EFFECT OF PROBLEM SOLVING STRATEGY ON ACHIEVEMENT AND RETENTION OF PRIMARY SIX PUPILS WITH LOW COGNITIVE ABILITY IN NIGER STATE, NIGERIA

Sulaiman, F. J; Ezenwa, V. I;Wushishi, D. I. & Isah, A.
[1]Department of Science Education, Federal University of Technology, Minna, Nigeria.
[2]Department of Statistics, Federal University of Technology, Minna, Nigeria.
Email: jellaasabe@gmail.com

Abstract
This paper examined the effect of problem solving strategy on retention ability of low cognitive primary six pupils in Niger State, Nigeria. The research design was a pretest - posttest randomized non-equivalent group. The population for the study was80,829 in 3,066 primary schools in the 25 Local Government Areas. The research was conducted in the three senatorial zones of Niger State using a sample size of 240 primary six pupils with low cognitive ability. 120 of the sampled pupils were as signed to both experimental and control groups. The control group was used to determine the differences in retention ability resulting from the application of problem solving strategy. The instrument used for data collection was Mathematics Retention Test (MRT). The content validity of Mathematics Retention Test Problem-Solving (MRTPS) was done by experts in the field of Test and Measurement Evaluation section of the State Ministry of Education, primary six Mathematics teachers and senior lecturers in Federal University of Technology, Minna. The reliability of the Mathematics Retention Test Problem Solving (MRTPS) was a test – retest method in interval of two weeks. The two tests were marked and the scores collated and analyzed using Pearson Product Moment Correlation (PPMC) and a reliability coefficient of 0.86 was obtained. Data were collected using the Mathematics Achievement Test Problem Solving (MATPS) consisting of 20-item structured questions. The resulting data were analyzed with Statistical Package for Social Sciences (SPSS) for mean retention scores, standard deviation and Analysis of variance (ANOVA) at the 0.05 level of significance. Findings from this research showed that problem-solving strategy had a significant effect on pupils' retention in Mathematics as the pupils taught Mathematics with problem solving strategy recorded a higher mean retention score in Mathematics than their peers taught with conventional teaching method. The result also reveals that there was disparity in the retention ability of the pupils in the three senatorial zones of Niger State with the pupils in the Niger East better in Mathematics retention. It is therefore recommended that teachers should embrace problem solving strategy in teaching primary six pupils Mathematics so as to improve their retention abilities.

Keywords: Problem Solving Strategy, Achievement, Retention, Low Cognitive Ability.

Introduction
Mathematics is at the heart of most disciplines and remains a universal and must-to-do subject at both primary and secondary school levels in Nigeria considering its impacts in individual as well as national development. Kurumeh, Onah and Mohammed (2012) stressed that Mathematics is such an indispensable tool that is crucial in the field of humanities, sciences, technology, engineering, and indeed in all Mathematical-based disciplines. An average individual uses Mathematics in his everyday activities. Mathematics is also important in the fundamentals of scientific investigations, innovations, and ultimately scientific discoveries. Thus, for a nation like Nigeria to elevate its status from being a developing country to a developed nation, proper understanding of Mathematics is paramount for its people (pupils and students) that will drive the Nigerian economy through mathematical and scientific innovations, information and communication technology and technological advancements. This is why Mathematics is often referred to as "mother of science". Thissingular reason accounts for why Nigerian government makes Mathematics a 'core subject' up to the secondary school level and put it at the center of her reforms in basic education(Awofala and Awolola, 2011). Despite the roles Mathematics play in individual and national developments, pupils and students in the past few decades have recorded consistent poor achievement in the subject and some contemporary researchers have linked this ugly situation to poor retention skills and ineffective teaching methods in use in our schools.

The West African Examinations Council (WAEC, 2006) reported on students' performance in the Senior Secondary School Certificate Examinations (SSCE), and expressed worries over the low achievement due to poor retention rate and interest in mathematics by Nigerian candidates. Teachers method of instruction has been identified as one of the major factors responsible for such situation. For instance, Gambari, Ezenwa and Anyawu (2014) and Kiboss (2012) attributed poor teaching strategy to poor performance in

