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SCHOOL LOCATION, GENDER AND TEACHING METHODS AS PREDICTORS OF PRIMARY 5 PUPILS' LEARNING OUTCOME IN MATHEMATICS

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ABSTRACT

Numerous instructional strategies have been used by researchers to find solution to learners' poor performance in Mathematics. It is observed that the use of these instructional strategies have been neglected in schools. There is the need to look for more proactive methods that will make pupils learn profitably and more friendly. Therefore, this study investigated the effects of Personalised System of Instruction (PSI), Direct Instruction (DI) and Conventional method (CM) on pupils' achievement in Mathematics in Oyo State. This study adopted a 3x2x2 combination of the pretest-posttest and control group design, randomized, quasi-experimental design in which the treatment operates at three levels [Personalized System of Instruction (PSI) , Direct Instruction (DI) and Conventional Method (Control)] crossed with gender (male and female), and school location (rural and urban). Purposive sampling was used to select four local government areas in Oyo State, this was to ensure that all the selected local government areas were not clustered in one educational zone. Simple random sampling was used to select 16 primary five classes in 8 urban and 8 rural locations and the pupils constituted the study sample. The instrument used in the study was Mathematics Achievement Test (MAT) (r=0.82). The data generated were analysed using analysis of co-variance (ANCOVA) tested at 0.05 level of significance. Treatment ($F_{(2,384)}$=183.409), gender($F_{(1,384)}$=7.081) and school location($F_{(1,384)}$=59.753) had significant main effects on pupils' achievement in Mathematics. A significant difference existed in the achievement scores in Mathematics between the participants in DI (x=79.8), PSI (x=50.6) and Control (x=38.9). A significant interaction effect of treatment and school location ($F_{(2,384)}$=17.004) existed on pupils' achievement in Mathematics. The adoption of DI for the improvement of learners' performances was recommended. Learners should be encouraged to work together and help one another in a manner that tends to promote more positive self-evaluations of capability and higher academic attainments than individualistic or competitive ones. Mathematics teachers should give opportunities to all pupils irrespective of their school location and gender so that they are exposed to active learning techniques of PSI and DI especially when treating difficult mathematics concepts and problems.

INTRODUCTION

The primary purpose of providing quality instruction is for learners to be successful on academic tasks, mould character and to effect behavioural changes. However, it should be emphasized that most models of quality instruction, in addition to the specification of events of instruction, incorporate teaching activities during planning and management. In the same vein, Emeke (2002) says that the quality of instruction in any teaching learning situation is governed by the presentation, explanation and ordering of elements of the task to be learned which eventually has influence on learners' attitude. She went further to say that teachers should determine in advance how best to present a given task. To this effect, the quality of instruction can affect both learners' learning rate and achievement level. An important instructional planning element is that any model of instruction which can stand the test of time must be implemented in combination with a curriculum that is aligned to objectives measured on an evaluation of achievement (Cohen, 1995).

Learning is a relatively enduring permanent change in behaviour patterns of the human organism which occurs as a result of (previous) practice, training or experience (Kim and Axelrod, 2005). In the normal school setting, the teacher imparts the knowledge in the learner to help mould or change his/her behavioural pattern. Learning is manifested by a change in behaviour, and the principle of contiguity (how close in time, two events will be repeated) is central to explaining the learning process (Kim & Axelrod, 2005). Learning by nature is very individualized therefore; those working with learners should endeavour to use teaching methods that has this characteristic.

The method of teaching could be regarded as the vehicle through which a message is delivered to the learners. In order to ensure effectiveness in the delivery of primary school education and enhance quality of outputs, it is important to study the basic and important components of the educational process, such as inputs, the instructional delivery processes and strategies used in ascertaining how much of the expected behaviourial changes learners have attained (Ezeokoli, 2002). Ndukwu (2002) finds that the quality of a teacher significantly influences pupils' intellectual development. The teacher should be able to develop pedagogical skills that will make learning more interesting and acceptable to the learners.

To achieve the learning objectives some instructional strategies were developed by some researchers, among these are Direct Instruction (DI) developed by Siegfried Engelmann and Wesley C. Becker in 1960, Personalized System of Instruction (PSI) developed by Fred Keller in 1968 and Learning for Mastery (LFM) developed by Benjamin Bloom in 1971. For the purpose of this study, Personalized System of Instruction (PSI) and Direct Instruction (DI) will be used to facilitate learning independently. Keller's PSI is also known as the Keller Plan. It entails structuring a learning content into small self-paced modularized units of instructions with study guides which direct learners through the modules. Unit tests are given on each module where the learners must show mastery by scoring at least a 90%. Keller divided the process for creating PSI into four steps. They include: determining the material to be covered in the course; dividing the material into self-contained modules (segments); creating methods of evaluating the degree to which the learner has conquered the material in a given module and allowing learners to move from module to module at their pace.

