



## **P**RACTICAL-BASED INSTRUCTIONAL STRATEGY AND PUPILS' ACADEMIC ACHIEVEMENT IN MATHEMATICS IN UKWA-WEST LOCAL GOVERNMENT AREA OF ABIA STATE, NIGERIA.

### **ABSTRACT**

The study explored practical-based instructional strategy and pupils' academic achievement in mathematics in Ukwa-West Local Government Area of Abia state, Nigeria. The study is a quasi-experimental, non – randomized, control group pretest, post-test design. Intact classes were used. Two research questions and two hypotheses guided the study. The study was carried out in Ukwa-West Local Government Area of Abia state, Nigeria. The population of the study was one thousand one hundred and thirty-six lower basic pupils. A sample of two

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### **INTRODUCTION**

In learning mathematics, the learners learn by means of activities that involve carrying out practical such as verification, demonstration, measuring, and drawing. As verifications are carried out, the learner sees the patterns evolve and they begin to conceptualize the relationships among the properties. The use of activity shifts the study of Mathematics from abstract concepts, from a long list of unrelated facts, numerous notes, and memorization to practical experiments. This is in line with Cope (2015) who found out that students who learn Mathematics using a practical-based instructional strategy develop a deep understanding and application of the mathematical concept, because of their active participation in learning mathematics. A practical-based instructional strategy helps the learner to find out information and understand concepts through appropriate activities thereby encouraging them to discover patterns in mathematics leading to rules and formulae. The abstract ideas are transformed into concrete ideas when the learners are actively involved in the process of learning. Active participation leads the learners to have deep concentration in concept learning. This supports the words of Ado and Abasi (2014) who stated that students' practical work provided them with ease in imagination and abstraction in concept formation. It enables them to think out the mathematical ideas which are contained within the various activities. This could be the result of the procedure used as students proceeded from handling objects to diagrams and finally to a symbolic stage



hundred and twenty-one basic three pupils were used for the study. The Research instrument used for the study was the Lower basic mathematics achievement test (LBMAT) The Kuder-Richardson Formula 21 was used to determine the reliability coefficient of LBMAT which was found to be 0.79. The data collected was analyzed. The research questions were answered using mean, standard deviation, while, the hypotheses were analyzed using ANCOVA. The findings of the study revealed that the use of a practical-based instructional strategy significantly improved students' achievement than the conventional instructional strategy ( $P=0.000, p < 0.05$ ). The findings showed that there was no significant difference in the mean achievement scores of male and female students taught mathematics using a practical-based instructional strategy ( $P=0.20 > 0.05$ ). From the results of the study, it was recommended that a practical-based instructional strategy should be used in teaching mathematics at lower basic level to improve pupils' achievement in mathematics.

**Keywords:** Practical-based instructional strategy, academic achievement, and conventional instructional strategy

which assisted them in establishing the relationship between rules and formulae. Omwirhiren and Khalil (2016) described the practical method as a method of teaching which involves showing, doing, and interacting. According to them, the teacher displays the steps in the process and explains them to the pupils accurately and clearly while pupils are expected to practice by repeating the things the teacher has done and likewise apply it to similar situations. This is in agreement with Arubayi (2015) who wrote that the practical method has been noted for bridging the gap between theory and practice. Also, Ikitde and Edit (2013) opined that, to arrest students' attention, interest, curiosity and promote their performance in Mathematics, the use of activity-stimulating and student-centered methods like the practical-based instructional strategy is required to be embraced instead of depending on the conventional teaching strategy in teaching Mathematics. Dorgu, 2015 have it that, a practical-based instructional strategy enables learners to become good observers and generate their interest; students see immediate progress as a result of a correct effort and it enables the teacher to teach operational skills. From the ongoing, practical-based instructional strategy requires proper planning. Yet most teachers in lower-basic education still use conventional teaching strategies which are teacher-centered. Even-through, that in using the practical-based instructional strategy, students are exposed to physical materials that will illustrate some meaning to their cognitive framework. Experiences like this go a long way to enriching learning of mathematical concepts. The use of activity-stimulating and student centered teaching methods such as practical-based instructional strategy in the teaching of mathematics improves students' performance. On these facts the researchers set to investigate on practical-based instructional strategy and pupils' academic achievement in mathematics in Ukwa-West Local Government Area of Abia state, Nigeria

