EVALUATION OF THE EFFECT OF DRILL-AND-PRACTICE INSTRUCTIONAL PACKAGE ON THE ACADEMIC ACHIEVEMENT AND ATTITUDE OF STUDENTS WITH DIFFERENTIAL ABILITIES IN MATHEMATICS

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Abstract
Mathematics is one of the core subjects in secondary schools and a credit pass is required in it for gaining admission into tertiary institutions. In a secondary school setting, every classroom is made up of students with heterogeneous ability levels. This study, therefore, investigated the effect of drill-and-practice instructional package on achievement and attitude of students with low, average and high ability levels in Mathematics. The study adopted pretest, posttest quasi-experimental design. Sixty-four (64) students selected through multistage sampling procedure made up the sample. The sample was grouped into low, average and high ability levels using the pretest. Two research instruments named Mathematics Achievement Test (MAT) and Students' Attitude towards Mathematics Questionnaire (SAMQ) were used for data collection. MAT and SAMQ had reliability coefficients of 0.78 and 0.73 respectively. Data collected were analyzed using mean, standard deviation and ANCOVA. Finding from the study revealed no significant difference in the achievement of students with low, average and high ability after exposure to treatment. However, a significant difference in their attitude was revealed in the study. It was then concluded that drill-and-practice instructional package benefitted low, average and high ability students alike without disparity. However, students with high ability had higher attitudinal score than the other two groups. The researcher therefore recommended that Mathematics teachers should adopt the use of the drill-and-practice instructional package to teach Mathematics in Junior Secondary Schools so as to be able to identify and meet the academic needs of the heterogeneous classes.

Keywords: Mathematics, Drill-and-practice, achievement, attitude, ability

Introduction

The role of mathematics in the development of any nation is extensive and has a far-reaching societal empowerment potential. Mathematics is a subject that determines individuals' functionality in any given society. This can be buttressed by the assertion of Sunday, Akamu and Fajemidagba, (2014) where they suggested that the importance of mathematics to human existence cannot be overemphasized in view of its application to human everyday life activities. As stipulated in the National Policy on Education (NPE) of the Federal Republic of Nigeria (FRN, 2013), Mathematics is one of the core and compulsory subjects for all students in the basic and post-basic education (that is, primary and secondary education). Every student, regardless of ability level, is required to obtain a credit grade in the subject in order to be able to gain admission into tertiary institution.

The recognition being given to mathematics in the nation's education system could be hinged on the role of mathematics in scientific and technological development of the nation. Mathematics could be regarded as the basis for the discipline of science and technology which, in turn, is a basic requirement for the development of a nation. Mathematics is described as the fundamental structure of a nation which enables her to make scientific forecast that draws on the basis of logic (Kolawole & Oluwatayo, 2004).

Regardless of the unique recognition given to mathematics in the Nigeria's education system (FRN, 2013), performance of students in the subject seems not encouraging. The West African Examination Council's Chief Examiners Report (2016) for the Senior Secondary School Certificate Examination revealed that the situation is very worrisome in spite of government effort at improving the teaching and learning process, students' performance in mathematics continues to be poor. Adunola (2011) posited that the poor performance of students in Mathematics is fundamentally linked to the application of ineffective teaching methods by teachers to impart knowledge to learners. The teaching and learning of mathematics in schools will be made relevant and productive if strategies that target ways of encouraging and nurturing the young minds to develop requisite skills are employed.

There is an array of these strategies and it is believed each strategy is worthy of practice, but the alignment of teaching methods with students' need and preferred learning influences their learning outcomes. ICT-driven strategies have been proven to play an important role in teaching-learning process as they provide learners with the understanding, skills and knowledge necessary for scientific research (Munishi, 2004). With the rapid usage of ICT resources, ICT-based strategies are considered as effective alternative to traditional teaching methods because they present students with unlimited opportunities to demonstrate the mastery of contents taught (Lei & Zhao, 2007).

Moreover, attitude of students towards learning is an important aspect of their learning outcomes in any given subject. Students' attitude can be positively influenced if appropriate strategy is employed by the teacher. Popoola, Isaac and Daramola (2018) succinctly reported that strategy such as concrete model instruction made students to develop positive attitude towards learning mathematics.

