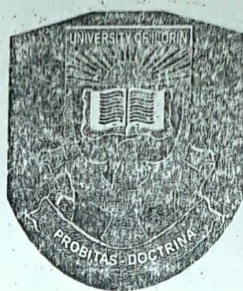
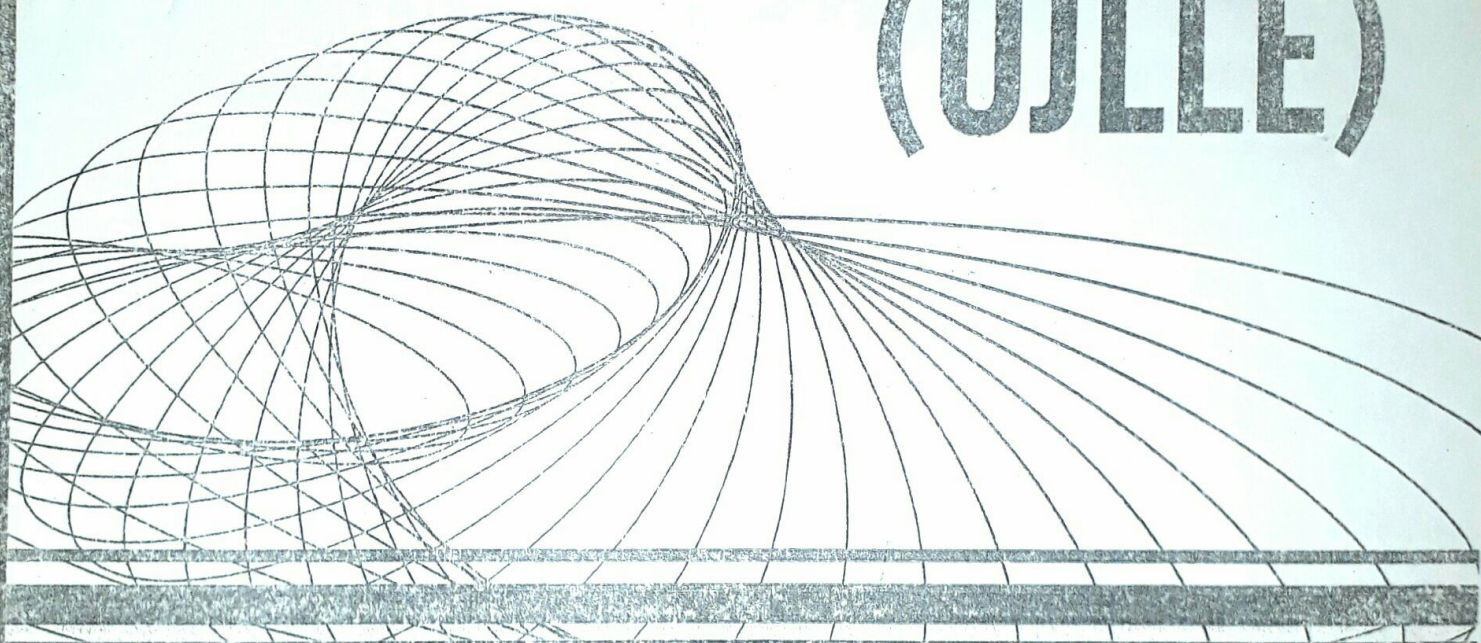


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EFFECT OF THE MOTHER TONGUE ON STUDENTS' PERFORMANCE IN SENIOR SCHOOL MATHEMATICS IN ÒGBÓMỌŞÓ, NIGERIA

Victoria Olúðúnni ÒGÚNNÍRAN,
ogunniran.vo@unilorin.edu.ng;

&

Surajudeen Adéwálé BADRU
walebadru4real@gmail.com;
Department of Arts Education,
Faculty of Education,
University of Ilorin,
Ilorin, Nigeria