#### **STATEMENT OF THE PROBLEM**

The problem of meagre academic achievement by Nigerian pupils in mathematics has been of concern to all mathematics educators in the country. The West African Examination Council, chief examiners' reports from WAEC, (2022) confirm this observation. This could be as a result of lingering problems emanating from lower basic level of education. Several factors contributed to worsening in pupils' academic achievement in mathematics which pupils' interest and their inability



to retain the concepts learnt among others. It is possible that these factors jointly or singly affect pupils' academic achievement in mathematics. It is also possible that strategies of instruction in teaching mathematics contributes to students' abysmal academic achievement in the subject (Kioko, 2015). It is in line with this that, the researchers investigated if the use of practical-based instructional strategy will improve pupils' academic achievement in mathematics in Ukwa-West Local Government Area of Abia state, Nigeria

#### **Aim and objectives of the study**

This study investigated on practical-based instructional strategy and pupils' academic achievement in mathematics in Ukwa-West Local Government Area of Abia state, Nigeria.

Specifically, the study:

1. Determine the difference in the mean achievement scores of lower basic three pupils who were taught mathematics using practical-based instructional strategy and those taught with conventional instructional strategy.
2. examine the difference in the mean achievement scores of lower basic three male and female pupils who were taught mathematics using practical-based instructional strategy.

#### **Research Questions:**

The following questions were formulated to guide the study:

1. What is the difference in the mean achievement scores of lower basic three pupils who were taught mathematics using practical-based instructional strategy and those taught with conventional instructional strategy?
2. What is the difference in the mean achievement scores of lower basic three male and female pupils who were taught mathematics using practical-based instructional strategy?

#### **Hypotheses:**

In order to further guide the study, the following hypotheses were formulated and tested at 0.05 alpha levels.

1. There is no significant difference in the mean achievement scores of lower basic three pupils who were taught mathematics using practical-based instructional strategy and those taught with conventional instructional strategy.
2. There is no significant difference in the mean achievement scores of lower basic three male and female pupils who were taught mathematics using practical-based instructional strategy

#### **METHODOLOGY**

**Research Design:** Research design for this study was quasi-experimental, specifically, the non-equivalent control group research design. Intact classes were randomly assigned to experimental and control groups.

**Area of Study:** The study was carried out in Ukwa-West Local Government Area of Abia state.

**Population:** The population of the study was 1,136 lower basic pupils in the schools. (Source: Ukwa-West Universal Basic Education Board). There are 144 government primary schools in Ukwa-West Local Government Area of Abia state as of the time of the study 2021 / 2022 section.

**Sample and sampling technic:** The sample size of the study comprised 221 basic three pupils located in 144 government primary schools in Ukwa-West Local Government Area of Abia state, were used for the study. The sampling procedure was a multi-stage approach. The first stage was purposive sampling which was used in the selection of six schools from the Local Government Area. The schools selected were the ones the authorities permitted the use of their schools. The researchers further used simple random sampling to select one intact class from each school through balloting. Assignment to treatment conditions for the six schools was by simple



randomization. The researchers assigned three schools for the experimental group (EGP) those taught using practical-based instructional strategy while the other three were used for the control group (CGP) those taught with conventional instructional strategy.