Class composition variable with respect to students' ability grouping is an important variable in determining students' learning outcomes in school subjects since every intact class comprises students with different levels of ability. Students' ability grouping is the process of grouping all students in a classroom according to their academic achievement levels. The grouping is usually based on high, average and low ability levels. According to Gamoran (1992), ability grouping is one of the most common responses to the problem of providing for student differences. He said that grouping has different effects in different circumstances.

Observations have being made on the differential ability of students in relation to their academic achievement and attitude to learning. Obochi (2021) observed that problem-solving instructional strategy made a significant effect on the academic performance of students with differential abilities in Biology. Closely related, but with a contrary submission, Adesoji (2008) asserted that problem-solving instructional strategy did not produce any significant difference in the performance of students with different ability levels.

Research on students' ability grouping in relation to their attitude to learning by Abdulrazak (2020) reported that grouping students along their different ability levels yielded a positive impact on the attitude of low and high ability students. He stated that it abolished boredom among low ability level students and increased competition among the high ability level students.

This study, therefore, investigated the effect of drill-and-practice instructional package on the academic achievement and attitude of students with low, average and high ability levels in Mathematics. To guide the study, one research question was raised and two hypotheses formulated.

a) Research Question

Will there be any effect of drill-and-practice instructional package on the academic achievement of students with low, average and high ability levels in Mathematic?

b) Research Hypotheses

1. There is no significant difference among the posttest scores of students with low, average and high ability levels in Mathematics.
2. There is no significant difference in the attitude towards learning Mathematics of students with low, average and high ability levels.

Methodology

The study adopted pretest, posttest control group quasi-experimental design. The population for the study consisted of 2,134 Junior Secondary School Two (JSS2) students in all the 16 public secondary schools in Akoko North-East Local Government Area, Ondo State. The sample consisted of 64 junior secondary school two students selected from two secondary schools in the Local Government Area through multistage sampling procedure. The first stage was the use of purposive sampling technique to select two schools using availability of computer laboratory as criterion for selection. The second stage was the use of simple random sampling technique to select two intact classes for the research in the schools and lastly, the two classes were also randomly assigned: one for treatment and the other for control. The sample was grouped into low, average and high ability levels using the pretest. Two research instruments named Mathematics Achievement Test (MAT) and Students' Attitude towards Mathematics Questionnaire (SAMQ) were used for data collection. MAT and SAMQ had reliability coefficients of 0.78 and 0.73 respectively.

The duration for the experiment was six weeks in three stages: pre-treatment stage (one week), treatment stage (4 weeks), and post treatment stage (one week). Data collected were analyzed using descriptive statistics such as mean and standard deviation to answer the research question raised, while Analysis of Covariance (ANCOVA) was used to test the hypotheses formulated. All hypotheses were tested at 0.05 level of significance.

Results

Question: Will there be any effect of drill-and-practice instructional package on the academic achievement of students with low, average and high ability levels in Mathematic?

In order to answer the question, the achievement scores of students in pretest and posttest were obtained and compared. The result is presented in table 1.

Table 1: Summary of Descriptive Statistics showing the achievement scores of students with low, average and high ability levels in Mathematics

Treatment	Ability	Mean	Std. Deviation
Pre-Experiment	Low	3.33	2.08
	Average	4.78	1.86
	High	5.45	1.91
Post Experiment	Low	16.30	3.16
	Average	15.47	3.47
	High	17.20	2.78
Total	Low	10.84	6.44
	Average	10.05	5.74
	High	12.00	7.56

Table 1 revealed that students with low, average and high ability obtained the mean scores of 3.33, 4.78 and 5.45 respectively in the pretest while at the posttest stage; they obtained 16.30, 15.47 and 17.20 respectively. It could be seen that the achievement scores of the three ability levels (low, average and high) appreciated in the posttest which implies that the three levels were positively impacted by the treatment.

Hypothesis 1: There is no significant difference among the posttest scores of students with low, average and high ability levels in Mathematics.

In order to test the hypothesis, the posttest achievement scores of students with low, average and high ability were tested for statistical significance using Analysis of Covariance at 0.05level of significance. The result is presented in table 2.

Table 2: Analysis of Covariance showing the significant difference in the posttest scores of low, average and high ability levels.

