Statement of the Problem

This study sought to find out the effect of language of instruction, numerical ability and pupils' attitude on the performance of primary school pupils in mathematics.

Hypotheses

H_{01} There is no significant main effect of:

a) treatment on pupils achievement in mathematics
b) numerical ability on pupils achievement in mathematics
c) attitude on pupils achievement in mathematics

Ho_2 There is no significant first order interaction effect of:

a) Treatment and attitude on pupils' achievement in mathematics.
b) Treatment and attitude on pupils' achievement in mathematics.
c) Attitude and numerical ability on pupils' achievement in mathematics

Ho_3 There is no significant second order interaction effect of treatment, attitude and numerical ability on pupils' achievement in mathematics

Methodology

This study adopted quasi experimental design which implies that variable was manipulated.The sample for this study was obtained using a multi stage sampling techniques. From three senatorial zones of Oyo State, one senatorial zone was randomly selected. Three local government areas from Oyo Central senatorial zones were randomly selected. Finally two schools from each of the three selected local government areas were randomly selected.

Three different instruments were used to collect data, namely:

i. Mathematics Achievement Test (MAT): This instrument was designed to obtain information on the effect of language instruction on the pupils' achievement in mathematics. It consisted of two parts. The first part, consist of instruction while the second part consist of objective questions to test effect of language of instruction on the pupils performance.
ii. Numerical Ability Test (NAT): This instrument was designed to obtain information on the pupils' numerical ability. The first part, consist of instruction while the second part consist of objective questions to test the pupils' ability in mathematics.
iii. Attitude Questionnaire (AQ): This instrument was designed to obtain information on the pupils' attitude towards mathematics. It consists two parts. The first part consist information about the pupil and school. The second part consist statements that elicits information about individuals' present attitude towards the subject, mathematics teacher, mathematics lesson, class work and assignment on mathematics.

The researchers used eight weeks in carrying out the research work. The first week was used in training the research assistants on how to use the instruments in gathering the data and how to apply treatment after the pre-test. The second week was used for administration of pre-test. Still the second, third, fourth, fifth, sixth and seventh weeks were used in giving treatment after pre-test. Then post-test was administered on the eight week. Intact primary five classes were used in the six schools. Analysis of Covariance (ANCOVA) was used to analyse the data collected for this study

Results and Discussions

Ho_1 There is no significant main effect of:

a) Treatment on pupils achievement in mathematics
b) Numerical ability on pupils achievement in mathematics
c) Attitude on pupils achievement in mathematics

Ho_3: There is no significant second order interaction effect of treatment, attitude and numerical ability on pupils' achievement in mathematics

Table 1: Analysis of Covariance (ANCOVA) of Treatment on Pupils' achievement in Mathematics

Source of variation	Sum of Squares	Df	Mean Square	F	Sig.	Eta Squared
Corrected Model	3125.052(a)	12	260.421	22.008	.000	.585
Intercept	8355.680	1	8355.680	706.117	.000	.791
Pretest	7.319	1	7.319	.619	.433	.003
Treatment	2173.046	2	1086.523	91.819	.000	.495
Level of numeric ability	.979	1	.979	.083	.774	.000
Level of attitude	41.185	1	41.185	3.480	.064	.018
Treatment * level of numeric ability	23.856	2	11.928	1.008	.367	.011
Treatment * level of attitude	.120	2	.060	.005	.995	.000
Level of numeric ability * level of attitude	.001	1	.001	.000	.992	.000
Treatment * level of numeric ability * level of attitude	15.996	2	7.998	.676	.510	.007
Error	2212.823	187	11.833			
Total	30091.000	200				
Corrected Total	5337.875	199				

a R Squared = .585 (Adjusted R Squared = .559)

Table 1 shows the summary of Analysis of Covariance (ANCOVA) of tests of between-subjects effects. The table reveals that the observed mean difference among the three treatment groups was statistically significant $F_{(2, 187)} = 91.819$; $P < .05$, partial eta squared $T^2 = .495$. Therefore, the effect size (49.5%) of treatment on pupils' achievement in mathematics is moderate. This means that there is statistical significant main effect of treatment on pupils' achievement in mathematics. In order to determine which group differs significantly among the three treatment groups, Pair wise Comparison Post hoc test (sidak) was conducted and the results are presented in table 2

Table 2: Pair wise Comparisons Post hoc test (Sidak) Dependent Variable: Posttest

(I) Treatment	(J) Treatment	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
		Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound
Yoruba and English instruction	Yoruba Only	-6.668(*)	.672	.000	-8.286	-5.050
	Conventional	3.983(*)	.659	.000	2.396	5.571
Yoruba Only	Yoruba and English instruction	6.668(*)	.672	.000	5.050	8.286
	Conventional	10.651(*)	.797	.000	8.731	12.571
Conventional	Yoruba and	-3.983(*)	.659	.000	-5.571	-2.396

English instruction	Yoruba Only	-10.651(*)	.797	.000	-12.571	-8.731

Note*the mean difference is significant at the .05 level.

