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EFFECTIVENESS OF COMPUTER ASSISTED DRILL AND PRACTICE ON STUDENTS' ACHIEVEMENT IN LINEAR INEQUALITIES IN PORT HARCOURT, RIVERS STATE.

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Abstract
This study investigated the effectiveness of Computer Assisted Drill and Practice on student achievement in linear inequalities in Port Harcourt, Rivers State. The study used the pretest-posttest quasi-experimental design. The sample consisted of 120 JSS 2 students drawn from three public junior secondary schools in Port Harcourt, Rivers State. Purposive random sampling was used to select the students (60 males and 60 females). Two research questions and two hypotheses were formulated, and tested at 0.05 level of significance. The Inequality Achievement Test made up of 30 items of multiple-choice type, was developed and validated for data collection. The scores of students were analysed and mean and standard deviation were used to answer the research questions while ANCOVA was used to test hypotheses. The result of the study indicated that students taught using Computer Assisted Drill and Practice achieved significantly higher than those taught using Conventional Instructional Strategy (CIS). Also, there was a significant difference in the post test achievement scores of male and female students taught using Computer Assisted Drill and Practice. Based on the findings, it was recommended among others that Computer Assisted Drill and Practice should be used for teaching and learning of Linear Inequalities.

Keywords: *Achievement, Computer Assisted Drill, Linear Inequalities, Mathematics.*

Introduction

Mathematics, often referred to as the bedrock of all subjects, has been an age long subject. From time immemorial, human beings have embraced the application of Mathematics. Ojo (2002) points out that Mathematics is the key to science. The development of a country's economic and social systems highly depends on knowledge of Mathematics. The importance of Mathematics to nation building has led the Federal Government of Nigeria to make Mathematics a core subject to be offered by students at all levels of education in Nigeria (Wonu et al., 2021). It is widely known that Mathematics is a compulsory subject as an entry requirement into university education. That's why a pass grade at credit level in Mathematics is important to qualify an individual for further studies. However, inspite of its importance, Mathematics is a subject that is considered difficult and boring by many students. It is further believed that people think Mathematics could be a cold and austere discipline which provides no scope for creativity. For instance, weaker students feel anxiety towards Mathematics and this affects their achievement in the subject (Van Wyk, 2012). In the same vein, Inequalities may be as complex and difficult for students. An inequality says that two values are not equal. According to Macrae et al., (2007), an inequality is an algebraic sentence which contains an inequality sign. They further put that there are other special symbols that show in what ways expressions are not equal, that is, $<$ for less than, $>$ for greater than, $\leq$ for less than or equal to, $\geq$ for greater than or equal to, etc. hence, from the

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above, it is important to note that inequalities involves symbols and graphs, which makes its solution appear complex, difficult and boring for Mathematics students.

In recent times, students' achievement in Mathematics has been below average in Senior Secondary School Examination (SSCE) in Nigeria. West African Examination Council (WAEC) revealed that only 30% of students who sat for WAEC passed Mathematics at credit level as at 2012. This shows that candidates do not possess a firm grip of details needed to answer questions (Wonu et al., 2021). Also, WAEC Chief Examiners report (2012) confirmed that candidates had weak presentations on questions which had adverse effects on the achievement of students. These problems emanate as a result of the problems facing effective teaching and learning in Nigerian educational institutions (Bankolere, 2006).

Teaching method goes a long way to influence the achievement of students. According to Okafor (2006), poor teaching methods is a major contributing factor to the poor achievement of students in Inequalities. The instructional methods employed by the teacher plays an important role in the acquisition of skills and meaningful learning. It is one of the factors that make students become passive and have fewer interactions with each other in doing tasks. Zakaria et al., (2010), concluded that positive changes takes place when a teacher changes his teaching methods towards a more student-centred approach. Sule (2003), reports that teaching of inequalities without the instructional media contributes a lot to failures in Inequalities.