Mathematics, also Kurumeh (2007) maintained that the inappropriate, inadequate, elitist and euro-centric teaching techniques used by mathematics teachers is instrumental to pupils' and students' poor retention of the basic mathematical principles, computations or logical facts involved. Each society expects that its education system should enable the individuals to become an effective problem solver in their real life Walker and Loft on (2003); and Chin and Chia (2004). Ali, Hukamdad, Akhter, & Khan (2010), pointed out as roots of problem solving learning is found in Dewy's thoughts, "that learning by experimentation or doing is more lasting" (Dewy, 1938).Children with low cognitive ability and inattentiveness experience difficulty with social behavior (aggression and prosocial skill deficits) at school entry and that these behaviors place them at risk for stable social maladjustment and poor peer relationships in elementary school. The impact it has on the acquisition of knowledge and reasoning skills in academic domains, low cognitive ability may delay the acquisition of skills and reasoning related to social competence Bellantiand Bierman (2000).This implies that the teachers are saddled with the responsibility of seeking for the appropriate teaching method that is capable of improving pupils' and students' ability to assimilate information, retain, retrieve and recall them when necessary. There are overwhelming evidences in the literature that teaching and learning strategy, and instructional modality are the main factors responsible for poor retention of pupils and students in Mathematics (Kurumeh*et al.*, 2012; Omenka, 2010;Paden and Dereshiwsky, 2007; Mari, 2002). This research therefore focuses on the effects of problem – solving strategy on the Mathematics retention ability of low cognitive primary six pupils in Niger State, Nigeria.

Statement of the Problem
The results from Examinations bodies such as National Common Entrance Examinations (NCCE) results 2008 – 2012; Niger State Junior Secondary Certificate Examinations(JSCE) results 2008 – 2012; West African Examinations Council (WAEC) results 2007 – 2011 and National Examinations Council (NECO) results 2008 – 2012, the performance of pupils in Mathematics both primary school and secondary school level in Niger State has been disappointing. For instance from 2010 – 2012 no pupils scored above 200 out of 650 mark in the NCCE (NECO,2013) and also the results of the state JSCE taken from 2008 to 2012, more than 59% of students had less than credit pass (Niger State Ministry of Education, 2013) while on the average less than 20% had credit pass between 2010 and 2012in the same exam JSCE. The statistical analysis of these results showed that primary six pupils in Niger State are underachieved and this situation has been attributed to lack of teaching strategy that foster adequate assimilation and retention of facts learnt in the subject. Even with the public uproar on this ugly trend, the poor performance remains on. It becomes obvious that the approaches and strategies in use for teaching and learning of Mathematics in both primary and secondary school levels are rather questionable, and are not used effectively to promote learners activity and provide them with necessary skills that will enable them retain concepts they have been taught and used them for problem-solving when the need arises (Kurumeh *et al.*, 2012).

Likewise, Kiboss (2012) attributed poor performances in Mathematics to poor strategies used by teachers to teach the subject and other related subjects. It therefore implies that the problem solving is actually all about how to learn independently and calls for pupils' participation in primary school classroom environment, and this is the most convenient approach to achieve the aims of teaching learning process. This study therefore examines the effect of problem-solving strategy on the Mathematics retention ability of low cognitive primary six pupils in Niger State, Nigeria.

Research Questions
In order to achieve the purpose of the study, the following research questions were raised:
1. Will there be difference between the mean retention scores of pupils with low cognitive ability taught mathematics with problem solving strategy and those taught with conventional method?
2. Will there be difference between the mean retention scores of pupils with low cognitive ability taught Mathematics with problem solving strategy in Niger South, Niger East & Niger North senatorial zones?

Null Hypotheses
The following null hypotheses were formulated and tested at 0.05 significant level.
HO_1 There is no significant difference between the mean retention scores of pupils with lowcognitive ability taught mathematics with problem solving strategy and those taught with conventional method.
HO_2 There is no significant difference in the mean retention scores of pupils with low cognitive ability in Niger South, Niger East and Niger North taught mathematics with problem solving strategy.

Methodology
The research design that was adopted for the study was a pretest - posttest randomized non-equivalent groups design (Fraenkel and Wallen, 2008). The design establishes cause-effect relationships for two

variables (Independent and dependent variables of a study). The experimental group and control group were given the pretest and posttest. Experimental group was subjected to treatment using problem solving strategy while the control group was taught using conventional method. The population for the study was the entire primary six pupils in the 25 Local Government Areas of Niger State. There is a total of 80,829 (46,506 males and 34,323 females) primary six pupils in the Local Government Area, Niger State Universal Basic Education Board, (NSUBEB,2014), and the details for three zones under investigation in Niger State are summarized in Table 1. The choice of primary six pupils is based on the preparation for entry into JSS1 and on the assumption that they have been exposed to the teaching of Mathematics from primary one to six.

