

**INTERNATIONAL JOURNAL OF
EDUCATIONAL LEADERSHIP
(IJEL)**



Volume 3, Number 3. December, 2010

**UNIVERSITY OF EDUCATION, WINNEBA
GHANA, WEST AFRICA**

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THE EFFECT OF FORMATIVE TEST, INDIVIDUAL ASSIGNMENT AND GROUP ASSIGNMENT ON STUDENTS' ACHIEVEMENT IN JUNIOR SECONDARY SCHOOL MATHEMATICS

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ABSTRACT

The study investigated the extent to which formative test, individual assignment and group assignment determined students' achievement in Mathematics. Four schools in Ijebu-North of Ogun State were purposively chosen and an intact class in JSS 2 was used for each group for the treatments with a fourth group as control. Pre-test was conducted for the four groups before the commencement of the teaching. Three groups were taught using three different strategies: formative test on the first group, individual assignment on the second group and focus on group assignment on the third group while the fourth was taught using conventional method of instruction. A post test was administered on the four groups. The results (pre-test and post-test) were subjected to analysis of covariance. It was revealed that formative test, individual assignment and group assignment significantly affected achievement in Mathematics. The adjusted means showed that formative test has the highest mean of 28.44 followed by individual assignment with adjusted mean of 25.06; group assignment recorded an adjusted mean of 23.48 and control had the least adjusted mean of 20.62. It was recommended among other things that teachers should regularly give a take home assignment in Mathematics to students which should be promptly marked and recorded.

Introduction

Assessment has always been an important part of the education system. However, with the passage of time its importance appears to have been played down (Onuka and Oludipe, 2004). The need for improvement on how students are assessed in Mathematics in Nigeria became imperative with the advent of national policy on education in 1977 and much more so after the 1981 revised edition of the said policy and the subsequent ones (Federal Republic of Nigeria [FRN], 1977; 1981; 1998; 2004). Subsequently also the need to reform the Mathematics curriculum arose. The big debate of the era was: What should be taught in Mathematics? How should it be taught? How should it be assessed? (Onabamiro, 2005).

Currently, the education sector in Nigeria is undergoing different types of reforms. These reforms will be incomplete without adequate provision for means of assessing of learning outcomes (Onuka and Junaid, 2007). Pandey (1990) states that assessment is traditionally derived from the curriculum; however, assessment has not been part of a feedback loop linked to instruction. He further states that it is now widely believed that assessment must be an integral part of teaching, so that it is used as a tool not merely to collect data, but also to influence instruction. Onuka and Oludipe (2004; 2006) believe that assessment forms the basis for effective feedback into the school system, if the system was to improve. Unfortunately, most of the schools are yet to focus on adequate assessment of the students and the learning process. According to the National Teachers' Institute (2006), most schools still operate the traditional assessment practices of the last century by which students are assessed with the sole aim of preparing them for examination and not with the aim of making

them to understand the concepts in the subject taught. By this, rote learning has gradually replaced the systematic reading and understanding of the subjects.

William and Black (1998) in de Sousa (2007) define formative assessment as the activities that teachers and students undertake to get information that can be used diagnostically to alter teaching and learning. Many researchers have looked at the effects of formative assessment on student achievement and have found that the results are promising when consistently incorporated into the curriculum. When formative assessment is used properly it provides the educator with feedback about how well the students understand what is being taught and if any adaptations in instruction need to be made. A study was carried out by de Sousa (2007) on the effect of formative test on achievement in Mathematics. The results of the study indicate that the students in the group in which the implementation of formative assessment was used, scored higher on all assessments throughout the unit.

Researchers like Boston (2002), Stiggins (2002), and Deubel (2006) have addressed the benefits of formative assessment. These researchers have found that students can get involved in learning and perform better through formative assessments. Formative test has not found favour with the classroom teachers and the reasons are not far fetched. Stiggins, (2002) said that only few teachers are prepared to face the challenges of classroom assessment because most of them have not been given the opportunity to learn how to do so. Apart from this, the time allocated for each subject is not adequate to entertain adequate formative testing.

Assignment is the work given to students by the teacher at the end of the class. This kind of assignment often becomes what may be termed 'a take-home type'/homework.' The two will therefore be used interchangeably. Assignment should be able to help students to have deeper knowledge of what the teacher has taught as it will make them to search deeper into what was taught. In fact, Ming-Chih Lan (2003) opines that not only does homework help students master what they have learned in class, but also extends the time during which they could learn the subject matter after school. Some studies (Frederick & Walberg, 1980; Husen, 1972) have shown that the amount of time that students spend on homework contributes significantly to the improvement of school grades. The situation has to be helped. Thus it becomes imperative to find out whether these variables of interest in this study could actually result in improved learning by the learners as measured by their achievement in Mathematics. This study, therefore, investigated the effect of formative test, individual assignment and group assignment on achievement in Mathematics.

