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**INTRODUCTION**

A baby, even if he has challenges in the use of his physical body, would naturally cry for his needs - for food when hungry, for water when thirsty and for help when in pain in his body. Gradually he would learn to express himself verbally and give signals for his necessities. Later he would be taught to differentiate right from left and up from down. All these experiences need certain means to be communicated. All the things a child needed is structured as he grows up to make him relevant and useful in the society. However, a child would have to learn through all these.

Likewise, in the academics, language serves a very important role. To impart knowledge in the classroom which are referred to as newly born baby, one must understand their first language to introduce the contents of the particular subject to them and later on the second language which is the official language. As Chomsky (1965) rightly states: (the conceptual knowledge developed in one language helps to make sense in the other language(s))

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## EFFECTS OF BILINGUAL TEACHING STRATEGY ON PUPILS' ACHIEVEMENT IN MATHEMATICS IN OYO STATE PRIMARY SCHOOLS

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### ABSTRACT

After a careful analytical observation, Primary Education which is the foundation upon which further education is built is considered not to be at its best presently in Nigeria. The mode of instruction used by teachers of Mathematics (being a core subject) seems to be contributory to the performance of pupils in primary schools. This study investigated the effect of Bilingual teaching Strategy on pupils' achievement in Mathematics with the view to improving such. The research adopted the pre-test, post-test control group using 2x2 factorial matrix. The subjects consisted of 141 primary five pupils. Two local governments were randomly selected out of the four local governments in Oyo town. Each of the local government was clustered into two groups; two schools were randomly selected from the two groups and randomly assigned to treatment, making four schools. Four instruments, namely; Mathematics Achievement Test, Pupils Attitude Scale, Teacher Instructional Guide on Bilingual Teaching Strategy and Conventional Teaching Strategy, were used to collect data. Three hypotheses were tested and data were analyzed using descriptive statistics and Analysis of Covariance (ANCOVA). The result of the study showed that there was a significant effect of treatment (teaching strategies) on pupils' achievement. [ $F(1,141) = 185.372, P < 0.05$ ].

Mean score of Bilingual teaching strategy is ( $\bar{X} = 13.67$ ), and conventional group (control) scored the least ( $\bar{X} = 7.10$ ) in achievement in Mathematics. It revealed no significant main effect of attitude [ $F(1, 141) = 1.258, P > 0.05$ ]. Findings also imply that pupils' attitude does not serve as hindrance to their achievement in Mathematics; among other discoveries. The work, therefore, recommends, *inter-alia*, that Mathematics teachers should utilize bilingual approach to support teaching of Mathematics in primary schools to enhance pupils' performance.

**Keywords-** Bilingual Teaching Strategy, and Achievement

### INTRODUCTION

A new born baby, even if he has challenges in any part of his physical body, would naturally communicate for his needs - for food when hungry, for water when thirsty and for help when having aches in his body. Gradually he would learn to express himself verbally and give signs to support his impressions. Later he would be trained to differentiate right from left and good from bad. All these experiences need certain means to be communicated. All the knowledge a child needed is structured as he grows up to make him relevant and useful in the society. However, a child would have to learn throughout his life.

Likewise, in the academics, language serves a very important role. To impart knowledge to the learners whom are referred to as newly born baby, one must understand their first language to introduce the contents of the particular subject to them and later on the second language which is the official language. As Cummins (2000) rightly states, the conceptual knowledge developed in one language helps to make input in the other language(s)



comprehensible. If a child understands certain concepts in his language, he could easily label it in the second language, in this instant, English language.

The above process calls for Bilingual mode of instruction (teaching strategy) in order to make learning more meaningful to the learners. Mathematics which seems mysterious and perhaps most difficult subject for students, has its root from language. There are some Mathematical Jargons which might have different meanings in the real sense. Therefore, learners need to understand all these terms in their own language (mother tongue) for effective learning to take place. The National policy on Education (NPE, 2004) stipulated that the medium of instruction at the early stage of basic education should be mother tongue or language of immediate environment, and English language at later stage. Despite the provisions of this policy, most teachers and school authorities still frown at pupils who use their mother tongue to communicate or answer questions and thereby penalized them. (Banjo, 2005 in Ujakpor, 2012). Nevertheless, researchers in Mathematics education are in agreement that communication is essential to the learning of Mathematics (Ryve, 2004).

