



SEMIARID JOURNAL OF ACADEMIC RESEARCH AND DEVELOPMENT (SJARD)

Impact of Cuisenaire-Rod Strategy on Remediating Errors in Addition and Subtraction among Primary School Pupils, in Kano Municipal Local Government Area Kano, Nigeria.

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ABSTRACT

This study investigated the impact of Cuisenaire rods strategy on remediating errors in addition and subtraction of numbers among primary school pupils in Kano State, Nigeria. Simple random sampling technique using “balloting method” was used in selecting two co-educational primary schools in kano municipal local government. One of the schools was also randomly selected as experimental group while the other as the control group. The same method was used in selecting intact classes for the study. A population of (2,328) primary II school pupils consisting of 1,271 males and 1,057 females were used for the study. The experimental group was taught using Cuisenaire rod strategy (CRS) while the control group was taught using conventional method. A Quasi –experimental research design of pretest, post-test was adopted by the researcher. The instrument used by the researcher was a primary mathematics errors remediating test (PMERT) which consist of 50 test items of multiples choice objective test and a paired Cuisenaire rod strategy (PCRS) was developed and validated by the expert in mathematics education and the data were collected. Four (4) research questions and four (4) hypotheses guided the study. The target population of the study was all the 2,328 class two pupils of the public primary schools in kano municipal local government area of Kano State. All the public primary schools selected were coeducational and have the same characteristics. Thus the sample size was 227 pupils. The data research questions were answered using the descriptive statistic of mean and standard deviation while hypotheses were tested using the independent sample t-test statistic at 0.05 level of significance. The treatment for the study involved exposing class two pupils addition and subtraction of numbers using a Cuisenaire rods strategy which consist of 74 rectangular rods in 10cm different length and 10 different colours for experimental group and the lecture method for the control group. Both the experimental and control group were taught for six weeks, one hour per week by the researcher. The Findings of the study showed that the pupils taught using Cuisenaire-rod strategy committed less error than the pupils in the control group. It is recommended that mathematics teachers should be trained on how to implement Cuisenaire rods strategy on remediating errors in addition and subtraction of numbers among primary school pupils in their classrooms.

Keywords: Cuisenaire-Rod, Remediating Errors, Primary School Pupils.

Introduction

The problem associated with teaching of mathematics at primary schools most especially on addition and subtraction are renaming, renaming-unit to tens, renaming-tens to hundred, place value and word problems. These errors committed by the pupils were studied and classified according to one of the algorithm error where pupil applies the correct operation (formula, techniques) but makes errors in carrying through the necessary step. In other word the error occurs within the step, enumerate by Joseph (1990). The data were collected through scrutinizing the test scripts of the pupils with reference to the questions papers and marking schemes. For the error made each of the scripts was taken and then analyzed to see why the pupils failed. The error(s) were later classified and summed up by errors type. Also the total numbers of errors in each error-type for the entire pupil in each school were calculated.

The study remediated the errors using Cuisenaire-rods strategy. Cuisenaire-rods are mathematics manipulation use for elementary level of learning. A pack of Cuisenaire-rods consist of 74 rectangular rods in 10cm different length and 10 different colors. Each color corresponding to different length. Cuisenaire-rods are good to be used in teaching mathematics. It entails the used of concrete, physical, observable and touchable objects like Cuisenaire-rods to teach abstract concept. There is therefore a need to have a tryout of an approach like the use of Cuisenaire-rods

The rods could be used as manipulative and symbolic concrete representation in teaching concepts in mathematics. Teacher explores whole numbers, fraction, measurements, ratio, perimeter, symmetry, congruency 3, dimensional geometry and function using Cuisenaire-rods (Thomson,