According to Wonu et al., (2021), learning model goes a long way in determining the outcomes of learning, and performance. They ascertained that learning models are the particular approaches or techniques employed by the learners to try to learn arithmetic concepts. These learning models may be helpful in making learning to be easier, faster, more enjoyable, more self-directed, more effective, and more transferrable to new situations. Therefore, to enhance the understanding of inequalities, students should be given the chance to develop, interact and to share ideas with friends and colleagues through Computer Assisted Drill and Practice. Zakaria et al., (2013), believes that an alternative method for the delivery of Mathematics learning materials is Computer Assisted Drill and Practice. Hence, Computer Assisted Drill and Practice is a back bone to effective teaching and learning of Mathematics.

Computer Assisted Drill and Practice is an interactive instructional technique whereby a computer is used to present the instructional contents and to monitor the learning that takes place. Deubel (2001) sees Computer Assisted Drill and Practice as a self learning technique usually offline/online involving interaction of students with programmed instructional materials. He believes that Computer Assisted Drill and Practice gives students the opportunities to work at their own pace with continuous supply of new and relevant problems and assignments to solve. The main view of the above fact is that Computer Assisted Drill and Practice programs can be used for the purpose of learning inequalities.

The potential benefits of Computer Assisted Drill and Practice programs cannot be under estimated in our today's contemporary world. The use of computer facilities and resources has gradually become a trending development with the aim of enhancing learning (Yusuf & Afolabi, 2010). Therefore, the position of Mathematics makes it necessary for the use of innovative Computer Assisted Drill and Practice programs. Then, the big question is "if Computer Assisted Drill and Practice programs are used to teach inequalities, what would be their effects on students' achievement in inequalities? In view of this, Computer Assisted Drill and Practice program and students' achievement in inequality is investigated in this study.

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Statement of the Problem

It is quite sad that despite the fact that Computer Assisted Drill and Practice have come to play an important role in the teaching and learning of inequalities, some difficulties are experienced in attempting to spread its usage. Such difficulties may be economical, technological, etc. although considerable research indicates that Computer Assisted Drill and Practice can have a positive impact on students' achievement, but the question is: how can using Computer Assisted Drill and Practice programs enhance students' achievement and abilities in solving inequalities.

Purpose of the Study

The purpose of the study was to investigate the effectiveness of Computer Assisted Drill and Practice on students' achievement in Mathematics, in the area of linear inequalities. The objectives of the study are to examine:

i) The differences in the mean achievement of students taught with Computer Assisted Drill and Practice (CADP) program, and Conventional Instructional Strategy (CIS)
ii) The difference in the mean scores of male and female students taught with Computer Assisted Drill and Practice program.

Research Questions

The following research questions guided the study:

i) What is thedifference between the mean achievement of students taught with Computer Assisted Drill and Practice (CADP) program, and those taught with the Conventional Instructional Strategy (CIS)?
ii) What is thedifference between the mean scores of male and female students taught with Computer Assisted Drill and Practice program?

Hypotheses

The following null hypotheses were formulated for the study:

i) There is no significant difference in the mean achievement of students taught with Computer Assisted Drill and Practice (CADP) program, and those taught with Conventional Instructional Strategy (CIS)
ii) There is no significant difference in the mean achievement of male and female students taught with Computer Assisted Drill and Practice program.

Research Design

The study adopted a pretest-posttest quasi-experimental design.

Participants

The population of the study comprised of four thousand five hundred and fifty four (4554) junior secondary school 2 students (1585 males and 2969 females) from the twenty-four (24) public Junior Secondary Schools in Port Harcourt Local Government Area of Rivers State (Rivers State Universal Basic Education Board, 2019 Port Harcourt zonal office). The sample of this comprised of 120 junior secondary school two (J.S.S 2) students. A sample of three (3) co-educational public Junior Secondary Schools were drawn from the 24 public Junior Secondary Schools in the study area. 60 of the students served as an

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experimental group while the other 60 served as the control group. The sample distribution of the JSS 2 students in the schools is tabulated below;

Table 1: Sample Distribution

School	Male	Female	Total
A	20	20	40
B	20	20	40
C	20	20	40
Total	60	60	120

Source: Researchers' Fieldwork

The purposive technique was adopted to ensure that the participants chosen (both males and females) had a similar background, experience, and environmental exposure.The sample of students was selected based on previous terminal achievements and results, class teachers' remarks and referral.