Source	Sum of Squares	df	Mean Square	F	Sig.
Group	1469.446	1	1469.446	203.745	.000
Ability*Group	.398	2	.199	.028	.973
Treatment*Ability	25.431	2	12.715	1.763	.181
Error	418.308	58	7.212		
Corrected Total	2357.938	63			

a. R Squared = .823 (Adjusted R Squared = .807)

The result in table 2 revealed that the treatment has significant effect on the achievement score of students [f = 203.75; p<0.05]. However, there is no significant

difference between the ability scores of pretest and posttest of students exposed to instructional package [f = 0.028; p>0.05]. This indicated that students' ability levels have no effect on their academic achievement. The result showed that there is no significant interaction effect of ability level and treatment on students' achievement [f = 1.763; p>0.05]. The null hypothesis is therefore retained. This implied that drill-and-practice instructional package helped students with different ability levels to perform alike without any discrepancy.

Hypothesis 2: There is no significant difference in the attitude towards learning Mathematics of students with low, average and high ability levels.
In order to test the hypothesis, the attitudinal scores of students with low, average and high ability were tested for statistical significance using Analysis of Covariance (ANCOVA) at 0.05 level of significance. The result is presented in table 3.

Table 3: Analysis of Covariance showing the significant difference in the attitude towards learning Mathematics by low, average and high ability level students.

Source	Sum of Squares	df	Mean Square	F	Sig.
Attitude	31.210	1	31.210	7.760	.007
Ability	1016.169	2	508.085	126.337	.000
Attitude * Ability	8.775	2	4.387	1.091	.343
Error	233.257	58	4.022		
Corrected Total	1361.000	63			

a. R Squared = .829 (Adjusted R Squared = .814)

Table 3 revealed that treatment has significant influence on the attitude of students towards mathematics [f = 7.76; p<0.05]. There is a significant difference between the ability of students exposed to drill-and-practice instructional package on attitude [f = 126.337; p<0.05]. Hence, the null hypothesis is rejected.

However, in an attempt to determine the source of difference among the three (3) groups, Duncan post hoc was carried out as shown in table 4.

Table 4: Summary of Duncan test

		Subset		
Ability Group	**N**	**1**	**2**	**3**
Low	19	32.8947		
Average	37		39.0270	
High	8			46.3750
Sig.		1.000	1.000	1.000

It could be seen from table 4 that students with high ability (46.38) have the highest mean score followed by students in average ability group (39.03) and students in low ability group (32.90). This indicated that there is a significant difference in the attitude of students of the three ability levels.

Discussion

Descriptive analysis of the research question revealed that the students exposed to the drill-and-practice instructional package have the same ability level of achievement in Mathematics. In other words, there was no difference in the performance of the students because they were grouped according to their ability level. Also, ANCOVA test on hypothesis one showed that there was no significant interaction effect of ability and treatment on students' academic achievement. This finding is in consonance with Adesoji (2008) who concurred that problem-solving instructional strategy did not produce any significant difference in the performance of students with different ability levels. However, it disagrees with the submission of Obochi (2021) that problem-solving instructional strategy made a significant effect on the academic performance of students with differential abilities in Biology. Hence, the null hypothesis that there is no significant difference among the posttest scores of students with low, average and high ability levels in Mathematics is upheld. This implied that drill-and-practice instructional package impacted students in low, average and high ability levels to perform alike in Mathematics without any discrepancy. The package equalized Mathematics achievement of students in the three different ability levels.

Furthermore, ANCOVA test on hypothesis two revealed a significant difference in the attitude of students of the three ability levels whereby students in high ability group had the highest mean score followed by students in average and low ability groups in a reverse order. As a result, the hypothesis of no significant difference in the attitude of students with low, average and high ability levels in Mathematics is rejected. Students' attitude to Mathematics is directly proportional to their ability levels. This finding is in agreement with Abdulrazak (2020) who asserted that grouping students along their different ability levels yielded a positive impact on the attitude of low and high ability students as it abolished boredom among low ability level students and increased competition among the high ability level students.

Conclusion and Recommendation

Based on the findings of this study, it could be concluded that drill-and-practice instructional package benefitted low, average and high ability level students without any disparity in terms of achievement. However, the high level students had higher attitudinal score than the other two groups. That is, students' attitude to Mathematics is directly proportional to their ability levels. It was therefore

recommended that Mathematics teachers should adopt the use of the drill-and-practice instructional package to teach mathematics in Junior Secondary Schools so as to be able to identify and meet the academic needs of the heterogeneous classes. Also, teacher educators should consider a review of curriculum for secondary school Mathematics with a view to incorporating drill-and-practice instructional package.

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