Rubenstein and Thompson (2002), emphasized that for teachers to be more aware of, and sensitive to issue of Mathematical language acquisition, and to be more creative and persistent in finding ways to support children's learning, they must first understand children's difficulties in using Mathematical language. Perry and Bockett (2002) concluded that "without sufficient language to communicate the ideas being developed, children will be at a loss to interact with their peers and their teachers, and would therefore, have their Mathematical development seriously curtailed". Because of the significance of language in learning Mathematics, it is important that Mathematics teachers are aware of the particular difficulties and complexities of the way language is used in this subject. There are five categories of these problems, namely; Vocabulary; Syntax; Abstract and Natural language; Miscues in word problems; and The predominance of structure over content.

Some of the problems associated with technical vocabulary of Mathematics according to Haylock (2007) are that:

1. Mathematics uses a number of technical words that are not usually used by primary school pupils outside Mathematics lessons. Examples might include 'parallelogram' and 'multiplication'. Such words are not being reinforced in everyday usage and are, therefore, not being given greater meaning through employment in a range of contexts. The existence of a discrete set of Mathematical terminologies also encourages pupils to perceive Mathematics as being something that happens in school but unrelated to their everyday lives outside school.
2. There are words that are used in everyday English, which have different or much more specific meanings in Mathematics. For example, in relation to subtraction the 'difference between 8 and 13' is not that one has one digit and the other has two digits. Other familiar example include: 'volume' (in everyday English used mainly for levels of sound); and 'right' as used in 'right angle' (not the opposite of a left angle!).
3. Mathematics uses 'odd' to refer to every other counting number, which is hardly consistent with the everyday use of the word (Pimm1987). Clearly, primary school teachers have to anticipate possible confusions when using such words as these.
4. Words in Mathematics are characteristically used with precise meanings. But in ordinary everyday English, many Mathematical words are misused or used with a degree of sloppiness, which can be a barrier to pupils' understanding of Mathematical concepts.



'Sugar cubes' are usually cuboids, but not all of them are actually cubes. Adults do not mean a time interval of one second when they say, 'Just a second!' The phrase 'a fraction of the cost' uses the word 'fraction' imprecisely to mean 'a small part of'. And the word 'half' is often used to mean one of two parts not necessarily equal. Moreover, many teachers themselves use Mathematical language carelessly, such as confusing 'amount' with 'number', or using 'sum' to refer to a calculation other than addition.

To assist learners who have Mathematics language problems, therefore, teachers need to apply Bilingual teaching strategy to facilitate learning and to make Mathematics language clearer. Bilingual strategy involves teaching academic content in two languages, a native language and secondary language with varying contents of each language used in accordance with programme model. Model of Bilingualism refers to when first language and the second language are interdependent. And the fundamental assumptions of this model are those required academic and cognitive (related) skills and knowledge in the first language transferred to the second language (Cummins 2000). Bilingualism is the ability to speak two languages fluently, one complementing the other. It can be further explained as the use of two languages in teaching especially to foster learning in pupils.

Some types of Bilingual education models according to Thomas and Collier (1997) include: Transitional Bilingual Education in which the children are given education for more than three years before the introduction of the secondary language; Two Way or Dual Language Immersion Bilingual education where the teacher instructs in both English and native language; students studying in two different Ways. This involves:

- a. Academic subjects being taught in English language by specially trained bilingual teacher who understand students when they ask questions but answer in second language;
- b. Learners being taught with native language and the skills learned in the native language can be transferred easily to second language latter; and the Late-Exit or Developmental Bilingual Education where education is in the child's native language first and then transferred to the second language.