1994). Cuisenaire-rods approach is hand-on and mind-on manipulative activities field approach for teaching abstract concept in mathematics and science. This approach helps to develop key skills such as, classification, critical thinking, problems solving and logical reasoning (Rule and Hllaga, 2006). It is a valuable educational tool for modeling relationship between what is taught in school and what exists at home, making connection between what is taught in school and their everyday life activities (Elia et al 2007). It enables every pupil to work independently and in a group on meaningful mathematics contact while the teacher provides individual attention to other pupils (Van de Walle, 2007). Cuisenaire-rods are ready made, its approach minimize preparation and set up time both for the teacher and pupils. The study is necessary because it will help pupils grasp abstract concept in mathematics using colors card board strip of varying length called Cuisenaire-rods, with the intention to establish a firm foundation in mathematics in Nigeria. The primary school could be the right place to introduce such instructional materials. This study remediated the errors that pupils commit when solving problem of addition and subtraction of numbers in primary school as well as to investigate teaching strategies to bring equity in gender performance in mathematics.

This study remediated the errors that pupils commit while solving problem of addition and subtraction of numbers among primary school pupils as well as to investigate especially with teaching strategies to bring equity in gender performance in mathematics. Also the study investigated the impact of gender. In view of Aiyedun, (2000) there is no significant different in the performance of boys and girls in mathematics and that they both perform equally well. Ashafi and

Areelu (2010) assert that in mathematics boys achieved significantly higher than girls as a result of retention rate. This conflicting result call for continuous investigation

Statement of the Problem.

The teaching/learning of mathematics at all level of education in Nigeria have grown and brought with it many instructional strategies. Yet, the pupils/pupils interest, attitude, performance and achievement towards mathematics at primary and secondary schools levels have remained a topic of concern (Adetula, 1987). Because there is massive cry from the society as to why there has been massive failure of mathematics in schools, and the need to evaluate primary school mathematics. This is because it is believed that a strong foundation is necessary at the grassroots in order to eradicate this failure problem, otherwise the system will one day collapse totally.

The situation of persistent failure could be attributed to several factors such factors include the abstracters of mathematical concept, the way the concepts are presented to the pupil and poor foundation, among others. As a way out, the use of practical and concrete representations in locking abstract concept for better understanding in mathematics. Also pupils always find it difficult to add and subtract number involving remaining these are the of discovery for teaching commutative and association additive property of primary school level (Adetula, 1989) most of the mathematics teachers in primary schools taught the subject by using traditional conventional teaching approach. Concept is expressed thereby confusing and confounding below average learners. Hence, the teacher`s in ability to concretize concept in classroom makes the learners to develop hatred against the

subject. This attitude in variable may be the cause of poor performance in primary school examination for some years. Kurumeh,(2004) maintained that the mathematics taught in schools in foreign, euro center in origin and build on the western cultural background making pupil learn by rote memorization in which the attendant result is consistent mass failure: hence pupils no longer home interest toward the study of the subject. Various factors responsible for pupil`s poor achievement in geometry and mathematics generally have been identified by researchers in mathematics education. These include lack of enough qualify teachers, instructional materials, large size and pupil poor, background. However, other finding asseverated that most important factor is the use of poor teaching strategy in leaching materials. Such finding has agreed that under achievement is large due to in appropriate instructional strategy (Usman, 2004, Hassan, 2010 Obiom, 2011). However the study will investigate the impact of Cuisenaire-rods strategy on remediating errors in addition and subtraction of number among the primary schools pupils in KMC local government Kano state.

Objectives of the Study

The main objective of the study was to examine the impact of Cuisenaire-rods strategy on remediating errors in addition and subtraction of numbers among primary schools pupils in KMC local government Kano state.

Specifically, the research investigated:

1. The impact of Cuisenaire-rods strategy on remediating addition of numbers among primary schools` pupils in KMC local government Kaduna state.
2. The impact of Cuisenaire-rods strategy on remediating subtraction of numbers

among primary schools' pupils in KMC local government Kaduna state.

Research Questions.