Direct Instruction (DI) is a model for teaching that emphasizes well-developed and carefully planned lessons designed around small learning increments and clearly defined and prescribed teaching tasks. It is based on the theory that clear instruction eliminating misinterpretations can greatly improve and accelerate learning (Engelmann, 2012). Direct Instruction is an explicit, intensive instructional method that allows students of all abilities to become confident and capable learners. SRA/McGraw-Hill's Direct Instruction programs use common instructional planning and consistent classroom routines to boost learners' skill mastery in reading, spelling, language arts, and mathematics. Over the years pupils have always being exposed to conventional way of teaching, because learners are seen as having 'knowledge holes' that need to be filled with information. Conventional method of teaching like the lecture method is also a valuable method for summarizing ideas, showing relationships between theory and practice, and re-emphasizing main points (Agboola & Oloyede, 2007). The teacher does all the talking and writes on the chalkboard if he wishes as he explains; thus, making the pupils' involvement and participation very low because communication is often one way for most of the time in the teaching process.

The issue of gender differences in achievement has been the concern of many researchers. Some researchers believe that males perform better than females in mathematics (Olatudun, 2008; Yinyinlola, 2008;), while others have contrary view (Ogunsanwo, 2003; Nicolaidou & Philippou, 2003). Thus, there has been conflicting results in studies attempting to find gender related differences in problem solving abilities. From these research findings, it appears that mathematics is not a male dominated subject as claimed by some people, provided both sexes are subjected to the same teaching and learning condition especially in the primary level of education which serves as the foundation of all other levels. The location of a school in this study is measured with respect to urban or rural location. The location of a school has a significant effect on the academic performance of the child (Adeyemi, 2012). According to him, urban schools are likely to have pupils who are exposed to better and modern infrastructural facilities unlike their counterparts in the rural schools. He further emphasized that pupils tend to learn and perform better in educationally stimulating environments which are likely to arouse the child's higher degree of interest.

The general poor performances in Mathematics in primary schools in Nigeria are evident in a National Report of Monitoring of Learning Achievement Project 2003 titled "Assessment of Learning Achievement of Primary four and Primary six pupils published by the Nigeria Education Sector Analysis (2004). The numeracy test was administered on 22,091 Primary Four pupils, nationwide to measure pupils' level of attainment in simple mathematical operations such as addition and subtraction up to five digit numbers, division and multiplication in non-worded or worded terms, fractions, buying and selling, telling the time, lowest common multiple (LCM) and highest common factor (HCF), distinguishing between geometric shapes, angles and solving simple problems in everyday statistics. The results of analysis of performance as indicated in the report show variations in the level of numeracy acquisition. The mean percentage score ranged from as low as 19.2 percent with a standard deviation of 14.38 to an all high of 49.27 percent with a standard deviation of 21.46 although the percentage score by pupils exceeded the national average of 33.74 in 14 states, the mean performance by pupils in 22 out of the 36 states, including the Federal Capital Territory (FCT) was below the national mean.

Many factors have been identified as the causes of poor performance of pupils in Mathematics education by many researchers. These include negative attitude towards Mathematics (Adegoke, 2002; Adeleke, 2007; Georgewill, 1990), lack of problem solving abilities, teacher related problems, such as poor method and poor teacher preparation, shortage of qualified and quality Mathematics teachers, lack of commitment, devotion and dedication to duty and motivation (Akinlua, 1996; Ifamuyiwa, 1999,), poor instructional method (Awofala, 2002). However, one of the most prominently discussed is instructional strategies being employed by mathematics teachers. The search for methods of improving pupils' performance in Mathematics has been a continuous exercise. It seems that as the search continues, pupils' performance in Mathematics gets worse, especially at the primary school level, which should be the foundation for further educational experiences in the subject and related subjects like the sciences.

However, the poor achievement at this level especially in mathematics may be traceable to the methods of teaching being employed by primary school teachers. Teachers are expected to device some other means of teaching their pupils if they hope to bring the best out of them. To some pupils, schooling is uninspiring because science and mathematics seems unreal, vague and meaningless. The performance of pupils in mathematics at the primary school level is at variance with our educational goals and national aspirations. After teaching the pupils, teachers should employ feedback mechanism to ascertain whether the lesson has being effective or not. Similarly, much research is needed to determine how individual differences in learners can be related to variations in the quality of instruction. There is evidence that some learners learn quite well through independent study while others need highly structured teaching learning situations. Many studies have confirmed the inadequacies of conventional method of teaching in producing expected learning outcomes, also various methods of improving the poor performance of pupils in primary mathematics have been neglected but this study hope to fill this gap hence there is the need to look for more proactive methods that will incorporate individual differences of learners and make them learn in a more friendly but profitable way. It is against this background that the study investigated the effects of school location, gender and teaching methods as predictor of pupils' learning outcome in Mathematics.

Design and Method

Through this study, the researchers sought to test the following hypotheses:

1. There is no significant main effect of (a) treatment (PSI, DI and CM); (b) gender; (c) school location on primary five pupils' achievement (pre-test and post-test scores) in Mathematics
2. There is no significant interaction effect of (a) treatment (PSI, DI and CM) and gender; (b) treatment (PSI and DI) and school location (c) gender and school location on primary five pupils' achievement (pre-test and post-test scores) in Mathematics.
3. There is no significant interaction effect of treatment (PSI, DI and CM), gender and school location on primary five pupils' achievement (pre-test and post-test scores) in Mathematics.