Table 2 shows that pupils that Yoruba language was used for teaching them as a language of instruction differ significantly from the other two groups.

Table 3: Mean Difference of level of Numeric Ability

level of numeric ability	Mean	Std. Error	95% Confidence Interval	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Low	10.997(a)	.464	10.081	11.913
High	11.164(a)	.348	10.477	11.851

From the Table 3 the result shows that the high numerical ability group had the higher mean score (Mean (M) = 11.164) and the low ability had lower mean score (M= 10.997). The mean difference between high and low numeric ability groups is .167. However, this mean difference between the groups is not statistically significant is not statistically significant $F_{(1,187)} = .083$; $p > .05$, partial eta squared $T^2 = .000$ (Table 1). There that the difference between high and low numeric ability pupils is not significant. There is no significant main effect of numeric ability on the pupils' achievement in mathematics. Therefore, there is no effect size. The null hypothesis was therefore not rejected.

Table 4: Mean Difference of level of attitude

level of attitude	Mean	Std. Error	95% Confidence Interval	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Low	10.538(a)	.445	9.661	11.415
High	11.622(a)	.374	10.885	12.360

a Covariates appearing in the model are evaluated at the following values: pretest = .84.

Table 4 reveals that the high attitude group had higher mean score (Mean (M)) = 11.622) while the low attitude had the lower mean score (M = 10.538). The mean difference between the high and low attitude group is 1.084. However, the mean difference between high and low attitude groups is not statistically significant that there was no significant $F_{(1, 187)} = 3.480$; $P > .005$, partial eta squared T^2 =.018 (Table 1). There is no significant main effect of attitude on the pupils' achievement in mathematics. Therefore, the effect size (1.8%) of attitude on the pupils' achievement in mathematics is extremely small. The null hypothesis was not therefore rejected.

Ho_2. There is no significant first order interaction effect of:

a) Treatment and numerical ability on pupils' achievement in mathematics.
b) Treatment and attitude on pupils' achievement in mathematics.
c) Attitude and numerical ability on pupils' achievement in mathematics

Table 5 Mean differences of Treatment and Numeric Ability on Pupils' Achievement in Mathematics

Treatment	Level of numeric ability	Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound	Lower Bound	Upper Bound
Yoruba and English instruction	Low	9.599(a)	.469	8.674	10.524
	High	10.772(a)	.533	9.721	11.823
Yoruba Only	Low	17.025(a)	.994	15.065	18.985
	High	16.682(a)	.564	15.570	17.794
Conventional	Low	6.367(a)	.851	4.689	8.046
	High	6.037(a)	.707	4.642	7.432

Table 5 presents the summary of mean score of pupils' achievement in mathematics. From table 1 the observed differences in the mean score are not statistically significant, $F_{(2,187)} = 1.008$; $p > .05$, partial eta squared $T^2 = .011$. The effect size (1.1%) of treatment and numeric ability on pupils' achievement in mathematics is small. Therefore, the null hypothesis was not rejected.

Table 6: Mean Differences of Treatment and Attitude on the Pupils' Achievement in Mathematics.

Treatment	level of attitude	Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound	Lower Bound	Upper Bound
Yoruba and English instruction	Low	9.623(a)	.539	8.559	10.686
	High	10.748(a)	.461	9.839	11.658
Yoruba Only	Low	16.355(a)	.959	14.463	18.247
	High	17.351(a)	.630	16.108	18.594
Conventional	Low	5.637(a)	.747	4.163	7.112
	High	6.767(a)	.816	5.157	8.377

a Covariates appearing in the model are evaluated at the following values: pre-test = .84.

Table 6 presents the summary of mean score of pupils' achievement in mathematics using the interaction of treatment and pupils' attitude. From Table 1the observed differences in the mean scores are not statistically significant, $F_{(2,187)} = .005$; $P > .05$, partial eta squared $T^2 = .000$. There is no effect size (0%).

