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Effect of Formative Testing with Feedback on Students' Achievement in Junior Secondary School Mathematics in Ondo State Nigeria

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Abstract: The study investigated the effect of formative testing with feedback as an instructional strategy on junior secondary school students' achievement in mathematics in Ondo State. The effects of gender and socio-economic status on this learning outcome were also examined. The sample for the study consisted of 227 junior secondary school two (JSS II) students in intact classes of three co-educational schools purposively selected from Akure South Local Government Area of Ondo State. The study employed quasi-experimental design with treatment at three levels namely: Formative Test with Feedback, Formative Test only and Non-Formative Test which served as control. The treatment levels were crossed with students' socio-economic status (high, medium and low) and gender (male and female). Five research instruments namely: Formative Tests I, II and III, Socio-Economic Status Questionnaire (SESQ) and Mathematics Achievement Test (MAT) were constructed, validated and used for the collection of all revelant data. The data collected were analyzed using Analysis of Covariance (ANCOVA) and Scheffe's Post-Hoc Analysis. Results from the study revealed a significant effect of treatment on students' achievement in mathematics. However, there were no significant effects of gender and socio-economic status (SES) on achievement in mathematics.

Keywords: formative test, socio-economic status, feedback, gender, mathematics achievement

1. Introduction

The evaluation of students' progress and the ultimate level of achievement in schools is a very important part of any educational system. The utilization of formative testing in the teaching-learning process involve breaking up the subject matter content or course into smaller hierarchical units for instruction; specifying objectives for each units; designing and administration of validated formative test; offering a group based remediation in areas where students are deficient before moving to another units and then administration of summative test on completion of all units. Ajogbeje (2010) opined that the breaking up of subject or course into small units enable students to adequately prepare for periodic tests. And these periodic tests also provide a means of getting the students to be more involved and committed to the teaching-learning process thereby enhancing their performance. Hence the regular testing of students' ability as demanded by the "6-3-3-4" system of education assists greatly in discovering the performance of students and could also be used to improve learning

The essence of using tests and other evaluation instruments during the instructional process is to guide, direct and monitor students' learning and progress towards attainment of course objectives (Alonge, 2004; Kolawole, 2010). Teachers and learners cannot perform optimally or effectively

without the availability of adequate information on student's standing at any given time and the extent of his progress towards the achievement of instructional objectives. Hence, the tests given periodically, as continuous assessment tests, are supposed to remove the threatening effects of a single test (summative test) generally given at the end of a course of study. Some of the aspects of continuous assessment that are very relevant the teaching-learning outcomes include the frequency of the period of reporting on teacher-learner achievements, effecting immediate feedback of results into the teaching-learning situation and the emphasis that the results of these in-course assessments be combined with those of terminal assessments in deciding the final output of the individual learner.

Bardwell (1981) submitted that feedback is the information, which a teacher provides a student about his/her performance on a particular task or test. He further argued that when such information is provided, the student concern begins to have a better understanding of his/her capabilities and he/she might begins also to have a different perception of himself/herself. Studies have shown that feedback provides (1) reinforcement effect (Gronlund & Linn, 1990) and (2) correctional information (Bardwell, 1981; Gronlund & Linn, 1990). Ajogbeje (2012a) opined that formative evaluation process includes the provision of feedback to students on their scores or performance in a given test. Kulharvy (1977) reported that there are two conditions under which feedback does not perform its facilitative role. One, if the feedback has high availability for the learner before he responds and two, if the material studied is very difficult for the learner. He further stated that in the absence of these conditions, one would conclude that studies which are based on both theories agreed that feedback on performance helps to confirm correct responses as well as to identify and correct errors. This correctional function is probably the most important aspect of feedback, and if one was given the choice, feedback following wrong responses probably has the greatest positive effect. Hence in this study, feedback was used as means of effecting correction and reinforcing students learning.