This study focussed on the entire primary schools in Oyo State, Nigeria. However, only primary five pupils in public primary schools were investigated. The study was interested in finding out the effects of Personalised System of Instruction (PSI) and Direct Instruction (DI) on primary five pupils' achievement in Mathematics. This study adopted a 3 x 2 x 2 nonrandomized pre-test and post-test, control group, quasi-experimental design in which the treatment operates at three levels (Personalized System of Instruction, Direct Instruction and Conventional Method) crossed with gender (male and female), and school location (urban and rural).

Population and Sample

The target population for this study comprised all primary 5 pupils in public schools in Ibadan, Oyo State, Nigeria. The public primary schools were chosen to ensure homogeneity of the sample with respect to school type, school location and pupils' attitude. Multi-stage sampling technique was used in selecting the required number of respondents for the study. First, four local government areas were purposively selected from the six educational zones in Oyo State; this was to ensure that all the selected local government areas were not clustered in one zone. At the local government level, primary schools were stratified into urban and rural schools on the basis of location. Purposive sampling was used to select sixteen primary schools (eight urban and eight rural schools). In each school selected, simple random sampling was used to select a primary 5 class. However, where only one arm existed, the affected arm was used. The class teacher of any class selected and the pupils automatically qualify to participate. To be selected to participate in the study, the school must: be far apart in terms of distance in order to avoid undue interaction among the participants of one school and the other; have easy access of reaching the location. In all, 16 primary five classes in 8 urban and 8 rural locations and the pupils constituted the study sample.

Instrument and instrumentation

The instrument used for the study was Mathematics Achievement Test (MAT).

Mathematics Achievement Test (MAT): The Mathematics Achievement Test (MAT) which was developed by the researcher contained two sections (A & B). Section A was used to capture the bio-data of the respondents with respect to School location and Gender. Section B which contained the questions on the achievement test was used to test the cognitive level of achievement of the learner. It contained forty (40) multiple choice test items with four option letters A to D. The content area covered were Pythagoras theorem, perimeters of squares and rectangles, areas of squares and rectangles, areas of triangles and areas of compound figures. Kuder-Richardson 20 formula was used to determine the psychometric property and this gave a value of 0.821. The number of items in the MAT was reduced after the psychometric properties have been established. Correct response to each of the items attracted a score of 1 while an incorrect response attracted a score of 0.

Data Collection and Analysis

Teachers in these groups were trained by the researchers in respect to this study. They were taught by the researchers using the treatment packages for Personalised System of Instruction (PSI) and Direct Instruction (DI) as the bases of their training and helping them to develop their knowledge of creativity in teaching mathematical concepts. The pupils were taught the topics selected in the test blue print using the PSI and DI respectively. Adequate tasks were given to them to carry out both in the classroom and as take home assignment. The pupils in the PSI group were given special individual attention by the teacher, allowing them more time to work and corrective measures were given individually to ascertain their level of mastery. The pupils in the DI group were exposed to work as a group rather than as individuals, developing their sense of cooperative learning. Their achievement level was based on the performance of their groups.

The data collected from the study was analyzed through descriptive statistics Analysis of Covariance (ANCOVA) using the pretest scores as covariates. Scores obtained from this design were analyzed to determine the effects of all of the variables involved (pre-testing and post-testing). All hypotheses were tested at 0.05 alpha level of significance.

Results

Hypothesis 1: There is no significant main effect of treatments (PSI and DI) on primary 5 pupils' achievement (pre-test and post-test scores) in Mathematics. The result of this hypothesis is presented in Tables 1.1, 1.2 and 1.3.

Table 1: Analysis of Co -variance (ANCOVA) of Pupils' Achiev ement Scores in Mathematics by Treatment, Gender, and School location

Source of variation	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared	
Corrected Model	143923.557[a]	12	11993.630	38.418	.000	.546	
Intercept	601980.184	1	601980.184	1928.252	.000	.834	
Pre-Achmt Score	2175.164	1	2175.164	6.967	.009	.018	
Treatment	114517.033	2	57258.517	183.409	.000	.489	*
School location	18654.179	1	18654.179	59.753	.000	.135	*
Gender	2210.704	1	2210.704	7.081	.008	.018	*
TrtGroup * Gender	1630.760	2	815.380	2.612	.075	.013	Ns
TrtGroup * Schloc	10617.105	2	5308.552	17.004	.000	.081	*
Schloc * Gender	945.998	1	945.998	3.030	.083	.008	Ns
TrtGroup * Schloc * Gender	355.295	2	177.648	.569	.567	.003	Ns
Error	119880.816	384	312.190				
Total	1324125.000	397					
Corrected Total	263804.373	396					

a. R Squared = .546 (Adjusted R Squared = .531)
* = sig. at P<.05 Ns = Not Significant

Table 1 shows a summary result of effect of treatment, gender, and school location on primary five pupils' achievement (pre-test and post-test scores) in Mathematics. It reveals that, after adjustment for the covariate, Mathematics pre-test scores, there is significant main effect of treatment (Personalised System of Instruction and Direct Instruction) on pupils' achievement in Mathematics [$F_{(2,384)}$ = 183.409, p<.05]. Since the critical value of the F-ratio is significant, it follows that hypothesis 1a which tested the main effect of treatment on pupils' achievement in Mathematics was rejected. The partial Eta squared estimate was 0.489. This implies that the treatment accounted for 48.9% of the variance observed in the achievement post-test scores in Mathematics.