The following research questions were formulated and tested in this study:

1. In what way, would Cuisenaire-rods strategy affects remediation error of addition of numbers among primary schools' pupils in KMC local government Kano state?
2. To what extent would Cuisenaire-rods strategy affect remediation error of subtraction of numbers among primary schools' pupils in KMC local government Kano state?

Null Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significant.

HO1: There is no significant difference in the remediation of errors between pupils taught addition of numbers with Cuisenaire-rods strategy and those taught using conventional method.

HO2: There is no significant difference in the remediation of errors between pupils taught subtraction of numbers with Cuisenaire-rods strategy and those taught using conventional method

Research Design

The quasi experimental research method was applied in carrying out the research,

Table 1: Mean and standard deviation of remediating errors in addition by experimental and control groups on addition

GROUPS	N	Mean	SD	Mean Difference
EXPERIMENTAL	84	68.48	16.24	23.86
CONTROL	54	45.62	14.72	

The result in Table 1 showed that the experimental group (m=69.48, S.D=16.24)while the control group(m=45.62, S.D=14.72) taught addition. This indicated that there was a statistically significance difference in

the study employed pretest, posttest control design. In this study, two (2) intact classes were involved in the design. One class was randomly assigned to the experimental group while the other class was assigned as control group. The target population of the study comprises of 2,328 class two pupils of the public primary schools within the total number of 378 public primary schools in KMC local governments Kano State. Simple random sampling techniques using balloting method was used in selecting two coeducational primary schools within the two KMC local government. A sample size of 220 primary school two (2) pupils consisting of (124) males and (96) females were used for the study. The experimental group was taught using Cuisenaire-rods strategy (C R S) while the control group was taught using conventional lecture method.

Results

Research Questions 1. In what way, would Cuisenaire-rods strategy affects remediation errors of addition of numbers among primary schools' pupils in KMC local government, Kano state. The result was presented in Table 1

errors remediating between the experimental group and the control group. The mean difference between the experimental and the control group was 23.86. The difference in errors remediating between the experimental group and the

control group. The mean difference between the experimental and the control group was 23.86.

Research question two: To what extent would Cuisenaire-rods strategy affect

Table 2: Mean and standard deviation of remediating errors in addition by experimental and control groups on subtraction

GROUPS	N	Mean	SD	Mean Difference
EXPERIMENTAL	40	61.93	19.27	-2.35
CONTROL	42	64.28	19.19	

The result in Table 2, showed that the experimental group ($m=61.93$, $S.D=19.27$) while the control group($m=64.28$, $S.D=19.19$) taught subtraction of numbers. This indicated that there was a statistically significance difference in errors remediating between the experimental group and the control group. The mean

remediation errors of subtraction of numbers among primary schools' pupils in KMC local government area of Kano state?

difference between the experimental and the control group taught subtraction -2.35. HO1: There is no significant difference in the remediation of errors between pupils taught addition of numbers with Cuisenaire-rods strategy and those taught using conventional method. The summary of t-test was analyzed in table 3

Table 3:Summary of t-test analysis of the mean Remediation of Errors scores by the experimental and control groups on addition.

Group	N	Mean	SD	Df	t-value	p-value
Experimental	84	68.48	16.24	225	10.99	0.00
Control	54	45.62	14.72			Ho

Decision

Reject

Significant at 0.05

The result in table 3 showed the difference in the test scores between the experimental ($N=84$, $M=68.48$, $SD=16.24$) and the control group ($N=54$, $M=45.62$, $SD=14.72$) $t=10.99$, $p=0.00$ taught addition of numbers were statistical significant. This indicated that there was statistically significance difference in

errors remediating between experimental group and the control group. Ho2:There is no significant difference in the mean remediation of errors scores between pupils taught subtraction of numbers with Cuisenaire-rods strategy and those taught using conventional method

The summary of t-test was analyzed in table 4

Table 4: Summary of t-test analysis of the mean remediation of Errors scores by the experimental and control groups on subtraction.