Abstract

The woeful performance of the students in Mathematics has been the concern of the students, parents, teachers, government and the society as a whole. It was the compelling issue that led to this study, and discovered that the mathematical concepts, terms and skills are difficult, and the fact that Nigerian students have to be taught in a second language compounds the problem. This research work examined the effect of the Mother Tongue (MT) on students' performance in the Senior School Mathematics in Ogbomoso South Local Government, Oyo State. Two purposes of the study, two research questions and hypotheses were formulated to guide the study. The Non-equivalent Control Group design was adopted for the study. Two senior secondary schools were sampled from Ogbomoso South Local Government Area of Oyo State. One of the intact classes constituted the Experimental Group while the other served as the Control Group. One hundred and eighteen (118) students and five (5) teachers participated in the study: 62 students were in the experimental group while 56 students were in the control group. The instruments for data collection were pre-test multiple choice questions; teaching packages; and post-test multiple choice items. The instruments were validated and tested for reliability at 0.693 and was used to collect data for this study. Two hypotheses were postulated and tested using the Analysis of Co-variance at the 0.05 level of significance. The result of this study showed that there was a significant difference in the performance of students taught Mathematics through the medium of English and the MT, and their counterparts (i.e. the 56 students in the Control Group) taught through the medium of English without the MT. Thus, the study favoured the initial 62 students in the Experimental Group who learnt Mathematics through the medium of English and the MT. On the basis of these findings, it was recommended that teachers of Mathematics should use the MT and the language of instruction by code mixing and code switching to teach mathematics effectively and to explain the content of the subject when necessary.

Keywords: Mother Tongue (MT), Students' Performance, Mathematics, Medium of instruction, Code mixing, Code switching

Introduction

Mother Tongue (MT) is an instrument for the development of the human mind, it is through the skills achieved in the MT that the child expresses all his feelings and desires and also understands the feelings and desires of others (Chanda, 2010). Awóniyí (1978) describes the Mother Tongue as "the language which a group of people considered as inhabitants of an area acquired in the early years and which eventually becomes their natural instrument of thought and communication" (p3). Hence, the MT develops the learners' cognitive and intellectual capacity. Fudor (2004) affirms that language is a decisive factor in the development of thinking, formation of concepts and release of potential intelligence. In which case, anything learnt in one's MT will have more personal meaning and relevance to him, since we

think through a medium, and of course is a language. Therefore, for the effectiveness of teaching and learning Mathematics, the MT of students can be employed with the language of instruction. This means that the bilingual situation will improve students' competence in Mathematics.

Mathematics is a way of thinking and organizing a logical proof. As a way of reasoning, it gives an insight into the power of human mind and this form a very valuable teaching learning programme of school subjects everywhere. Townsis (1993) considers Mathematics as essential not only for living in the society but also for making useful contributions towards the development of one's environment. Mathematics plays a crucial and unique role in human societies and represents a strategic subject in the development of mankind. The importance of Mathematics and its contribution to man's daily life gives the subject the prominence it enjoys among other school subjects. This has earned it the status of a 'core subject' in the primary and the secondary schools curricula (Federal Republic of Nigeria, 2013). In this modern age of Science and Technology, emphasis is given to the teaching and learning of Sciences such as Physics, Chemistry, Biology, Medicine and Engineering. Mathematics is seen as an efficient and necessary tool being employed by all these Sciences. As a matter of fact, all these Sciences progress only with the aid of Mathematics. So it is aptly remarked, "Mathematics is a Science of all Sciences and art of all arts." "A Science is exact only in so far as it employs Mathematics". So, all scientific education which does not commence with Mathematics is said to be defective at its foundation. Neglect of mathematics works injury to all knowledge (Kant, 1992).

Despite the status and recognition accorded Mathematics, most Nigerians are figure-phobia (Gbólagadé, Waheed, & Sàngóniyí, 2013), and this leads to anxiety: hence the negative self-concept and finally, poor performance in Mathematics. However, Eke (1986) explains that the scientific concepts, terms and thinking are difficult enough by themselves and the fact that Nigerian children have to be taught these in a second language situation compounds the problem. Their tasks are threefold; they have to attain linguistic competence; make sense of the instructional tasks which are presented in L_2 and face with the problem of mastering the content itself. Yushau and Bokhari (2002) carried out a research to address the language barrier at King Fahd University of Petroleum and Mineral in Saudi Arabia. English was strictly maintained as the medium of instruction, but a handout of Arabic translation of the mathematical terminology of the entire course was given to the students. This involvement of the MT of students helped students to recall the mathematical concepts and they performed better. Noren (2007) had investigated the effectiveness of the use of the Mother Tongue in the Mathematics class in Stockholm, the immigrant pupils were involved. The teaching was done through Swedish (MOI) and Somali (MT of students). At the end, it was discovered that the students performed better, the fear and anxiety for Mathematics vanished and they felt comfortable and this improved teacher-students relationship. Yip, Tsang & Cheung (2003) conducted a research in Hong-Kong to investigate the effect of the MT on the performance of students in Mathematics. Two schools were involved, one school (control group) was taught through English and the second (experimental group) was taken through the MT of students (Chinese). It was discovered that the students that were taught through the medium of the MT and English performed better than their counterparts that were taught through the medium of English without the MT.