Tables 2 and 3 show the Scheffe multiple comparison and homogenous subsets respectively.

Table 2 : Scheffe Post Hoc Multiple Comparison of Pupils' Achievement in Mathematics by Treatment

(I) Treament	(J) Treament	Mean Difference (I-J)	Sig.
PSI	DI	-29.29*	.000
	Control	11.69*	.000
DI	PSI	29.29*	.000
	Control	40.98*	.000
CONTROL	PSI	-11.69*	.000
	DI	-40.98*	.000

*The mean difference is significant at p<.05

Table 3: Scheffe Post Hoc Means for Groups in Homogenous Subsets by Treatment

Treatment Groups	N	Subset Control	PSI	DI
Control	202	38.86		
PSI	99		50.55	
DI	96			79.83
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed

a. Uses Harmonic Mean Sample Size = 117.794

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type 1 error levels are not guaranteed.

The results presented in Tables 2 and 3 indicate that there was a significant difference in the achievement test scores in Mathematics between the participants in DI

($\bar{x}$=79.83) and Control ($\bar{x}$=38.86). Also, PSI ($\bar{x}$=50.55) differs significantly from the Control ($\bar{x}$=38.86). There exists significant difference between the mean scores of DI ($\bar{x}$ =79.83) and PSI ($\bar{x}$=50.55).

Hypothesis 2: There is no significant main effect of gender on primary 5 pupils' achievement (pre-test and post-test scores) in Mathematics.

Considering the adjustment for covariate, Table 1 shows that there is a significant main effect of gender on primary 5 pupils' achievement in Mathematics [$F_{(1,384)}$=7.081, p<.05]. The hypothesis was therefore rejected. The result also indicated that the partial Eta squared estimation was .018, this means that gender accounted for 1.8% of the variance in the observed post-test achievement scores in Mathematics.

Hypothesis 3: There is no significant main effect of school location on primary 5 pupils' achievement (pre-test and post-test scores) in Mathematics.

The result presented in Table 1 shows that there is a significant main effect of school location on primary 5 pupils' achievement in Mathematics [$F_{(1,384)}$=59.753, p<.05]. The hypothesis was therefore rejected. The result also indicated that the partial Eta squared estimation was .135. This implies that school location accounted for 13.5% of the variance observed in the post-test scores of the pupils' achievement scores in Mathematics.

Hypothesis 4: There is no significant interaction effect of treatment (PSI and DI) and gender on primary five pupils' achievement (pre-test and post-test scores) in Mathematics.

Table 1 shows that the $F_{(2,384)}$ indicating interaction effect of treatment (PSI and DI) and gender on primary 5 pupils' achievement (pre-test and post-test scores) in Mathematics is 2.612; $p<0.05$. Since p (0.075) is greater than 0.05 alpha levels, it can be concluded that there is no significant interaction effect of treatment and gender on pupils' achievement in Mathematics. As a result of this finding, hypothesis 2a was not rejected. It thus, implies that the effect of treatment on the pupils' achievement in Mathematics is not sensitive to gender.

Hypothesis 5: There is no significant interaction effect of treatment (PSI and DI) and school location on primary five pupils' achievement in Mathematics.

Table 1 shows that the $F_{(2,384)}$ indicating interaction effect of treatment (PSI and DI) and school location on primary 5 pupils' achievement (pre-test and post-test scores) in Mathematics is 17.004; $p<0.05$. Since p (0.000) is less than 0.05 alpha levels, it can be concluded that there is a significant interaction effect of treatment and school location on pupils' achievement in Mathematics. As a result of this finding, hypothesis 2b was rejected. It thus, implies that the effect of treatment on the pupils' achievement in Mathematics is sensitive to school location.

In order to examine the nature of interaction, a line graph was constructed as shown in Fig. 1

Fig. 1: Line graph showing the interaction effect of Treatment and School Location on Achievement

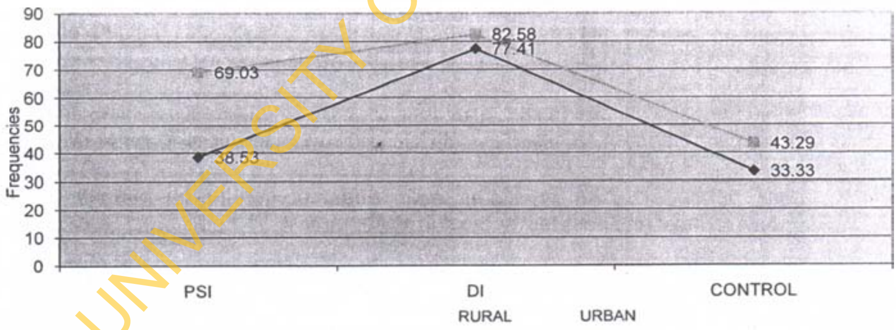

Figure 1: Interaction Effect of Treatment and School location

Fig. 1 shows that pupils from urban location (69.03)performed better than pupils from rural location (38.53) using the Personalised System of Instruction, while the same trend was recorded for pupils in urban location (82.58) and pupils in rural location (77.41)using the Direct Instruction learning strategy. In a similar vein, pupils in urban location (43.29) performed better than pupils in rural location (33.33). Observing the interactions critically, it could be concluded that the statistical difference was much stronger with pupils who were taught with Direct Instruction while that of the control was lower.