Table 1:
Summary of population of pupils in the three senatorial zones of Niger State

Zone	Male	Female	Total
Niger South (NS)	13,626	8,840	22,466
Niger East (NE)	18,942	16,984	35,926
Niger North (NN)	13,938	8,499	22,437
Total	**46,506**	**34,323**	**80,829**

(Source: NSUBEB, 2014)

The six (6) LGAs (Bida, Lapai, Chanchaga, Suleja, Kontagora and Wushishi) were (1) stratified to select LGA randomly (2) randomly selected from the pool of twenty five (25) LGAs in Niger State. This (selection) was achieved through raffle draw method.

The sample for this study consists of two hundred and forty (240) primary six pupils. The pupils were selected from twelve (12) primary schools in six (6) Local Government Areas selected for the study. Two schools were selected from each of the six local government areas (LGAs). One school served as the experimental groups while the other school was used as control group. Twenty (20) pupils were selected from each of the twelve (12) schools selected for the study. However, the study is focused on a special group of pupils who are of low cognitive. The groups were identified from their third term primary five promotional examination results. Pupils that scored below 50% in Mathematics were considered as pupils with low cognitive ability. It was from this group that twenty (20) pupils were eventually selected from six (6) schools through a raffle draw to form the experimental groups. Similar exercise was carefully carried out in the six (6) other schools that were used as control groups for the study.

Two research instruments were used for the research study as treatment instrument and test instruments. The treatment instrument was Problem Solving Teaching Strategy Lesson Plan(PSTSLP) and Conventional Method Lesson Plan (CMLP). The lesson plan which was in tabular form consists of developmental stage and approximated time that was used in each step, teaching and learning activities, learning point and remark. The teacher's activities as well as those of pupils were carefully spelt out in the PSSLP. The remarks on the observations in the course of teaching were noted after each lesson. The PSTSLP used to teach primary six pupils in the classroom situation followed the procedures outlined by Wetzel (2008).

The test instrument used was Mathematics Retention Test Problem Solving (MRTPS). The Mathematics achievement test consists of 20-item structured questions. The content validity of Mathematics Retention Test Problem-Solving (MRTPS) was done by experts in the field of Test and Measurement Evaluation section of the State Ministry of Education, primary six Mathematics teachers and senior lecturers in Federal University of Technology, Minna. The reliability of the Mathematics Retention Test Problem Solving (MRTPS), was a test – retest method in interval of two weeks. The two tests were marked and the scores collated and analyzed using Pearson Product Moment Correlation (PPMC) and a reliability coefficient of 0.86 was obtained.

The data obtained were analyzed using Statistical Package of Social Sciences (SPSS) Version 20.0. Mean, Standard Deviation, t-test and analysis of variance (ANOVA) statistics were obtained from the data collected.

Results of Data Analysis

Null Hypothesis 1

HO₁ There is no significant difference between the mean retention scores of pupils taught with lowcognitive ability taught mathematics with problem solving strategy and those taught with conventional method.

Table 2:
ANOVA of the Retention test Scores of Experimental and Control Groups

Sources of variation	Sum of Squares	df	Mean Square	F_{cal}	Sig.
Between Groups	153520.417	1	153520.417	2935.259	0.000
Within Groups	12447.917	238	52.302		
Total	165968.333	239			

*significant at 0.05 level

Result of Table 2 shows that (F_{CAL} = 2935.259, P<0.05). This meant that P_{VALUE} was less than 0.05 and the hypothesis that there is no significant difference between the mean retention scores of pupils with low cognitive ability taught Mathematics with PSS and those taught with conventional method was rejected. Therefore, there was actually a significant difference in retention between the two groups.

Null Hypothesis 2

HO₂ There is no significant difference in the mean retention scores of pupils with low cognitive skills in Niger South, Niger East and Niger North taught Mathematics with problem solving strategy.

Table 3:

ANOVA of Mean Retention Scores of pupils in Niger South, Niger East and Niger North.

Sources of variation		Type III Sum of Squares	df	Mean Square	F_{cal}	Sig.
Intercept	Hypothesis	445481.667	1	445481.667	2.902	0.338
	Error	153520.417	1	153520.417[a]		
Zone	Hypothesis	3495.208	2	1747.604	4.605	0.178
	Error	758.958	2	379.479[b]		
Retention	Hypothesis	153520.417	1	153520.417	404.556	0.002
	Error	758.958	2	379.479[b]		
Zone*Retention	Hypothesis	758.958	2	379.479	10.837	0.000
	Error	8193.750	234	35.016[c]		

Result of Table 3, p-value (0.000) is less than 0.05 alpha level (P<0.05), and thus the null hypothesis was rejected. It is therefore concluded that there was a significant difference in the mean retention scores of pupils with low cognitive ability taught Mathematics with problem solving strategy in Niger South, Niger East and Niger North Senatorial zones. Therefore, Duncan Post-hoc analysis was carried out to locate which of the zones responsible for the observed difference.