Countries like Hong-Kong, Japan, Dutch, Germany and France that emphasize the use of the Mother Tongue as the medium of instruction have all round success, especially in sciences. The academic, social and political performances as well as economic situation of those countries are better off, because instructions, skills and knowledge are passed to the students in their native language (Bámgbósé, 1987). The Science Teachers Association of Nigeria (STAN) (1992) gives evidence from the Second International Science study which shows Japanese primary school children came first in Primary

Science competition among various countries of the World, while Nigeria pupils came last.

Harker (2000) investigates gender differences in achievement of boys and girls in New Zealand. The result showed that there was significant difference in the performance of boys and girls; he explained that boys performed better in Mathematics, while girls perform better in English. However, Okeke (2004) states that there is no significant difference in the achievement of boys and girls in Science. The academic performance of senior secondary students in Mathematics in Nigeria has not been encouraging over the last some years or so. Tables 1 and 2 are presented to provide an empirical support for the above observation. Below is the result in Mathematics from year 2006 to 2010 SSCE as conducted by WAEC and NECO.

Table 1: The results for WASSCE May/June, 2006-2010(Mathematics)

Year	No. of Students	Students with A - C Grades	Percentage (%)
2006	526	16	3.00%
2007	829	15	1.80%
2008	589	39	6.60%
2009	505	4	0.80%
2010	386	20	5.10%

Source: Collection from various Secondary Schools in Ògbómòsò South Local Government Ògbómòsò, Òyó State by the researcher.

Table 2: The result for SSCE (NECO) (Mathematics)

Year	No. of Students	Students with A - C Grades	Percentage (%)
2006	631	262	41.50%
2007	595	243	40.80%
2008	722	209	29%
2009	497	21	4.20%
2010	334	42	12.50%

Source: Collection from various Secondary Schools in Ògbómòsò South Local Government Ògbómòsò, Òyó State by the researcher.

Tables 1 and 2 confirmed our earlier assertion that the academic performance of senior secondary school students in Mathematics has been poor over the years. Yet, Mathematics is a core subject. Without a credit pass in it, students cannot be admitted into Nigerian universities.

The tables 1 and 2 above are the evidences of the woeful performance of the senior secondary students, and one basic explanation for the phenomenon of poor academic performance in Mathematics is that students do not have a good grasp of the subject because they are taught solely in English. Had their Mother Tongue been used to supplement English as a medium of instruction, their academic performance would have been better. The woeful performance of students in Mathematics is a source of concern of the parents, teachers, students and the nation at large. It is the same concern that prompts the researcher to go into this study and examine how the Mother Tongue of students could be of help in the Mathematics class. Two schools were purposively chosen, one intact class was an experimental class, and being taught through the medium of English and the Mother Tongue of students while the control group was taught through the medium of English, without the MT. Simply, there is a significant difference in the performance of students, when they were taught through the medium of English and the Mother Tongue.

Studies conducted by Oládiipò (1990); Yushau & Bokhari (2002); Yip, Tsang and Cheung (2003); Noren (2007); show that the performance of students in Mathematics improved significantly when their Mother Tongue was used to teach the subject. Yorùbá, Bahasa, Melayu and Somali were the Mother Tongues of the learners used to teach Mathematics. Fafunwa's (1970-1975) Ifè Six -Year Primary Project (SYPP), the Rivers Readers Project (RRP) 1975 and Oládiipò (1990) had carried out researches on the effect of the Mother Tongue on students' performance in Mathematics and other subjects respectively in Nigeria.