Hypothesis 6: There is no significant interaction effect of gender and school location on primary five pupils' achievement in Mathematics.

Table 1 shows that the $F_{(1,384)}$ indicating interaction effect of gender on primary 5 pupils' achievement (pre-test and post-test scores) in Mathematics is 3.030; p>0.05. Since p (0.083) is greater than 0.05 alpha levels, it can be concluded that there is no significant interaction effect of gender and school location on pupils' achievement in Mathematics. As a result of this finding, hypothesis 2c was not rejected. It thus, implies that the effect of gender on the pupils' achievement in Mathematics is not sensitive to school location.

Hypothesis 7: There is no significant interaction effect of treatment (PSI and DI), gender and school location on primary five pupils' achievement (pre-test and post-test scores) in Mathematics

Table 1 shows that there was no significant interaction effect of treatment, gender and school location on primary 5 pupils' achievement in Mathematics [$F_{(2,384)}=0.569$; p>0.05]. Since p (0.567) is greater than 0.05 alpha levels, it can be concluded that there is no significant interaction effect of treatment, gender and school location on primary 5 pupils' self efficacy in Mathematics. The conclusion was that the hypothesis 3 was not rejected. This implies that treatment, gender and school location had no interaction effect on pupils' achievement in Mathematics.

Discussion of results

In the comparisons of the treatment based on achievement in Mathematics, the significant differences were in favour of Direct Instruction (DI) and Personalised System of Instruction (PSI) strategies over the control group. This corroborates the findings of previous researchers Carlson, Francis and Ferguson (2001) who confirm the effectiveness of the Direct Instruction model. In a 2000–2001 study of 40 schools in Houston (with a combined student population of nearly 10,000), Carlson, Francis, and Ferguson (2001) found that those schools implementing Direct Instruction outperformed the control schools significantly. Specifically, the authors concluded that the students who stayed in the program longer achieved considerably better results by the end of first grade: 60% to 74% of the students at the DI schools scored above the 50th percentile on the SAT-9 Reading tests, but only 43% to 53% of the students at the control schools scored above the 50th percentile (Carlson, Francis, & Ferguson, 2001, pp. 5–7).

In a similar vein, Personalised System of Instruction (PSI) has been found by researchers to be effective in teaching learners. Pascarella and Terenzini (1991) reported effect sizes of 0.42 and 0.49 from different meta-analyses of 19 and 61 studies respectively with learners exposed to PSI recording 19 percentile points higher than those exposed to conventional instructional approach. It was thus concluded by them that PSI promotes better subject matter mastery. PSI was also found by Kulik, Kulik and Bengert-Downs (1990) in a meta-analysis to promote better performance, time of learning task, retention and attitude when compared with conventional methods used for courses. In addition, Owolabi and Aderinto (2010) in a study titled 'effect of personalized system of instruction on senior secondary school students performance in mathematics' **observed that** PSI pays a direct attention to each learner. It pursues their needs to master the contents of instruction, motivate the learners to put in their greatest efforts to ensure success and adopt more positive attitudes to learning. It seems that its adoption may take the perennial failure out of the school system. This study has established the possibility of the adoption of PSI for the improvement of learners' performances (Owolabi & Aderinto, 2010).

The finding of this study supported some researchers' findings on gender difference in mathematics at elementary and secondary levels which shows some results with significant gender difference favouring males (Fenema, 1984; Hackett and Campbell, 1987). Gbodi (1998) conducted a study on map work in practical geography. The researcher concluded that the observed gender difference was not unconnected with the mathematical ability of participants. Also, according to Aremu and John (2005) review of related studies done by Lucy and Nkoyo (2000) and Okeke (2001), they posit that gender differences do exist in students achievement in science and technology and it revealed that women are not only under-represented, but their levels of achievement in science and technology are low compared to men.

This is in contrast with the findings of Yinyinola (2008), Ogunsanwo (2003), Akinsola and Tella (2007) and Onabanjo (2000) who did not find any significant difference in the academic achievement of male and female learners in their various studies. This implies that each of the treatments could be applied effectively across male and female learners. It is thus recommended through the finding of this study that Mathematics teachers should therefore give opportunities to all categories of Mathematics pupils so that they are exposed to active learning techniques of PSI and DI especially when treating difficult Mathematics concepts and problems.
This finding disagrees with the study of Akujieze (2012) who conducted a study on the effects of out of class activity and counselling strategies on low-achieving students' learning outcomes in geometry in secondary school mathematics in Ibadan, Nigeria. The result of the finding shows that there was no significant main effect of gender on participants' achievement in mathematics. In a similar vein, Akinsola (1999) examine the relationship between Mathematics self-concept and achievement in Mathematics. The results of the findings show that there was no significant difference between the main achievement scores of secondary school boys and girls in Mathematics. The researcher concluded that Mathematics is not a male dominated subject as claimed by some people, but rather for both sexes provided they were subjected to the same teaching and learning condition.