Kirkland (1971) stated that test scores feedback may affect the motivational, self-confidence and anxiety level of a student while Bridgeman (1974) opined that feedback from tests motivates the students intrinsically. Erinosho (1988) also opined that a person who is informed of his successful performance on a test would begin to develop interest in that subject and may continue to explore means of doing well in subsequent tasks. On the other hand, a negative feedback on performance may produce one of two effects. One, the students may use it for correction purposes and try to do well on later tests. That is, it influences him positively. Two, he/she may choose to be defeated and could begin to develop a feeling of inadequacy in the subject. The consequence is that he/she would continue to perform poorly as well as lose interest in the area of study. The findings of these studies have implication for teaching and learning in secondary schools. They point to the need for effective mounting of formative testing with feedback strategy in the school system.

Kirkland (1971) also argued that the way a person perceives a test influences his test-taking behaviors. He stated that if the person sees the test score as accurate, he will be willing to accept the result and act on them. But if he sees the test score as a poor reflection of his capabilities, he will dismiss them or rationalize them away. Hence, test results which are not indicative of what the students expect or conceive of themselves, produce negative effect on their academic performance. Scannel and Tracy (1975) associated the lack of knowledge of performance on an earlier task with lower and incomplete subsequent learning and poorer retention of what has been learnt. Erinosho (1988) also claimed that lack of knowledge of performance on a task might raise anxiety in the student. This is because he/she would not be able to assess his/her ability and competence on the task.

The implication of all these reported findings is that feedback from tests is effective to the extent that the student perceives the scores as representing his goals. Feedback from tests, only promote learning when the student attempt to do well and such student tends to assume responsibility for his

successes or failures rather than blame it on environmental factors. If a student has no pre-determined goals, information on his score alone may not be effective in producing increased performance. Means and Means (1971) and Ajogbeje (2012a) observed that most of the research studies reviewed utilizes tasks which involved simple computations that are not comparable to the complex demands of an academic subject. The type of feedback received by the students on their performance in most of these studies were skillfully guided while the methodology employed includes assigning of students in the sample to treatment groups using criteria such as ability, pre-test score or previous performance. Students were subsequently given the task on which they were to work after which random feedback rather than true score were given to students on their performance. In some of the studies, random scores were given to participants depending on the treatment group (Bridgeman, 1974); others randomly used expressions such as "Excellent", "Good", "you have tried", etc (Bridgeman, 1974; Means & Means, 1971) after which post-test was administered and comparison of achievement were made between the experimental and control groups. Hence, it is possible that some of the students were given scores, which they felt were not true representation of their ability thereby eroding their confidence and performance in subsequent tests.

Finally, findings on the effect of feedback on subsequent performance on a task have been inconclusive. It is possible that the perspective from which the studies were conducted need to be widened. It may well be that there are other aspects of the learning environment which influence feedback effect. It is a common features in most our school systems for students' scripts to be stock-piled in the teachers' offices only to be dashed out to market hawkers or to be destroyed after a period of time. In some cases students are provided the feedback of their performances after they might have written the final examinations on the subject. Such a feedback hardly serves any useful purpose for improving the learner's performance in mathematics. The current trend of formative testing without the adequate provision of feedback to students in our school system is a contributory factor to the consistent mass failures of students in junior secondary school mathematics. Hence, the present study is designed to investigate the effect of formative testing with feedback on students' achievement in junior secondary school mathematics. In addressing the above situation, the following research hypotheses were formulated and tested for validity or otherwise at 0.05 level of significance:

1. There is no significant effect of treatment on students' achievement in mathematics;
2. There is no significant effect of gender on students' achievement in mathematics;
3. There is no significant effect of socio-economic status on students' achievement in mathematics;
4. There is no significant interaction effect of treatment, gender and socio-economic status on students' achievement in mathematics.

2. Method

The study population consisted of all junior secondary schools in Ondo State. The study employed quasi-experimental design with a sample consisting of 227 students drawn from three co-educational junior secondary schools in Akure South Local Government Area of Ondo State using purposive sampling technique. Data collected were subjected to Analysis of Covariance (ANCOVA) and Scheffe's Post-Hoc Analysis test at 0.05 significant levels.