Research Questions

The following research questions were raised in this study;

1. Is there any difference in the performance between students who learnt Mathematics through the medium of English and the Mother Tongue and their counterparts taught in English without the Mother Tongue?
2. Is there any difference in the performance between male and female students who learnt Mathematics through the medium of English and the Mother Tongue?

Research Hypotheses

Ho₁: There is no significant difference in the performance of students who learnt Mathematics through the medium of English and the Mother Tongue and their counterparts taught in English without the Mother Tongue.

Ho₂: There is no significant difference in the performance of male and female students who learnt Mathematics through the medium of English and the Mother Tongue.

Methodology

The non-equivalent control group design which is one of the quasi- experimental designs was adopted for this study. The population for this study consisted of all the senior school students in Ògbómòsò South Local Government Area of Òyò State. The study sample consisted of the senior school one students. Two schools were purposively selected out of 21 schools. A total number of 118 students (54 males and 64 females) and 5 teachers of Mathematics participated in this study. Two intact classes participated in the study from two schools; one class was used for the experimental class, while the second one stood for the control group. The experimental group was exposed to the experimental treatment which was teaching Mathematics through the medium of English and the Mother Tongue (Yorùbá) and the

control group was taught Mathematics through the medium of English without The Mother Tongue

Table 3 A diagrammatical representation of the study design

Group	Pre-test	Treatment	Post-test
Experiment	O_1	X	O_2
Control	O_3		O_4

The instruments for this study included pre-test, post-test and teaching packages. The test items and teaching packages were prepared based on the topics in the senior secondary school one (SSS1) syllabus. Six weeks were separated for this study, the pre-test was administered in the first week, the teaching activities was carried out for six weeks precisely and the post-test was administered in the last sixth week. The participants in each group were exposed to the pretest in Mathematics to examine their previous knowledge in this core subject. The post-test was administered after the teaching exercise to check the effect of the Mother Tongue on the performance of students in Mathematics. The following topics were carefully selected (from sss1 syllabus) for the teaching package: (1). Idea of sets; (universal, finite, infinite, subjects empty and disjoint), (2). Union (intersection, complement and empty sets), (3). Venn diagrams. The test items and teaching packages were validated by two experts in the field of Mathematics. The reliability of the instrument was established through the use of split-half method. The correlational analysis data generated was done using Spearman's Rank Order Co-efficient. A reliability co-efficient of 0.693 was obtained. The instruments (pre-test, teaching package for mathematics, and post-test) were carefully administered by researcher assistants who are the experts in mathematics in those selected schools. The two postulated hypotheses were tested using the Analysis of Co-variance (ANCOVA) at the 0.05 level of significance. The results are presented in the table that analysed the performance of students in mathematics.

Results

Hypothesis 1: *There is no significant difference in the performance between students who learnt Mathematics through the medium of English and the Mother Tongue (Yoruba) and their counterparts taught in English without the Mother Tongue*

Table 4: ANCOVA Analysis showing the Performance of Students in Mathematics

Source	Type III Sum of Squares	DF	Mean Square	Calculate F Value	Sig
Corrected model	4566.243 ^a	2	2283.1	82.341	.000
Intercept	6504.157	1	6504.2	234.573	.000
Pretest	3.043	1	3.043	0.11	.741
Groups	4513.04	1	4513	162.763	.000
Error	3188.681	115	27.728		
Total	87679	118			
Corrected Total	7754.924	117			

a. R Squared = .589 (Adjusted R Squared = .582). P less than 0.05

Table 4 shows that the calculated F-value is 162.763 (1:117) = (0.000) computed at critical P - Value of 0.05. Since the calculated P value (0.000) is less than the critical Pvalue 0.05, hypothesis 1 is not accepted. This implies that there is a significant difference between the two groups. It means the students taught through the medium of English and Mother Tongue (Yoruba) performed better than their counterparts taught through English only.

Hypothesis 2: There is no difference in the performance between male and female students who learnt Mathematics through the medium of English and the Mother Tongue.