Instrumentation

One instrument was developed and used to source for data; this is Inequalities Achievement Test (IAT). The IAT consisted of 30 multiple choice questions with four options labelled A-D, used to test and measure the achievement of the students before and after exposure to the treatment.In scoring the instrument; each correct answer was awarded 2 marks, which implied that for the 30 questions, a total of 60 marks were due to students who got all correct answers. The research instruments were subjected to face and content validity then modified in a way the students would easily understand. The test-retest method was used to establish the internal consistency of the instruments. The IAT was administered to fifteen (15) JSS 2 students who were not part of the study sample. To do this, IAT was first administered to 15 students without any prior teaching, after which the same instruments were rearranged and re-administered to the same set of 15 students after two weeks interval without treatment. Both the first and the second test results were subjected to Cronbach Alpha correlation. A reliability coefficient of 0.78 was realized. This indicated that the test item was reliable and usable.

First, consent to carry out the study in the schools was obtained from the administration of the schools used for the study. The researchers then collected the achievement details of the student for the last term from the Mathematics classroom teachers. Students who have been achieving low on Mathematics were then selected. The researchers purposively selected participants from the three (3) co-educational public junior secondary schools, based on their previous achievements and results. These students were identified and their details are taken note of. Since the researchers used intact classes for the study; sampling was not carried out, however, only the scores of the affected students were used for the study. Consequently, students from the schools were grouped into 2 and used as the experimental group and the control group respectively.

The pretest of IAT was then administered to the two groups of students on the first day of classes. The Pretest was administered by the class instructors. The administration of the Pretest was not done in one period but on different periods because of the different locations of the schools. The duration of the IAT was 55-60 minutes. All the lessons for teaching the students were then prepared by the researchers. The topic was prepared for the experimental group and taught with Computer Assisted Drill and Practice,

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while the same topic was also prepared for the control group and taught with conventional instructional strategy. The regular intact class Mathematics instructors carried out the teaching. The regular intact Mathematics instructors of the sample students were trained by the researchers for two (2) consecutive days on how to carry out the teaching using the researchers' constructed lesson plans. The lesson plan was one of the major guides for teaching both groups of students. This was then be followed by the teaching of the contents of the lesson for two weeks. Each group was taught by their Mathematics teachers, under similar environmental conditions using the same lesson plans. The experiment was not revealed to the partaking learners to try not to counterfeit the episode. The trial bunch was instructed using Computer Assisted Drill and Practice, while the benchmark group was taught utilizing the conventional instructional strategy. The post-test was then administered to both groups of students after a two-week treatment. Both group of students received identical exercises concerning the amount and level of difficulty.

Results

Table 1 :Mean difference of participants exposed to Computer Assisted Drill and Practice (CADP) and those taught with Conventional Instructional Strategy

		Pre - Test		Post – Test		
Treatment	**N**	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**	**Mean Difference**
Conventional Instructional Strategy	60	16.075	3.489	25.275	5.253	9.200
Computer Assisted Drill and Practice	60	16.508	2.881	29.358	7.065	12.850

The table above shows the mean achievement of students' taught with CADP and those taught with CIS. From the table, it is clear that the students exposed to CADP performed better than those taught with CIS. The mean difference in achievement of students taught with CADP is 12.850 (i.e. mean=29.358 – 16.508), while the mean difference in achievement of students with CIS is 9.200 (i.e. 25.275 – 16.075).

Table 2: Mean achievement of male and female students taught Linear Inequality using CADP.

		Pre – Test		Post – Test		
Treatment	**N**	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**	**Mean Difference**
Male	30	15.765	2.635	29.085	7.880	13.320
Female	30	17.250	2.967	29.515	6.324	12.265

The table above shows the mean achievement of male and female students taught Linear Inequality using CADP. From the table above, male students taught with CADP progressed from a mean of 15.765 to 29.085 resulting in amean difference of 13.32. This mean difference indicates that male students achieved higher than their female counterparts who are taught using CADP whose mean gain is 12.265.