**Instrumentation:** The data for this research were obtained through one instrument named Lower basic mathematics achievement test (LBMAT) developed by the researchers. The Lower basic mathematics achievement test (LBMAT) was constructed in line with a test print on the six levels of specification based on Bloom taxonomy; knowledge, comprehension, application, analysis, synthesis and evaluation. It was divided into two parts: pre- LBMAT and post-LBMAT which were described as test one and test two respectively. They consisted of 25 objectives test items with options A-D and Students were expected to tick the correct option. The pre-LBMAT was used to ascertain the equivalence and level of Mathematics achievement of the sample pupils before treatment. The post-LBMAT was used to determine the extent of students' Mathematics achievement after the treatment

**Validity of the Instruments:** The LBMAT was given to three experts, one from the Mathematics Education option of the Curriculum Studies and Educational Technology Department, two from Measurement and Evaluation all from the Faculty of Education, University of Port Harcourt, to look at the contents, the scope of coverage, ambiguity, and vagueness of expression. The experts also checked among other things, the suitability and language clarity of the items measuring the specific tasks that were designed to measure. All the validators thoroughly scrutinized each item in relation to the objectives of the study. The validators also checked the lesson plans whether actually conveyed the activities involved in the teaching and learning approach

**Reliability:** The Lower basic mathematics achievement test (LBMAT) Lower basic was subjected to a trial test in order to establish the reliability of the instruments. The instrument was trial tested in a school that was not one of the schools sampled for the study. The trial testing was conducted in two intact classes of forty-two lower basic 3 pupils. Twenty-two students formed the experimental group while twenty formed the control group. The pre-test was administered first then the post-test was administered immediately after treatment to both the experimental and the control groups to ascertain the different levels of achievement. The Kuder-Richardson Formula 21 was used to determine the reliability co-efficient of LBMAT which was found to be 0.79.

**Method of Data Collection:** The intact classes randomly sampled were assigned to experimental and control groups which were not in the same school. The researcher spent one week training the research assistants (teachers) in the sampled schools. The training focused on the lesson plans and the selected topics in geometry of lower basic 3 pupils. Pre-LBMAT was administered before the treatment while post-LBMAT was administered after the treatment. The experimental groups were taught with using a practical-based instructional strategy while the control groups were taught with a conventional instructional strategy. At the end of six weeks, the post-LBMAT was administered to both groups.

**Method of Data Analysis:** The two research questions raised by the study were answered by descriptive statistics of mean and standard deviations while the two null hypotheses were tested using inferential statistics of Analysis of Covariance (ANCOVA) at 0.05 level of significance with the pre-test scores as covariate. The choice of ANCOVA was made because the study employed the quasi-experimental non-equivalence control group research design which use intact classes.

## RESULTS

**Research Question 1:** What is the difference in the mean achievement scores of lower basic three pupils who were taught mathematics using practical-based instructional strategy and those taught with conventional instructional strategy?



**Table 1: Mean achievement scores and standard deviations (pre-test and post-test) of lower basic three pupils for the experimental and control.**

Group	Pre-Test		Post-Test		Mean Gain
	Mean	Std Deviation	Mean	Std Deviation	
<b>Experiment</b>	7.69	2.94	16.70	5.54	9.01
<b>Control</b>	7.31	2.36	11.72	3.37	4.41
<b>Mean Diff</b>	0.38		4.98		4.60

Table 1 presents mean achievement scores and standard deviations of lower basic three pupils in experimental and control groups. The table showed the difference in the mean between the two groups at the pre-test was 0.38 while at the post-test, it was 4.98. The mean gained by the experimental group was 9.01 while that of the control group was 4.41. The difference in the mean gains between the experimental and control groups was 4.60. This means that students in the experimental group achieved more than those in the control group.

**Research Question 2:** What is the difference in the mean achievement scores of lower basic three male and female pupils who were taught mathematics using practical-based instructional strategy?