Table 5: ANCOVA Analysis showing the Significant Difference in the Performance of Male and Female Students in Mathematics

Source	Type III Sum of Squares	DF	Mean Square	Calculate F Value	Sig
Corrected model	20.326 ^a	2	10.163	0.305	0.737
Intercept	4726.501	1	4726.501	142.050	0.000
Pretest	14.323	1	14.323	0.430	0.513
Gender	5.962	1	5.962	0.179	0.673
Error	5955.937	115	33.273		
Total	62240	118			
Corrected Total	5976.264	117			

a. R Squared = .003 (Adjusted R Squared = -.008).

Table 5 reveals that the calculated F - value 0.179 (1:117) = (0.673) computed at the critical P - value of 0.05. Since the calculated P - value is greater than 0.05, the null hypothesis is not rejected. This implies that there is no significant effect of gender in the performance of male and female students in Mathematics, since the male and female students were exposed to the same treatment.

Discussion of Findings

In this study, it was discovered that students developed their mathematical knowledge and competence, they participated fully, they felt secured and had confidence to communicate Mathematical concepts and asked questions to clarify their doubts. Hence, the experimental class that was exposed to the teaching through the Mother Tongue and English performed better than their counterparts in the control group, who were taught through the medium of English without the Mother Tongue. This was confirmed by Chanda (2010) that the Mother Tongue of a child is essential for his educational achievement. It develops the learners' cognitive and intellectual capacity. It is through the Mother Tongue that a child can learn, assimilate, and express his view better. Eke (1986) and Mutunga (1992) explained that a considerable number of students have inadequate understanding of Mathematical concepts and skill and the problem of failure in Mathematics is relatively connected mostly with the medium of instruction. The result tends to agree with the submission of Adenegan (2007) that the indigenous language which is the child's mother tongue is a very crucial language in the child's developmental stage

of skill acquisition, language acquisition and education attainment. They agreed that Yorùbá language could be used to teach mathematics both in primary and post primary levels. The result of this study also agrees with the findings of Yip, et al (2003) and Noren (2007) who found significant difference in the performance of students in Mathematics when they are taught through the medium of English and the Mother Tongue.

Furthermore, the findings of this study also indicate that gender has no significant effect on the performance of students in Mathematics when the students are taught in English and the Mother Tongue. This finding is also similar to that of Yushau and Bokhari (2002) who found no significant effect in the performance of male and female students in Mathematics when both students were exposed to the same experimental treatment (medium of the mother tongue and English language).

Setati (2005), Adenégan (2007) and Oluwolé (2014) advocate the use of the indigenous language in teaching Mathematics. They believe that the mathematical content and language should be close to the child's real situation through his mother tongue. The learners cannot learn mathematics emphatically with the language they are struggling with. Therefore, it is affirmed that the use of an indigenous language as Nigerian's lingua franca can eradicate mass illiteracy, ensure effective mass communication, and make the education of the Nigerian child richer and more functional. More importantly, it is the belief in educational and linguistic circles that the MT, and not just any language, is more effective in learning, and should therefore, be used as the medium of instruction in schools, especially in mathematics class.

Conclusion

Based on the findings, the following conclusion were drawn that there is a significant difference in the performance of students in Mathematics when they are taught through the medium of English and the Mother Tongue and their counterparts taught in English without the Mother Tongue. This also is in favour of the experimental group taught through the medium of English and the Mother Tongue. In the same vein there is no significant gender effect in the performance of male and female students in Mathematics when they are taught through the medium of English and the Mother Tongue.

Recommendations

1. Consequent upon the findings of this study, it is recommended that teachers should use the Mother Tongue of students to teach Mathematics in order to discover the students' learning difficulties and provide solution necessary to improve students' performance in Mathematics. It is recommended therefore, that teachers can teach Mathematics through code-mixing and code-switching of the Mother Tongue and English language.
2. The National Education Policy maker should enforce the implementation of the Mother Tongue medium in the Science classes and Mathematics particularly and there should be in service programmes for teachers in order to produce competent native speakers Mathematics teachers.
3. It also recommended that the textbook writers should produce Mathematics and other books enriched with insights from the role of the Mother Tongue in enhancing the academic performance of students.
4. The study recommends an open debate and consultation involving all educational stakeholders including: parents, teachers, students, the school authorities and the government representatives, to dialogue on the possibility of using Mother tongue in educational setting and

in Mathematics in particular. Here, the contentious issues like mother tongue mathematical vocabulary and other related mathematical materials would be debated and finalised.

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