Bialystokfor (1991), emphasized that, the professional obligation of the teachers is to engage themselves by providing conducive and effective method to be able to develop learners' intellectual abilities in a typical Mathematics classroom session. This is because of the importance of Mathematics at all levels of education. Ilori in (Oshin,2013) asserts that the importance of Mathematics has long been recognized all over the world and that is why all students are made to study Mathematics at the primary and secondary school levels, whether they have the aptitude for it or not. Yet performance of students in Mathematics is not encouraging despite its importance as one of the subjects which determines the future of the students.

Oshin (2013) identified some factors responsible for poor performance of students in mathematics to include lack of adequate preparation, shortage of qualified teachers, inadequate teaching aids, lack of good school environment and infrastructural facilities. Others include inability to understand questions that demand high level of thinking, flagrant breach of rubrics, thus answering more questions than required, shallow and poor answers to questions due to poor command of English. Ayanwole (2011) opined that language terminologies, which students see as complicating, are ever contributing to students learning difficulties and poor acquisition of practical skills. Abadom (2002) noted that when the foundation built at the primary and junior secondary school is not sound in Mathematics, there will be difficulty in understanding some



critical problems in senior secondary schools which automatically lead to failure in examination done in secondary schools.

From the foregoing, if Mathematical concepts and contents are to be made clearer so as to improve the performances of pupils in the subject right from the primary level to other levels of education, it is obvious that mother-tongue should be used first as medium of instruction and latter, transferred to English language. This was the objective of this work as carried out by the researchers.

## **BILINGUAL, BILINGUALISM AND BILINGUAL EDUCATION**

The concept of bilingualism seems to be very simple but have diverse expressions to different authorities. According to Webster's dictionary(1961), bilingual is defined as 'having or using two languages especially as spoken with fluency characteristic of a native speaker, a person using two languages especially habitually and with control like that of native speaker'; and bilingualism as 'the constant oral use of two languages'. Bilingualism is the ability to perform in two languages. To be bilingual is to be fluent in two languages. Generally-speaking, people view being bilingual as being able to speak two languages perfectly. This is also the approach of Bloomfield (1935, in Josiane and Michel, 2000). He defines bilingualism as 'the native-like control of two languages'. The above definition contradict that of Macnamara (1957) who proposes that a bilingual is anyone who possesses a minimal competence in only one of language skills, listening comprehension, speaking, reading and writing, in a language other than his mother tongue.

Titone (1972), sees bilingualism as the individual capacity to speak a second language while following the concepts and structures of that language rather than paraphrasing his or her mother tongue. Paradis (1986) suggests that bilingualism is a multidimensional continuum, reduces the latter to linguistic structure and language skill. Mohanty (1994) limits the definition of bilingualism to its social-communicative dimension, when he says that 'bilingual persons or communities are those with an ability to meet the communicative demands of the self and the society in their normal functioning in two or more languages in their interaction with other speakers of any or all these languages'. Meanwhile, Grosjean (1985) defines a bilingual speaker as more than the sum of two monolinguals in the sense that he bilingual has also developed some unique language behaviour. Equally for Liddi (1986) "bilinguality" is more than addition of two monolingual competences, but an extreme form of polylectality.

Bilingualism can also be referred to as the use of two languages in teaching especially to foster learning in students trying to learn a new concept. However, concepts in bilingualism, according to McCarty, and Jogakuin (2010) stem from a number of dimensions, such as the age of a person using two languages- from the standpoint of when a person, on the individual level, starts being exposed to more than one language regularly. When a person acquires two or more languages from birth or infancy it is called **simultaneous bilingualism**. Because of differences in individuals and circumstances, there is no exact age or critical period after which a person cannot become fully bilingual, but after adolescence it becomes more a matter of deliberate learning than natural acquisition. If native-like pronunciation of the L2 (one's second language) is considered important, then the earlier the child starts, the better. Generally, when L2 is started after L1 (one's native language) is established, and because high bilingual proficiency is still possible, the use of two languages by such persons is called **consecutive or sequential bilingualism**.



There are two types of bilingualism which is distinguished according to the socio-economic status of the family or ethnic group. Where the child or family has little or no choice about the languages they use for daily life or learning, it is known as **circumstantial bilingualism**, where as when native speakers of the majority language choose to learn other languages, it is called **elite or elective bilingualism**.