Group	N	Mean	SD	Df	t-value	p-value
Experimental	40	61.93	19.27	143	-0.73	0.47
Control	42	64.28	19.19			

Decision

The result in table 4 showed the difference in the test scores between the experimental (N=84, M=61.93,SD=19.27) and the control group (N=54, M=64.28, SD=19.19) $t = -0.73$, $p = 0.47$ taught subtraction of numbers were statistical significant. This indicated that there was statistically significance difference in errors remediating between experimental group and the control group.

Discussion of findings

The study indicated the existence of significant difference between the errors remediation of pupils taught using Cuisenaire-rod strategy and those taught using conventional lecture method in favor of those exposed to Cuisenaire-rod strategy as shown in the Table 4.5. This implies that Cuisenaire-rod strategy was more effective than the conventional method of teaching mathematics. This result further supports that Cuisenaire-rod strategy could help to enhance pupils' understanding of Cuisenaire-rod strategy in mathematics more than the conventional lecture method.

The result of the study Table (4.7) revealed that there was difference in the test scores between experimental group male and experimental group female's pupils exposed to CRS .However, (Fennema and Hart, 1994) argued that in USA the genders difference in Mathematics may be decreasing and that an intervention is a need for achieving equality in Mathematics education. Meanwhile, other authors (Forgasz, 1995, Fennema and Peterson, 1985), claim that the impacts in the way teachers interact with their pupils, and therefore its influence on pupils participating in classroom should be one of the component of external influence which contributes to the development of gender difference in learning Mathematics and in attitude toward Mathematics.

The result of the study Table (4.8) revealed that there was difference in the test scores between experimental group male and experimental group female pupils taught subtraction using CRS.

To Bebeze (2005) when new work is introduced to pupils it must be done in

such a way that they will understand what they are learning. Activities should be organized to help think not result for them. According to Beneze (2006) Pupils need use and test idea, skills though relevant activities. This is a concrete experience of abstract idea that has been presented to the learners. Finally, learners do not mean receiving and remembering transmitted message instead educational research must offer compelling evidence that pupils learn Mathematics will only when they have constructed their own understanding. Assessment is very important in all learning experience.

According to Holt and Willard Holt (2000) emphasize the concept of dynamic assessment, this is a way of assessing the true potential of learners that most differ significantly from conventional test. Here the assessorial interactive nature of learning is extended to the process of assessment. Rather viewing assessment as a process carried out by one person, such as instructor, it is seen as a two way process involving interaction between both instructor and learner.

addition, Fennema et.al,(1990) stated that one component of the external influence which may affect the development of gender related difference in Mathematics would be the teacher influence on both pupil's internal motivation belief and on pupil participation in classroom learning activities

Conclusions

1. The favored pupils taught by Cuisenaire-rods Strategy committed less error than those taught by conventional method, therefore it was concluded that Cuisenaire-rods Strategy have effectively enhanced and improved pupils' academic performance in addition and subtraction of numbers.

2. Cuisenaire-rods Strategy proved to be more effective in remediating errors on addition and subtraction of numbers than the convectional lecture method. This is based on the findings that experimental group committed less errors scores than the control group.

Recommendations

In order to improve academic performance using Cuisenaire-rods Strategy, the following measures were recommended.

1. Mathematics teachers should be trained on effective procedure for implementing Cuisenaire rods Strategy in their class rooms. This will reduce the errors committed by pupil in addition and subtraction of numbers.

2. Mathematics educators, professional associations in mathematics as well as mathematics text books developers should incorporate Cuisenaire-rods Strategy in their future publications for enhanced pupils' academic performance and retention of mathematic concept.

3. Mathematics teachers at primary school level should be using Cuisenaire-rods Strategy in their lesson. This will help to close the existing gap in mathematics

errors between boys and girls and even make girls better achievers in mathematics.

4. Suitable environment for effective implementation of Cuisenaire-rods Strategy should be provided in primary schools. This can be in form of provision of special class rooms procurements of class room furniture suitable for group work and provision of group reward materials.

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