The three selected schools were assigned to the two experimental groups (Formative Test with Feedback Group, Formative Test Only Group) and the control group (or Non-Formative Test

Group) respectively. The treatment package given to the experimental groups contained the following:

2.1 Instructional Strategy I:

At the end of the expository class teaching of every unit, class test was administered. Students were provided with the feedback of their performance in the test the following week before the commencement of the next unit.

2.2 Instructional Strategy II:

At the end of the expository class teaching of every unit, class test was administered. Students were not provided with the feedback of their performance in the test the following week before the commencement of the next unit.

2.3 Experimental Procedures

The experimental procedures include the identification and selection of three research assistants one per each sampled school. This helped to avoid class disruption, reduce or eliminate the Hawthorne effect (i. e. participants reacting to the fact that they are part of an experiment) rather than the treatment per se. The experiment lasted nine weeks, out of which one week was spent for the training of teachers (research assistants), one week for pre-test, six weeks for treatment and the last one week for post-test. The treatment was administered on the participants for six weeks during the school regular lesson periods. It was assumed that the students had little or no previous knowledge of the selected topics for discussion because the treatment started at the beginning of a new session. In providing instruction, provision was made for differences in abilities within the group. That is, there was no rigid rule about the time allowed for instruction on each topic within the groups. This ensured that instruction was adequate for each group. Although, the teaching was done by the research assistants in all the schools but the research assistants were closely monitored by the researchers. Thus, it could be assumed that instruction variance was minimal. The non-formative test group served as control while the other groups went through different evaluation treatments. The following treatments were undertaken by each treatment group.

Participants in the Formative Test with Feedback Group were provided with feedback on their performances on Formative Tests I, II and III. The feedback provided is in form of allowing the students to study their marked scripts. The students were also allowed to discuss their test scores with one another. During the discussion period, the research assitant normally excused himself from the class in order not to give students the opportunity to ask for any assistance. At the end of the discussion time, the students' scripts were collected back from them and the group then proceeded to the next unit of instruction. After the administration of Formative Test III, an interval of one week was given before the administration of the post-test.

Similarly, the Formative Test Only Group participants received instruction procedures outlined above but they were not provided with feedback. At the end of each topic, a formative test covering all the objectives outlined for the unit was administered. The participants in this group sat for all the formative tests but their marked scripts were not given and no reference was made to the test once administered. The same procedure as in the Formative Test with Feedback Group was followed in administering the post-test after the administration of Formative Test III. Finally, the participants in the Control Group (or Non-Formative Test Group) equally received the instruction procedures outlined above but they were not exposed to any formative test and feedback on the three selected topics. The participants were only exposed to the normal teaching-learning process by their teacher (research assistant) and the normal classrooms exercises or take home assignments given by their teacher from their textbooks and no formal effort was made to check through their

assignments. After the coverage of the third unit, the same procedure as in the Formative Test with Feedback Group was followed in administering the post-test

2.4 Research Instruments

Five research instruments namely Formative Tests I, II and III, Socio-Economic Status Questionnaire (SESQ) and Mathematics Achievement Test (MAT) were used for the collection of all revelant data.

2.4.1 Formative Tests

The three Formative Tests I, II and III are 20 multiple-choice items with five options (A, B, C, D and E) constructed by the researchers to test the content and objectives of each unit of instruction on Number and Numeration, Plane Shapes and Algebraic Processes selected for discussion. Each formative test was expected to measure a part of the total sample tasks. The Formative Test I, II and III were reviewed and vetted for face and content validities by experienced junior secondary school mathematics teachers and two test experts in the area of test construction with bias in mathematics. Kuder Richardson formula 21 (KR_{21}) was used to establish a reliability coefficient estimate of 0.82, 0.78 and 0.75 for Formative Tests I, II and III respectively.

2.4.2 Mathematics Achievement Test (MAT)

The MAT is a fifty multiple-choice achievement test with five options (A, B, C, D and E) constructed by the researchers based on the depth coverage of the selected topics for discussion. The test was designed to assess learners' mastery or otherwise of the content covered during instruction. The items on the Formative Tests I, II and III were not the same as the items on the MAT. The MAT was reviewed and vetted for face and content validities by experienced junior secondary school mathematics teachers and two test experts in the area of test construction with bias in mathematics. Kuder Richardson formula 21 (KR_{21}) was used to establish a reliability coefficient estimate of 0.72 for MAT.