**Table 2: Mean achievement scores and standard deviations of lower basic three male and female pupils who were taught mathematics using practical-based instructional strategy**

Gender	Pre-Test		Post-Test		Mean Gain
	Mean	Std Deviation	Mean	Std Deviation	
<b>Male</b>	7.34	2.96	17.40	5.84	10.06
<b>Female</b>	2.01	0.20	2.61	0.16	0.60
<b>Mean Diff</b>	-0.76		-0.46		0.30

Table 2 presents mean achievement scores and standard deviations of male and female lower basic three pupils in the experimental group. The table revealed the difference in the mean achievement scores of male and female pupils at the pre-test as 0.76 favour of male pupils. At the post-test, the table revealed the mean difference as 0.46 in favour of the males. The mean gained by male pupils was 10.06 while that of females was shown as 0.60. The difference in the mean gain between males and females was revealed as 0.30. This means that there exists a difference in the mean achievement scores in favour of the male.

**Hypothesis 1:** There is no significant difference in the mean achievement scores of lower basic three pupils who were taught mathematics using practical-based instructional strategy and those taught with conventional instructional strategy

**Table 3. Summary of One-way ANCOVA on lower basic three pupils' academic achievement in mathematics who were taught mathematics using practical-based instructional strategy and those taught with conventional instructional strategy.**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
<b>Corrected Model</b>	3142.34	2	1571.17	93.56	0.00
<b>Intercept</b>	2084.79	1	2084.79	124.15	0.00
<b>Pre- test</b>	1376.90	1	1376.90	81.99	0.00
<b>Group</b>	1544.57	1	1544.57	91.98	0.00





<b>Error</b>	4752.39	283	16.79		
<b>Total</b>	66757.00	286			
<b>Corrected Total</b>	7894.73	285			

Table 3 presents a summary of one-way ANCOVA on lower basic three pupils' academic achievement in mathematics who were taught mathematics using practical-based instructional strategy and those taught with conventional instructional strategy. The table reveals that  $F(1,283) = 91.98$  and  $p = 0.00$ . With  $p < 0.05$ , the study found the test statistic significant. The null hypothesis of no significant difference in the mean achievement scores of lower basic three pupils who were taught mathematics using practical-based instructional strategy and those taught with conventional instructional strategy was rejected. This indicated that the mean difference between the pupils in the experimental group and the control group was statistically significant. The study, therefore, concluded that lower basic three pupils taught using practical-based instructional strategy significantly attained higher mean achievement scores in LBMAT as compared to those who were exposed to conventional instructional strategy.

**Hypothesis 2:** There is no significant difference in the mean achievement scores of lower basic three male and female pupils who were taught mathematics using a practical-based instructional strategy

**Table 4: Summary of One-way ANCOVA on mean achievement scores of Lower basic three male and female pupils taught Mathematics using practical-based instructional strategy.**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
<b>Corrected Model</b>	1332.63	2	666.32	30.11	0.00
<b>Intercept</b>	1508.86	1	1508.86	56.16	0.00
<b>Pre- test</b>	1242.92	1	1242.92	56.16	0.00
Sex	<b>194.73</b>	<b>1</b>	<b>194.73</b>	<b>8.80</b>	<b>0.82</b>
<b>Error</b>	3275.35	148	22.13		
<b>Total</b>	46697.00	151			
<b>Corrected Total</b>	4607.99	150			

Table 4 presents a summary of one-way ANCOVA on mean achievement scores of Lower basic three male and female pupils taught Mathematics using a practical-based instructional strategy. The table reveals that  $F(1,148) = 8.80$  and  $p = 0.82$ . Since  $p > 0.05$ , the test statistic was considered not to be significant. The null hypothesis of no significant difference in the mean achievement scores of female and male lower basic three pupils exposed to the practical-based instructional strategy was accepted.