Research Questions:

Specifically, this study sought to provide answers to the following questions:

1. Are there significant differences in the achievement of the experimental and control groups?
2. What is the significant main effect of the treatments on students' achievement in Mathematics?
3. What are the relative effects of formative test, individual assignment, group assignment and the conventional method on students' achievement in Mathematics?

Methodology

Research Design

Pre-test/post-test quasi-experimental and/control groups design was used in the study involving three different experimental groups and one control group. The three experimental groups used in the study were each assigned different treatment.

Sampling and Sample

Four schools were randomly chosen in Ijebu-North Local Government Area of Ogun State. In each school, one intact class of junior secondary 2 students was randomly selected and used. One of the intact classes comprising 61 students was used for formative test experimental group. The class of 58 students was used for individual assignment as the second experimental group while the third experimental group comprising 62 students was taken from yet another school for group assignment and lastly an intact class made up of 53 students served as the control group.

Instrumentation

The researchers constructed and validated a 40-item Mathematics Achievement Test (MAT). The reliability coefficient of 0.62 was obtained through test-retest, while the concurrent validity coefficient was 0.71.

Procedure for data collection

The subjects were taught for eight weeks and those in the experimental groups were respectively given formative test, group and assignment consistently to the experimental groups respectively while the control group was given neither test nor assignment. A pre-test was given to all the groups before the commencement of the experiments to determine the entry behaviour of the students. In the formative test group, the students were tested along with the teaching. The tests were marked immediately and correction given by one of the students in each group. The individual and group assignments were given each day of the lesson. The assignments were submitted at the beginning of the next class and correction given before teaching commences. In the group assignment class, the students were grouped into ten of six members each in the first eight groups while the remaining two groups have seven members each. In the case of the control group, they were taught in the conventional way. At the end of the eighth week, a post-test was given to the four groups.

Analysis of Data

Data arising from the study were collated and analysed using t-test and ANCOVA statistics

Results and Discussion

Table 1: Comparative Achievement in Pre-Test and Post-Test of Experimental and Control Groups

Test	Treatment group	N	Mean	SD	T-value
Pretest	(a) Experimental	181	18.80	4.72	-0.350 NS
	(b) Control	53	19.06	4.97	
Posttest	(a) Experimental	181	25.66	5.48	6.012 S
	(b) Control	53	20.64	4.48	

The above table shows the result of the pre-test and post-test scores for the experimental and control groups. The t-value, -0.350 for pre-test is not significant at 0.05, but the t-value, 6.012 for post-test is significant at 0.05. This shows that there is no significant difference in the performance of the students before the administration of the treatments and that there is significant difference after the administration of the treatment.

Table2:

Levene's Test of Equality of Error Variances

a

Dependent Variable: POST-TEST

F	df1	df2	Sig.
2.117	3	230	.099

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept+PRE-TEST+GROUP

From table 2, The level of significance of 0.099 which is greater than 0.05 shows that the error variance of the post-test is equal among all the groups. This result indicates that the students in experimental groups and those in control group were at the same level in mathematical ability before the administration of the treatments which makes it necessary for the use of ANCOVA to analyse the data.

Table3:

Tests of Between-groups Effects

Dependent Variable: POSTTEST

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	1886.457 ^a	4	471.614	18.731	.000	.247
Intercept	7294.807	1	7294.807	289.721	.000	.559
PRETEST	23.690	1	23.690	.941	.333	.004
GROUP	1812.514	3	604.171	23.995	.000	.239
Error	5765.936	229	25.179			
Total	148356.000	234				
Corrected Total	7652.393	233				

a. R Squared = .247 (Adjusted R Squared = .233)

Following the adjustment of the pretest scores, there was a significant effect of the between factor groups (the treatments), $F(3, 229) = 23.995$, $p < .005$. This was an indication that the treatments (formative test, individual assignment and group assignment) have significant main effect on students' achievement in Mathematics. The Eta squared 0.239 which is greater than 0.14 which has been chosen as the rule of thumb implies that the treatments have a large effect on the achievement.

Table 4:

Pairwise Comparisons

Dependent Variable: POSTTES

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
FORMATIVE	INDIVIDUAL	3.384*	.929	.000	1.553	5.214
	GROUP	4.960*	.915	.000	3.158	6.762
	CONTROL	7.817*	.945	.000	5.955	9.678
INDIVIDUAL	FORMATIVE	-3.384*	.929	.000	-5.214	-1.553
	GROUP	1.576	.917	.087	-.230	3.383
	CONTROL	4.433*	.955	.000	2.551	6.316
GROUP	FORMATIVE	-4.960*	.915	.000	-6.762	-3.158
	INDIVIDUAL	-1.576	.917	.087	-3.383	.230
	CONTROL	2.857*	.941	.003	1.003	4.711
CONTROL	FORMATIVE	-7.817*	.945	.000	-9.678	-5.955
	INDIVIDUAL	-4.433*	.955	.000	-6.316	-2.551
	GROUP	-2.857*	.941	.003	-4.711	-1.003

Based on estimated marginal means

* The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Table 4 shows where the significant differences occur in the post-test scores of the various groups. From the table, positive difference occurs between the formative test group and every other group (individual assignment, group assignment and control groups). There is no significant difference between individual assignment group and group assignment group. A negative difference also occurs between the control group and every other group (formative test individual assignment and, group assignment) which means that the experimentations made significant effect on the achievement better than the control.