Baker (1996) also made fundamental distinction between bilingual ability and bilingual usage. Bilingual ability refers to a person's language proficiency in its four basic dimensions: listening, speaking, reading and writing, and naturally also, thinking. While bilingual usage made use of two or more languages. As a bilingual moves from one situation to another so may his or her language changes.

*Bilingual education* is a broad term that refers to the presence of two languages in instructional settings. The term is, however, "a simple label for a complex phenomenon" (Cazden and Snow) that depends upon many variables, including the native language of the students, the language of instruction, and the linguistic goal of the programme; to determine which type of bilingual education is used. Students may be native speakers of the majority language or a minority language. The students' native language may or may not be used to teach content material. Bilingual education programs can be considered either *additive* or *subtractive* in terms of their linguistic goals, depending on whether students are encouraged to add to their linguistic repertoire or to replace their native language with the majority language. *Bilingual education* is used here to refer to the use of two languages as media of instruction. In some schools, bilingual instruction is required to help ensure that children learn the required subject matter, but also that they stay fluent in both of those languages. This provides the students with valuable skills later in life, but the teachers need to come up with specific strategies in order to teach the various subjects in two languages

The common denominator of all schools which profess to have a **Bilingual Education** programme is simply that some or all of the content based subjects are delivered through the medium of a second language, which is not the mother tongue of the majority of the pupils. Some programmes will aim at producing pupils who are **bilingual** at the end of their schooling. Others will aim at easing the **transition** from a minority language to a majority language, which might involve losing one language and acquiring another. Yet others will aim at increasing the pupils' **competence** in a foreign language so that, at the end of their schooling, pupils have a '**working knowledge**' of that language. Along this line, varieties of models exist around the world and differ in terms of: their goals; the characteristics (linguistic and otherwise) of the participating students; the sequencing and amount of instruction in the languages involved; their pedagogical approaches; and the amount of support from the policy makers and the community.

The meanings given to the concept of bilingualism by different authorities were to serve the purpose of the fact they wanted to establish. Meanwhile, all are synonymous in context, by the recognition of the use of two languages or two aspects of a language. However, for the purpose of this study, the use of two languages (English and Yoruba) as mode of instructions to foster learning in pupils is embraced, while the researchers are indifferent in other aspects of definitions.

## STATEMENT OF THE PROBLEM

The phobia for Mathematics, lack of interest created by the majority of the students and mass failure in Mathematics examination both at primary and secondary school levels have



been traced to lack of inappropriate mode of instructions and difficulties exhibited in understanding peculiar Mathematical languages by most Mathematics students. Consequently, students find it difficult to gain admission into higher institutions because of lack of credit pass in the subject. Mathematics has remained a must-pass subject for most secondary school leavers aiming at further education. The teaching in the classroom is majorly based on second language, which is mostly English language. In this regard, majority of the pupils have difficulty in understanding some Mathematical terminologies which form the basis of the concept. Bilingual teaching strategy is scarcely used in Mathematics class. This study is, therefore, designed to determine the effect of Bilingual teaching strategies on primary schools pupils' achievement. The study also examines the moderating effects of attitude to Mathematics on the pupils' achievement in the subject. These are done with a view to improving pupils/students comprehension and achievement, respectively in Mathematics.

### **PURPOSE OF THE STUDY**

The purpose of this study is to investigate the effect of Bilingual teaching strategies on pupils' achievement in Mathematics. It will reveal to the teachers how to arouse students' interest by using two languages (mother tongue and secondary language) to explain mathematical concepts (bilingual teaching strategy). It will help pupils to gain knowledge of mathematical concepts, retain the knowledge gained for a long period of time, and create positive interest in them. This research work will help the curriculum planners to implement Bilingual teaching strategies as some of the best methods for teaching Mathematics. Finally, it is expected to impact positively on the general standard of education since students' performance in a subject considered to be a major pillar in further education is enhanced.

### **HYPOTHESES**

Ho<sub>1</sub> There is no significant main effect of treatment on pupils' achievement in Mathematics.