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Table 3: Summary of Analysis of Covariance (ANCOVA) on the achievement of students in the Control and Experimental groups

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1141.9a	2	570.95	3.7085	0.001
Intercept	4792.3	1	4792.3	31.129	0.000
Covariate	141.5	1	141.5	0.919	0.89
Treatment	945.3	1	945.3	6.1405	0.001
Error	9006.05	57	77.0		
Total	189236.0	60			
Corrected Total	10147.95	59			

a. R Squared = 0.594 (Adjusted R Squared = 0.587)

Table 3 shows that there is a significant difference between the mean achievement of students taught using CADP and those taught using CIS $F_{(1,57)}$=6.1405, p<0.05). The null hypothesis is rejected at 0.05 level of significance.

Table 4: Summary of Analysis of Covariance (ANCOVA) on the mean achievement of male and female students taught linear inequality using CADP.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	595	2	297.5	1.821	0.145
Intercept	4467.75	1	4467.95	27.35	0.000
Covariate	209.95	1	209.95	4.5	0.560
Sex	384.9	1	384.9	1.285	0.145
Error	9552.95	57	81.65	2.439	
Total	189236.0	60			
Corrected Total	10147.95	59			

a. R Squared = 0.279 (Adjusted R Squared = 0.251)

Table 4 above shows that there is significance difference between the achievement of male and female students taught using CADP$F_{(1,57)}$=2.439, p<0.05. The null hypothesis is rejected at 0.05 level of significance.

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Discussion of Findings

The result of the findings shows that students taught Inequalities using Computer Assisted Drill and Practice achieved higher than those taught using the Conventional Instructional Strategy (CIS). The findings agree with Ajelabi (1998) on Social Studies, Udousoru (2000) in Mathematics, Okoro and Etukudo (2001) in Chemistry, conducted in Nigeria which confirmed that Computer Assisted Drill and Practice has been effective in enhancing students' achievement in Mathematics and other subjects than the conventional instructional strategy (CIS). The findings also supported the findings of Tabassum (2004), who stated that students taught through CADP achieved significantly higher than other students. Another similar study that gave credence to the importance of CADP is Liao (2007).

The influence of gender in the academic achievement of students in inequalities when taught with CADP was examined using hypothesis two. The result of the Analysis of Covariance (ANCOVA) showed significant gender difference for students exposed to CADP. This finding showed that gender had influence on the achievement of students in inequalities when taught with CADP. Gender bias in Nigeria and Africa as a whole is still very prevalent (Arigbabu & Mji, 2004). Contrarily, the findings of the study contradicts the conclusion of Viann (2004), who found no significant gender differences between male students and female students taught with computer aided instruction. The finding on gender contradicts earlier findings by Bello (1990) on gender and achievement in biology. It also contradicts the conclusion of Kirkpatrick and Cuban (1998), Spencer (2004), and Yusuf and Afolabi (2010) who maintained that gender has no influence on students' achievement with CADP. Thus, based on the findings of this study, it can be deduced that the use of CADP enhanced the achievement of students (i.e. male and female students) in Inequalities, but with males achieving higher than their female counterparts.

Conclusion

In conclusion, the study has critically examined the effectiveness of computer Assisted Drill and Practice on student's achievement in Linear Inequalities. The use of Computer Assisted Drill and Practice seems to be the answer. Computer Assisted Drill and Practice is more effective in teaching and learning concepts of inequalities, it is also gender friendly.

Recommendations

Based on the analyzed data and findings, the following recommendations were made:

1. Computer and adequate Drill and Practice programs should be provided by the state government in public schools.

2. Since the findings showed that students who worked with CADP achieved higher than those taught with CIS, teachers should employ the use of CADP to improve students' achievement in Mathematics.

3. Mathematics teachers should be trained on the effective use of Computer Assisted Drill and Practice through seminars, workshops and conferences.

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