The findings of this study corroborated the findings of Adeyemi (2012) who found that there was significant main effect of school location on students' achievement and attitude to economics. In the same vein, Owoeye (2000) opined that school location has a significant effect on the academic performance of the pupils. Noting that because of this, parents enrol their children into urban schools on the basis of better performance. Ndukwu (2002) found that the economic condition seems to be better in urban location than in the rural location, it is thus explicable that learning outcomes of children who live and attend primary schools in urban location tend to be better than those of their counterparts in rural location. Adepoju (2001) found that learners in urban schools manifest more brilliant performance than their rural counterparts. Also, Ogunleye (2002), Ndukwu (2002) and Odinko (2002) reported a significant difference in the achievement of students in urban peri-urban areas. This however contradicts some findings which noted that, school location has no significant effect on academic performance of pupils (Onah & Ugwu, 2010; Yussuf & Adigun, 2010).

This study also revealed that there was no significant interaction effect of treatment and gender on pupils' achievement in Mathematics. It thus, implies that the effect of treatment on the pupils' achievement in Mathematics is not sensitive to gender. With regard to gender differences, the results of this study affirm similar findings in recent research by Sungur and Telkaya (2004), Pajares and Graham (1999) and Nicolaidou and Philippou (2003) who found no significant difference among gender. This implies that the treatment (DI and PSI) is not sensitive to participants' gender. The findings of this study also corroborate with the results of other studies Henry (2008) who reported that achievement in science is not gender sensitive but at variance with others and Akujieze (2012) who reported that there was no significant interaction effect of treatment and gender on participants' achievement in Geometry and attitude towards Mathematics. The result indicates that the combination of treatment and gender does not influence achievement in Mathematics. This means that the effect of the treatment on participants' achievement does not vary from male to female. The result, when viewed against the background of the insignificance of the main effect of gender, suggests that gender cannot be biased to the learning of mathematics. The reason for no gender difference could be as a result of behaviourists' nature of strategies employed by the researcher, which guaranteed high facilitative learning that brings about high level of achievement to both sexes (male and female). The teacher should freely integrate the instructional strategies (DI and PSI) into the teaching of both male and female participants.

However, the study revealed that there was significant interaction effect of treatment and school location on pupils' achievement in Mathematics. The significant interaction effects of treatment and school location are indications that the effects of DI and PSI on cognitive learning outcomes are location sensitive. The finding of this study agrees with Amusan (2013) who in a study found out that there were moderately significant relationships between school location, pedagogical skills, attitude, classroom interaction and the criterion variable Basic Science and Technology achievement. He went further to say that school location had significant direct effect on BST achievement of the pupils. This study also agrees with Owoeye (2000) who opined that school location has a significant effect on the academic performance of the pupils. In the same vein, Adepoju (2001) found that learners in urban schools manifest more brilliant performance than their rural counterparts. Also, Ogunleye (2002), Ndukwu (2002) and Odinko (2002) reported a significant difference in the achievement of learners in urban and peri-urban areas. This study however contradicts the findings of Onah and Ugwu (2010), Yussuf and Adigun (2010) who noted that school location has no significant effect on academic performance of pupils.

However, the study revealed that there was no significant interaction effect of gender and school location on pupils' achievement in Mathematics. It thus, implies that the effect of gender on the pupils' achievement in Mathematics is not sensitive to school location. This finding is in contrast with Jacobs (2002) who observed that female students do better in school than male students and that girls get higher grades and complete high school at a higher rate compared to boys. Odinko and Iroegbu (2005) in a study titled "effects of pre-primary education on cognitive and affective learning outcomes among primary school children in Nigeria" found out that gender, on its own, does not significantly influence cognitive and affective learning outcomes of primary school children in Nigeria and that the effects of treatment and location respectively on the learning outcomes tend not to vary for boys and girls. They went further to conclude that children's exposure to pre-primary education tend to significantly improve their cognitive and affective learning outcomes during the first year of primary education. This assertion seems to be valid irrespective of the children's gender and location. However, the impacts of exposure to pre-primary education on the cognitive and affective learning outcomes vary for children who live and attend primary school in urban and rural locations (Odinko & Iroegbu, 2005).

On gender difference, the finding of this study is in agreement to the finding of Akinsola and Tijani (1999) who examined the relationship between Mathematics self-concept and achievement. The results of the findings show that there was no significant difference between the mean achievement scores of boys and girls in Mathematics. The researchers concluded that Mathematics is not a male dominated subject as claimed by some people but rather for both sexes. Similarly, Akinsola and Tella (2001) conducted a study on diagnosis of pupils' difficulties and errors in learning Mathematics in primary schools in Ibadan. The finding revealed that no significant difference existed between the Mathematics achievement test scores of male and female participants in their study. In the same vein, Ogunsanwo (2003) studied the effects of homework mode and parental involvement in homework as determinants of primary school pupils learning outcomes in Mathematics in Ibadan North Local Government area of Ibadanland. The result of the study indicated that the achievement test scores of boys were not significantly better than those of girls. The researcher concluded that gender did not have any significant main effects on learners' achievement.

The study revealed that there was no joint significant interaction effect of treatment, gender and school location on pupils' achievement in Mathematics. This implies that the variables cannot jointly influence the learning outcome of pupils in Mathematics. However, taking the variables independently, the variables had significant main effects on pupils' achievement in Mathematics. That is, the interaction effect involving the three variables is not mutually influence by achievement to produce a joint effect. The study aimed at improving Mathematics learning outcomes of low achieving pupils in primary school. This indicates that irrespective of the combination of the three variables (treatment, gender and school location) to produce a joint effect, the result of the study has shown that DI and PSI groups perform better than the control group. Therefore, the findings of this study have provided further empirical support on the effectiveness and usefulness of DI and PSI strategies over the conventional method, which is the control group.