Table5: Estimated Marginal Means

Dependent Variable:

	Mea	Std.	95% Confidence	
			Lower	Upper
Formative	28.44 ^a	.648	27.16	29.72
Individual	25.06 ^a	.660	23.76	26.36
Group	23.48 ^a	.639	22.22	24.74
Control	20.62 ^a	.689	19.26	21.98

a. Evaluated at covariates appeared in the model:

18.85.

Having statistically removed the effect of pre-test, the above table shows the adjusted means for each group. From the table, formative test has the highest adjusted mean of 28.44 followed by individual assignment with adjusted mean 25.06, group assignment with adjusted mean 23.48 and control the least with adjusted mean 20.62. These indicate that formative test has the most effect on the achievement, followed by individual assignment, then group assignment and conventional teaching was the least effective.

Discussion

The findings are indications that there was no significant difference in the performance of the students before the administration of the treatments and that there is significant difference after the administration of the treatments. It follows, therefore, that the treatments (formative test, individual assignment and group assignment) have significant effect on students' achievement in Mathematics. The finding corroborates the assertion of Johnson, Johnson, and Holubec (2002) that cooperative learning in groups can be highly effective and the finding of Dunn and Price (2000) that homework/assignments that permit students to complete assignments under preferred conditions of noise, light, design, mobility, and time of day improved students' achievement, attitudes, and conduct.

The fact that there was significant main effect of treatments (formative test, individual assignment and group assignment) on students' achievement in Mathematics portends the fact that the treatments yielded better results than the conventional method of teaching. This finding supports the conclusion of Boston (2002), Stiggins (2002), and Deubel (2006) who found that when students were to get involved in learning through formative assessments they did perform very well in their studies. It also agrees with the finding of Sasser (1981) that the Mathematics achievement of students receiving homework assignments was significantly greater than the Mathematics achievement of students not given homework. By implication, therefore, it is advisable that teachers must endeavour to give home assignments to students in order to encourage to embarking on learning outside school.

Viewing the results reveal that the group of formative test teaching has the greatest effect on the students' achievement, followed by individual assignment experimental group, then group assignment set with the control group bringing up the rear. This finding corroborates the findings of de Sonsa (2007), Ming-Chih Lan (2003) who variously discovered that students in the group where formative assessment was used, scored higher on all the assessments given them than students where formative test was not implemented. Therefore, it thus could be concluded that applying formative test during teaching engenders greater student achievement than the conventional teaching method.

The study also confirms the findings of Onuka and Oludipe (2006); Onuka and Junaid (2007), and Onuka (2007) that regular assessments in whatever forms provide feedback and engender improved students' performance in any subject. This is invariably so as regular test or assignment in every form gives direction to the students on how to answer questions as well as put them on the path of industry and thus regular study, which in turn minimizes examination malpractices. The implication of these findings is that since the treatments had significantly improved learning, all the stakeholders must endeavour to evolve machinery to ensure regular assessment in its various forms in the school system.

Conclusion

The study has clearly shown that when assignment and assessment are regularly given to students and carried out, they respectively and definitely engender higher academic achievement because they form sources of feedback on the performance of the students and in turn encourage them to cultivate positive study-habit as well as academic industry. This is so because they are propelled to learning more so as to both improve on their academic achievement and compete more favourably with their academic peers since they are regularly given feedback on their performances.

Recommendations

The following recommendations were consequently made.

1. Teachers should endeavour to bring in formative test into their teaching.
2. Individual assignment should be given regularly to assist students to take their study seriously and they should in the process be regularly monitored.
3. The curriculum planners should formally integrate formative testing into the teaching/learning process in order to ensure that it is regularly used to assist students develop critical minds and good study habits.
4. Teachers should be encouraged by stakeholders to effectively make use of formative tests, individual assignment and group assignment in the teaching and learning process.
5. Teachers should be trained in assessment techniques and in the use of ICT as well as be provided with the requisite equipment which will facilitate the conduct, marking and reporting these assessment processes promptly for feedback and corrective measures.
6. School administrators should encourage their teachers to regularly use these assessments to improve culture in their students and teachers should be monitored to ensure that this is done.

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