Table 4:
Duncan Post Hoc Analysis of Mean Retention Scores of Niger South, Niger East and Niger North.
Post-hoc details on the difference observation in the three zone

Zone of the pupils	N	Subset		
		NS	NN	NE
Niger South	80	39.31		
Niger North	80		41.63	
Niger East	80			48.31
Sig.		0.000	0.000	0.000

Result of Table 4 shows the Duncan Post Hoc analysis of mean retention scores of pupils in experimental group from Niger South (NS), Niger North (NN) and Niger East (NE) are 39.31, 41.63 and 48.31 respectively. This indicates that Niger East had the highest mean retention scores among the three zones followed by the Niger North, and could be raised to explain the significant difference observed in Table 7. Hence, there is a significant difference in the mean retention score of pupils with low cognitive skills in NS, NN and NE zones taught Mathematics with problem solving strategy in favour of pupils in the Niger East zone.

Discussion of Results
There sult of the study showed that pupils taught Mathematics with problem solving strategy had a significant difference in retention between the two groups. This was confirmed by the result in Table 1 which revealed there is significant difference in mean retention between pupils taught mathematics using problem solving strategy and their colleagues using conventional method were significant leading to rejection of hypothesis one. This shows that problem solving strategy enhanced pupils' retention more positively and effective in improving and facilitating pupil's retention in Mathematics than the conventional teaching method. It should be emphasized here that the result has crucial implication for the use of problem solving strategy to teach Mathematics in our primary schools since students' achievement is a function of retention (Kurumeh*et al*., 2012). The result also showed that only the pupils in the experimental group who were taught using problem solving benefited and retained Mathematics concepts more than their peers in the control group (taught with conventional method) and the difference between the retention mean scores of pupils in experimental group and control groups is statistically significant. This finding concurs with Bawa (2011) who found that the problem solving instructional strategy improved retention of ecological concepts and helped in shifting the subjects' problem solving pattern and thus influencing their performance positively.

It was observed that there is a difference in the mean retention scores of pupils among the three Senatorial zones of Niger State considered in this work, and the difference was also found to be statistically significant. From the three zones, the pupils in the Niger East zone recorded the highest achievement in mathematics; and the hierarchical order of achievement of the zones considered in this work is established as:Niger East ˃ Niger North ˃ Niger South.

The result points out that there are some factors that are inherent in the Niger East zone of Niger State that accentuated the effect of problem solving strategy. This may be attributed to the proximity of the zone to the Niger State Headquarters, Minna which perhaps supports the availability of some resources (more qualified teachers, teaching aids, instructional materials, to mention a few) that reinforces the instructional content of the problem solving that translates to better understanding of the lessons and ultimately manifests in better achievement.

Conclusions
This work shows that low cognitive skill primary six pupils in Niger State taught Mathematics with problem solving strategy recorded higher mean retention score in Mathematics than their peers taught with conventional teaching method, and thus problem solving strategy is more effective than the conventional method in enhancing pupils' retention ability. The study also reveals discrepancy in the retention ability of the pupils in the three senatorial zones of Niger State, the pupils in the Niger East being the best Mathematics retainers. The proximity to the Niger State Headquarters in Minna has been raised to explain the leading status of this particular zone. Because the difference in retention disparity among the zones is statistically significant, it is concluded that there exists a gap in the retention ability of pupils among the zones. The differences observed in the retention ability of pupils in the three zones suggested that instructional strategies are not the only determinants of retention but other factors such availability of more qualified teachers, teaching aids, instructional materials; pupils' background, interest, and so on.

Recommendations
It is therefore recommended that teachers should embrace problem solving strategy to teach Mathematics in our primary schools, and other stakeholders in education should encourage and enforce the strategy in our schools. It is also recommended that other factors that may influence retention of pupils in primary and secondary schools should be studied by future workers.

Mathematics teachers should adopt problem solving strategy to teach pupils and students particularly in our primary schools in Niger State and beyond as it is pupils' friendly, learner centered and effective. Hence, it can lead to discovery.

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