Conclusions

Conclusions drawn from the evidence provided by the study include: that, there was a significant main effect of treatment on pupils' achievement in Mathematics; that, there was a significant difference in the achievement scores in Mathematics between the participants in PSI and Control. Also, DI differs significantly from the Control while there exist a significant difference between the mean scores of PSI and DI. That, there was a significant main effect of gender on pupils' achievement in Mathematics; that there was a significant main effect of school location on pupils' achievement in Mathematics. That there was a significant interaction effect of treatment and school location on pupils' achievement in Mathematics. That there was no significant interaction effect of treatment and gender on pupils' achievement in Mathematics. That there was no significant interaction effect of school location and gender on pupils' achievement in Mathematics. That there was no significant interaction effect of treatment, school location and gender on pupils' achievement in Mathematics.

The following recommendations were made: Teachers should choose the teaching methods that would show a measurable positive effect on the learners which is capable of sharing the common feature of engaging learners in a comfortable or creative manner. This study has established the possibility of the adoption of DI and PSI for the improvement of learners' performances in Mathematics in primary schools. That learners should be encouraged to work together and help one another in a manner that tend to promote more positive self-evaluations of capability and higher academic attainments than individualistic or competitive ones. Mathematics teachers should therefore give opportunities to all categories of pupils so that they are exposed to active learning techniques of PSI and DI especially when treating difficult Mathematics concepts and problems. Pupils in both urban and rural schools should be given equal opportunities when learning is in progress.

References

Adegoke, B. A. (2002). Teacher influence as a determinant of dependent prone students' learning outcomes in senior secondary school geometry. Ph.D Thesis Institute of Education, University of Ibadan, Ibadan, Nigeria ixviii+243pp.

Adeleke, J. O. (2007). Gender role on topic preference of senior secondary school students in mathematics. A paper presented at WAEC monthly seminar held in Lagos. International Centre for Educational Evaluation (ICEE), Institute of Education, University of Ibadan, Ibadan, Nigeria.

Adeleke, J. O. (2007). Identification and Effect of cognitive entry characteristics on students' learning outcomes in bearing in Mathematics. An unpublished Ph.D Thesis University of Ibadan.

Adepoju, T. (2001). Location factors as correlates of private and Academic performance of Secondary Schools in Oyo State. A proposal presented at the higher students Joint Staff Seminar Department of Teacher Education, University of Ibadan, Ibadan.

Adeyemi, S.A. (2012). Effects of active review and panel discussion on students' learning outcomes in senior secondary economics in Ibadan, Nigeria. An unpublished M.Phil dissertation, Institute of Education, University of Ibadan, Ibadan, Nigeria.

Agboola, O. S. & Oloyede, E. O. (2007). Effects of project, inquiry and lecture demonstrations teaching methods on senior secondary students' achievement in separation of mixtures practical test. ***Academic Journal, Educational Research and Review Vol. 2*** (6) pp. 124-132.

Akinlua, A. A. (1996). An investigation of primary school teachers' basic mathematics competence for effective teaching in primary school. ***Journal of Educational Research and Evaluation 1****(2): 35-38.*

Akinsola, M. K. (1999). Effects of instruction on students' performance onknowledge, comprehension and application tables in Mathematics. ***African Journal of Educational Research, 5***(1), 94,100.

Akinsola, M. K. Tella, A. A. (2007). Correlates of academic procrastination and mathematics achievement of university undergraduate students. ***Eurasia Journal of Mathematics, Science & Technology Education,*** 2007. 3.4:363-370.

Agboola, O. S. & Oloyede, E. O. (2007). Effects of project, inquiry and lecture demonstrations teaching methods on senior secondary students' achievement in separation of mixtures practical test. ***Academic Journal, Educational Research and Review Vol. 2*** (6) pp. 124-132.

Akinlua, A. A. (1996). An investigation of primary school teachers' basic mathematics competence for effective teaching in primary school. ***Journal of Educational Research and Evaluation 1****(2): 35-38.*

Akinsola, M. K. (1999). Effects of instruction on students' performance onknowledge, comprehension and application tables in Mathematics. ***African Journal of Educational Research, 5***(1), 94,100.

Akinsola, M. K. Tella, A. A. (2007). Correlates of academic procrastination and mathematics achievement of university undergraduate students. ***Eurasia Journal of Mathematics, Science & Technology Education,*** 2007. 3,4:363-370.

OluOsokoya. The Department of Teacher Education, University of Ibadan, Ibadan, Nigeria.

Engelmann, S.. (2012). ***SRAonline.com/di_home_research***.html. retrieved 10th December, 2012.

Ezeokoli, F.O. (2002). What West African Examinations Council (WAEC) Senior School Certificate Examination Literature in English tests, In Abdul Mansaray and I. O. Osokoya (Eds). ***Curriculum development at the turn of the century: The Nigerian experience***. Ibadan: Wemilore Press Nig. Ltd.