Ho<sub>2</sub> There is no significant main effect of attitude on pupils' achievement in Mathematics.

Ho<sub>3</sub> There is no significant interaction effect of treatment and attitude on pupils' achievement in Mathematics.

### **METHODOLOGY**

#### **Research Design**

Pre-test, post-test quasi experimental design was adopted for the study, using 2×2 factorial matrix. This is represented as follows:

E:	O <sub>1</sub>	X <sub>1</sub>	O <sub>2</sub>
C:	O <sub>1</sub>	X <sub>2</sub>	O <sub>2</sub>

O<sub>1</sub>. represents pre-test score

X<sub>1</sub>. represents Bilingual Teaching Strategy Group (Experimental)

X<sub>2</sub>. represents Conventional Teaching Strategy Group (Control)

O<sub>2</sub>. represents post-test score

#### **Sample**

Two local government areas in Oyo state were selected using simple random sampling technique. Thereafter, two schools were selected through simple random sampling technique from each of the local government area selected. Two schools were used as control group for the study, while the other two schools were used as experimental group. A total of 141 primary five pupils were randomly selected for the study using simple random sampling technique.

#### **Instruments**

Mathematics Achievement Test (MAT) was used as a pre-test and a post-test instrument in this study. It included a 50 multiple choice items which was reduced to 20 items after validation. The reliability coefficient of the instrument was established using Kuder-Richardson





20 (KR-20) which is 0.81. Pupils Attitude scale (PAS) was also developed by the researchers. The scale has two options: Yes or No. The PAS instrument was also trial-tested and validated. Its reliability coefficient is 0.79

### Procedure

The two instruments (MAT and PAS) were administered to the two groups of participants as pre-test. Their scripts were collected for marking and recording. Thereafter, the pupils were exposed to treatment with the aid of already validated packages developed by the researchers, that is, Bilingual Teaching Strategy Package (BTSP) and Conventional Teaching Strategy (CTS). The Bilingual Teaching Strategy Package was designed by the researchers to deliver lesson to mathematics pupils in both English and Yoruba Language. While Conventional Teaching Strategy involves the normal approach for the delivering of lesson to mathematics pupils in English Language only. After this, a post-test of Mathematics Achievement Test was administered. Their answer scripts were marked and recorded accordingly.

### Results

*Table 1: Summary of Mean Difference of Pupils' Academic Achievement in Mathematics by Treatment*

Treatment	N	Pre test		Post test		Mean Gain
		Mean	Standard Deviation	Mean	Standard Deviation	
Bilingual teaching Strategy	70	3.67	1.657	13.67	2.707	10.00
Conventional Teaching method	71	2.34	1.393	7.10	2.433	4.76

*Table 2: Summary of Mean Difference of Pupils' Academic Achievement by Attitude to mathematics*

Attitude to Mathematics	N	Pre test		Post test		Mean Gain
		Mean	Standard Deviation	Mean	Standard deviation	
Positive	75	2.87	1.703	10.19	4.092	7.32
Negative	66	3.15	1.620	10.56	4.294	7.41

Table 3: Analysis of Covariance (ANCOVA)

Source	Type III Sum of Squares	Df	Mean Square	F	p.
Corrected Model	1541.961 <sup>a</sup>	4	385.490	58.214	.000
Intercept	2879.387	1	2879.387	434.822	.000
Pre-achievement	3.308	1	3.308	.500	.481
Treatment	1227.532	1	1227.532	185.372	.000
Attitude	8.329	1	8.329	1.258	.264
Treatment * Attitude	6.090	1	6.090	.920	.339
Error	900.592	136	6.622		
Total	17581.000	141			
Corrected Total	2442.553	140			

a. R Squared = .631 (Adjusted R Squared = .620)

Significant level  $P < .05$

## DISCUSSION

From Table 1, Bilingual Teaching Strategy has the highest mean gain (10.00), and Conventional Teaching Method (CTM) (4.76), in that order. This also implies that Bilingual Teaching Strategy group have highest post test score ( $X = 15.03$ ), while those from control group have least post test mean score (7.10). Also from Table 2, pupils with negative attitude to Mathematics have higher mean gain achievement score ( $X = 7.41$ ) than those with positive attitude to Mathematics mean gain score of 7.32. Pupils from the two groups of attitude to Mathematics have higher post test mean scores in achievement in Mathematics with values 10.19 and 10.56 respectively, than pretest mean scores 2.87 and 3.15, respectively, too.