Table 7: Mean Differences of Numeric ability and Attitude on pupils' Achievement in Mathematics

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Level of numeric ability * level of attitude	.001	1	.001	.000	.992	.000
Error	2212.823	187	11.833			

Table 7 shows the summary of mean scores of pupils' achievement in mathematics using the interaction of numeric ability and attitude. From Table 1 the observed differences in the mean scores are not statistically significant $F_{(1,187)} = .000$; $P > .05$, partial eta squared $T^2 = .0$. Therefore, there is no effect size (0%) of numerical ability and attitude on pupils' achievement in mathematics

Table 8: Mean Differences of treatment, numeric ability and attitude on pupils' achievement in mathematics

Dependent Variable: post-test

Treatment	level of numeric ability	level of attitude	Mean	Std. Error	95%Confidence Interval	
			Lower Bound	Upper Bound	Lower Bound	Upper Bound
Yoruba and English instruction	Low	Low	8.882(a)	.651	7.598	10.166
		High	10.316(a)	.675	8.985	11.647
	High	Low	10.363(a)	.860	8.667	12.060
		High	11.181(a)	.629	9.941	12.421
Yoruba Only	Low	Low	16.170(a)	1.733	12.750	19.589
		High	17.880(a)	1.005	15.898	19.862
	High	Low	16.540(a)	.837	14.890	18.191
		High	16.823(a)	.752	15.340	18.306
Conventional	Low	Low	6.304(a)	.954	4.422	8.187
		High	6.430(a)	1.410	3.649	9.212
	High	Low	4.970(a)	1.151	2.699	7.241
		High	7.104(a)	.813	5.500	8.709

Covariates appearing in the model are evaluated at the following values: pre-test = .84.

Table 8 presents the summary of mean score of pupils' achievement in mathematics using interaction of treatment, numerical ability and attitude on the pupils' achievement in mathematics. From Table 1, the observed differences in the mean scores are not statistically significant, $F_{(2,187)} = .676$; $P > .05$, partial eta squared $T^2 = .007$. The effect size .7% is extremely small. The null hypothesis was therefore not rejected.

Discussion

This result reveals that, the pupils that were taught with Yoruba language as a language of instruction during mathematics lesson, performed better than both the group that was taught with Yoruba and English languages combined and the group that was taught with English language only. The finding of this study agrees with Alidou, et al, (2006), Fafunwa et al (1975), Ramirez et al (1991) and Thomas & Collier (2002). They found out that pupils that were taught mathematics, language and science with their home language performed better than their counterparts that were taught with language that is different from their home language (which is the mother tongue).

In the same vein, Hovens (2002 & 2003) in the study carried out in Niger that tested bilingual and non-bilingual in L1 and L2 clearly demonstrated that those who did best were bilingual students tested in the L1, while those who performed low were non-bilingual students tested in the L2. Though some scholars envisage that problems like obstacle to national unity; rise in costs, lack of books and teaching materials, translation, publication and circulation if mother tongue is used in education, it seems there is no research work that disagrees with the findings of this study.

The table 3 shows that the numeric ability has nothing to do with the pupils' achievement in mathematics because the difference in the performance of pupils with high ability and pupils with low ability is not significant. This finding agrees with Ishola (2002) in Odual (2010) who established that the interaction effect of treatment, numerical ability and gender as correlates of students did not yield any significant difference in their physical treatment. Furthermore, the findings of this study also revealed

that there is clearly indication that pupils attitude is not a strong determinant of their performance in mathematics achievement. This result supports Onobanjo (2000) in Odual (2010); who affirmed that attitude towards mathematics does not directly affect students' performance in the subject.

Conclusion

This study revealed that the pupils that were taught mathematics with Yoruba language as language of instruction performed better than their counterpart that were taught with Yoruba and English and the pupils that were taught with only English language. Equally, the study revealed that pupils' attitude and numerical ability had no effect on their achievement in mathematics.

Recommendations

1. With the high rate of failure in mathematics, mother tongue or the language of immediate environment should be the language of instruction in mathematics class for all primary school pupils in order to lay good foundation for this subject right from primary school. Teaching with familiar language will eradicate phobia in the subject.
2. Mathematics books written either in the pupils' mother tongue (MT) or language of immediate community (LIC) should be made available for Basic Education level so that the teachers could get materials for teaching.
3. Academic programmes designed by the Ministry of Education to improve quality of education should lay emphasis on the use of MT or LIC for teaching of mathematics in primary schools.

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