Fencl, H. and Scheel, K. (2005). Engaging students': an examination of the effects of teaching strategies on self-efficacy and course climate in a no majors/physics course. Citation and Bibliographic information.

Fenema, E. H. (1984). Girls, women and mathematics, In E. Fenema and M. J. Ayre (Eds). ***Women and education: equity or equality***. Berkey C.A.: McCutcha, 137 – 154.

Gbodi, E. (1998). Three levels of visual mnemonics and senior secondary students achievement, retention and attitude to some aspects of practical Geography. Unpublished Ph.D Thesis, Department of Teacher Education, University of Ibadan, Nigeria.

Georgewill, J. W. (1990). Causes of poor achievement in West African School Certificate Examination in Rivers State Secondary Schools, Nigeria. ***International Journal of Mathematics Education in Science and Technology. 21*** (3): 379-385.

Hackett, G. & Campbell, N. K. (1987). Task self-efficacy and task interest as a function of performance on a gender-neutral task. ***Journal of Vocational Behaviour. 30***, 203 - 215.Ifamuyiwa, S. A. (1999). Problems facing mathematics teaching and learning in Nigeria. ***Nigeria Journal of Curriculum Studies, 6***(1):51-55.

Kannapel, P.J. & De Young, A.J. (1999). The rural school problem in 1999: A review and critique of the literature. ***Journal of Research in Rural Education, 15***, 67-79.

Keller F. (1968). Good Bye Teacher. ***Journal of Applied Behaviour Analysis***

Kim, T. & Axelrod, S. (2005). Direct Instruction: An Educator's Guide and a Plea for Action. ***The Behaviour Analyst Today, 6*** (2), page 111-123.

Kulik, J. A., Kulik, C-L. C & Bengert-Downs, R. L. (1990). ***Review of Educational Research, 60***, 265

Lucy, E. & Nkoyo, I. (2000). The sanctity of woman in science and technology: Problems and prospectus. ***Journal of Women in Academics, 1***(1) 90-99.

Ndukwu, P.N. (2002). School and Teacher factors as determinants of classroom material resources utilization in pre-primary school in Lagos State. Unpublished Ph.D Thesis, University of Ibadan, Ibadan, Nigeria.

Nicolaidou, M. & Philippou, G. (2003). Attitudes towards mathematics, self efficacy and achievement in problem solving. ***European research in Mathematics Education II.***

Nigeria Education Sector Analysis: (2004). Assessment of Learning Achievement of Primary four and Primary six pupils. National Report of Monitoring of Learning Achievement Project, 2003.

Odinko, M. N. (2002). Home and school factors as determinants of literacy of skill development among Nigeria Pre-primary school children. Unpublished Ph.D Thesis, University of Ibadan, Ibadan.

Ogunleye, B.O. (2002). Evaluation of the Environmental Aspects of the Senior Secondary School Chemistry Curriculum in Ibadan, Nigeria. Unpublished Ph.D. thesis University of Ibadan, Ibadan, Nigeria.

Ogunsanwo, T. (2003). Home work mode and parental involvement on home work determinants of primary school pupils' learning outcomes in mathematics in Ibadan North. Unpublished PhD thesis. Department of Teacher Education, University of Ibadan, Ibadan, Nigeria.

Olatundun, S.A. (2008). Impact of outdoor educational activities on pupils' environmental knowledge, attitude in selected primary schools in Ibadan. Nigeria. Ph.D. Thesis Department of Teacher Education, University of Ibadan, Ibadan, Nigeria.

Onabanjo, I.O. (2000). Peer tutoring assisted instruction. Parent supportiveness and students focus of control as determinants of learning outcomes in senior secondary school mathematics. Ph.D. thesis Institute of Education, University of Ibadan, Ibadan, Nigeria.

Onah, D.U. & Ugwu, E.I. (2010). Factors which predict performance in secondary school physics in Ebonyi north educational zone of Ebonyi State, Nigeria. Pelagia Research Library. Advances in Applied Science Research 1 (3): 255-258.

Owoeye, J.S. (2002). The effect of integration of location, facilities and class size on academic achievement of secondary school students in Ekiti State University. Unpublished Ph.D Thesis, University of Ibadan, Ibadan, Nigeria.

Owolabi, H.O. & Aderinto, M.O. (2010). Effect of Personalized System of Instruction on Senior Secondary School Students performance in Mathematics. ***Ilorin Journal of Education, Vol. 29.*** 92-98.

Pajares, F. & Schunk, D. H. (2001). Self-efficacy, self concept and academic achievement. In J. Aronson & D. Cordova (Eds). ***Psychology of Education: Personal and Interpersonal forces.*** New York: Academic Press.

Pascarella, E. T. & Terezini, P. T. (1991). ***How College Affects Students.*** San Francisco: Jossy Bass.

Yinyinlola, W.L. 2008. Study skills training and time management strategies enhancing restiveness and learning outcomes in Mathematics among Secondary School Students in Ibadan, Nigeria. Unpublished Ph.D. Thesis, Department of Guidance and Counselling, University of Ibadan, Ibadan, Nigeria. xiii + 266 pp.

Yusuf, M.A. & Adigun, J.T. 2010. The influence of school sex, location and type on students academic performance. ***Internation Journal of Education Science. 2***(2), 81 – 85.