### **Ho<sub>1</sub> There is no significant main effect of treatment on pupils' achievement in Mathematics.**

The results on Table 3 indicates that there is significant main effect of learning approach and Conventional approach (treatment) on pupils' academic achievement in Mathematics [ $F(1,141) = 185.372$ ,  $P < 0.05$ ]. It follows that hypothesis 1, on the main effect of learning approaches on pupils' academic achievement in Mathematics was rejected. This simply means that the learning approach improved the performance of the pupils in Mathematics. The adjusted R square value of .620 indicates that the independent variables accounted for 62.0% of the variation in the pupils' academic achievement in Mathematics. The partial Eta squared estimated was .577, this implies that treatment accounts for 57.7% of the variance observed in posttest academic achievement in mathematics.



This result support the findings of Ojerinde and Cziko (1977), Ojerinde (1979), Yoloye Ojerinde and Taiwo (1985), Fafunwa, Macauley and Osokoya (1989) Pwol (1990), Jegede (1990, in Ayanwole, 2011), who reported, respectively, that students taught Mathematics in Yoruba Language outperformed those taught in English Language when subjected to the same test. It also supported the report of the National policy on Education (NPE, 2004), which stipulated that the medium of instruction at early stage of basic education should be mother tongue or language of immediate environment and English language at later stage.

**Ho<sub>2</sub> There is no significant main effect of attitude on pupils' achievement in Mathematics.**

With respect to Table 3, it could be deduced from the adjustment of the covariate, that F (1,144) indicating the main effect of Attitude on pupils' academic achievement in Mathematics is 1.258;  $P > 0.05$ , since P value (.264) is greater than 0.05 alpha level, then there is no significant main effect of Attitude on pupils' academic achievement in Mathematics. So, Ho<sub>2</sub> is not rejected.

**Ho<sub>3</sub> There is no significant interaction effect of treatment and attitude on pupils' achievement in Mathematics.**

Hypothesis three was not rejected since the p value was greater than .05. The above result shows that pupils positive attitude to Mathematics have better scores than those with negative attitude to Mathematic; it then means that there may be other factors that causes low achievement in Mathematics other than teaching methods. This support the findings of Nicholas (2003) which emphasize that, attitude generally are not related to achievement. Also Nyala study find out that the attitude of pupils to Mathematics is positive. Eshunet et'al (1999) also reported that in general, students had positive attitudes towards Mathematics, especially, along the attitudinal variables, and the usefulness of Mathematics.

## CONCLUSION

The findings of the study revealed that learners who were exposed to Bilingual teaching strategies performed better than those in the control group. When this learning strategy was employed, it made Mathematics terminologies clearer in the selected schools, and pupils are encouraged and motivated in Mathematics class. There is, therefore, tendency for the teaching and learning of this subject (Mathematics) in primary schools to inculcate into learners lifelong learning skills embedded in the teaching and learning strategy employed in this study if applied appropriately.

## RECOMMENDATIONS

On the basis of the findings, the following recommendations are made:-

1. Learners should appreciate the essence of Bilingual teaching strategy as opportunity for developing positive attitude in learning Mathematical science as well as knowing that there are two ways of saying things all of which will lead to higher academic performance.
2. The use of Bilingual teaching strategy should be adopted to aid effective teaching and learning of Mathematics in primary schools and at all levels of education. Teachers of Mathematics should be ready to incorporate this teaching and learning strategy, for it is learning made easy approach.
3. Policy makers are enjoined to incorporate this strategy into the white paper of education. It will go a long way in aiding the pupils to learn Mathematics more effectively.
4. If carried out at the primary level as a pilot project and success is recorded, its use should be extended to the first three years in the Junior Secondary classes.

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