## DISCUSSION

The result of this study, therefore, showed that lower basic three pupils taught using practical-based instructional strategy significantly attained higher mean achievement scores in LBMAT as compared to those who were exposed to the conventional instructional strategy. This finding is in agreement with the finding of Olufemi and Ibukun (2013) in their work effect of practical-assisted instructional strategy on students' achievement in biology, the results indicate that practical-assisted instruction was more effective in fostering learning than the traditional lecture method. Likewise, Ekwueme et al (2015) in their study, of the impact of hands-on-approach on student academic performance in basic science and mathematics, the result of the study showed positive improvement in both the student's performance and participation in mathematics and basic science activities. The result also showed that the treatment had a significant influence on their



performance of the experimental group. Also, Muema et al (2018) in their study relationship between teaching methods and students' performance in mathematics in public secondary schools in Dadaab Sub County, Garissa County; Kenya, established that there is a positive correlation between teaching methods and students' achievement in mathematics. Moreso, Arhin and Offoe (2015) in their work gender differences and mathematics achievement of senior high school students: A Case of Ghana National College, identified that performance assessment-driven instruction improved students' problem-solving abilities.

The result of the present study also, from table 2 presents mean achievement scores and standard deviations of male and female lower basic three pupils in the experimental group. And found that there was a significant difference between the mean achievement scores of male and female students taught mathematics using the practical-based instructional strategy in favour of their male counterparts. However, table 4 reveals that  $F(1,148) = 8.80$  and  $p = 0.82$ . Since  $p > 0.05$ , the test statistic was considered not to be significant, which means that there was no significant difference in the mean achievement scores of male and female students taught mathematics using a practical-based instructional strategy ( $P=0.20 > 0.05$ ). However, the present study is in consonance with the study of the findings of Olufemi and Ibukun (2013) who studied the effect of practical assisted instructional strategy on students' achievement in biology and the interaction effect between instructional strategy and gender was not significant. The result of Arhin and Offoe (2015) in their work gender differences and mathematics achievement of senior high school students: A Case of Ghana National College, identified that performance assessment-driven instruction showed no bias among gender also in agreement with the result of the present study. Onyeka & Charles- Ogan (2021) in their study effects of Geotrigmetric Set on students' academic performance and retention in Mathematics in Rivers State Nigeria. also found that there was no significant difference in students' performance with respect to the use of geotrigmetric set based on gender is in agreement with the present study.

This present study, anyway, contradicted the study of Oribhabor (2019) in his work, the Influence of Gender on Mathematics Achievement of Secondary School Students in Bayelsa State, the result of the analysis revealed that there is a significant difference in the mathematics achievement of male and female students in favour of the males. Same as in the study of Okpe et al (2022) who carried out research on the gender difference in mathematics achievement and retention among secondary school students in Nsukka Education Zone, Enugu State, Nigeria, their findings showed that male students had higher achievement in mathematics than their female counterpart. Likewise, Alordiah et al (2015) who worked on the influence of gender, school location, and socio-economic status on students' academic achievement in mathematics, their result also showed that male students performed better than female students.

## **CONCLUSION**

From the results of this study, it has been empirically proven that using the practical-based instructional strategy in teaching mathematics enhances higher mean achievement scores than the use of the conventional instructional strategy.

It was also, found that there was a significant difference between the mean achievement scores of male and female students taught mathematics using the practical-based instructional strategy in favour of their male counterparts.

## **Recommendations**

Based on the findings and conclusions generated from the study, the following recommendations are made by the researchers:

1. Mathematics teachers should be encouraged to use the practical-based instructional strategy as an alternative and a supplement to the conventional instructional strategy.



2. Textbook writers should shift emphasis from teacher's activities to student activities that will promote the incorporation of practical-based instructional strategy in Mathematics textbooks.
3. Curriculum planners should ensure the implementation of a practical-based instructional strategy that stimulates cognitive activities and promote higher academic achievement in mathematics.
4. Seminars workshops and conferences should be organized by the federal and state government, professional bodies like the Mathematical Association of Nigeria, and Science Teachers Association of Nigeria as well as PTAs and NGOs for the effective use of practical-based instructional strategy in teaching mathematics

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