2.4.3 Socio-Economic Status Questionnaire (SESQ)

The Socio-Economic Status Questionnaire (SESQ) was designed to elicit information about the participants' age, sex, their parents' occupation and educational background. For the SESQ, scores were assigned to each component of the socio-economic status measures. The construct validity of SESQ was established by trial testing a neat copy of the SAVQ on 112 JSS II students, from two junior secondary schools in Akure North Local Government Area of Ondo State. The two schools possessed all the criteria earlier used for the selected sampled schools. The convergence method of comparing measurements from two different groups of similar traits was used. Using Product Moment Correlation a high and significant convergence coefficient of 0.71 was obtained for SAVQ which shows that the instrument has construct validity.

2.5. Data Collection

All the three groups responded to a SAVQ and MAT before and after treatment. The formative test with feedback group and the formative test group only received formative tests (treatment) while the control group did not receive formative test (treatment). The data from all the research instruments were manually scored and coded by the researcher. For the SAVQ, scores were assigned to each component of the socio–economic status measures. The parent occupation item was an open–ended item; hence all sorts of occupations were listed. For this reason the Obanya [1978] scoring plan for occupations was used. The maximum possible score was four (4) marks, Unclassifiable [1], Manual, peasant farming, petty trading, being a house wife [2], Clerical, sub–technical [3], and Managerial/Professional [4]. Similarly parental education attracted a maximum score of four (4) marks, Very little education [Schooling] or no schooling [1], Primary education

[2], Secondary education, Teachers College [3], and University or other forms of tertiary education [4]. The entire socio–economic status measures yielded a maximum score of 16. Dividing this into three nearly equal parts, it was possible to classify subjects as belonging to: [i] High socio–economic status (HSES) 12 - 16 points; [ii] Medium socio-economic status (MSES) 7- 11 points and [iii] Low socio-economic status (LSES) 1-6points. In scoring section B of the SAVQ, the transformation; Strongly Agree (4), Agree (3), Disagree (2) and Strongly Disagree (1)were used for each item under consideration. The scores for the items making up each scale were added together to get the total score for that scale and were later used for data analysis.

3. Results

The results of this study are presented as shown below. Hypothesis one was aimed at determining effect of treatment on achievement in mathematics. The mean scores and standard deviations of post-test scores are shown in Table 1. Table 1 show that all the three groups had appreciable high post-test scores. The formative test with feedback group had the highest mean score of 21.20, followed by the formative test only group with a mean score of 17.09 while the control group had a mean score of 14.43.

Table 1. Mean and standard deviation of post-test scores for the treatment groups

Treatment Group	Formative Test & Feedback		Formative Test Only		Control	
	82		71		74	
	Mean	S.D	Mean	S.D	Mean	S.D
Post-test	21.20	4.56	17.09	3.96	14.43	3.34

To determine if any statistically significant difference exists among the mean scores of the treatment groups, an analysis of covariance was computed as shown in Table 2. Table 2 reveals a significant difference in the students' achievement among the three groups. The obtained F-ratio is $F(2, 223) = 165.333$, $P < 0.05$, with this F-value, the decision was to reject the stated hypothesis that there is significant difference in the effect of treatment on students' achievement in mathematics since significant differences exist among the three groups.

Table 2. Analysis of covariance of post-test scores according to treatment groups

Source of Variation	Sum of Squares	df	Mean Square	F-cal	Sig.
Corrected Model	7736.157	3	2578.719	127.799*	.000
Intercepts	7516.848	1	7516.848	372.527*	.000
Pre-test	47.907	1	47.907	2.374	.072
Treatment	6672.181	2	3336.091	165.333*	.000
Error	4499.638	223	20.178		
Corrected Total	2235.795	226			

The data was further subjected to the multiple classification analysis (MCA) in order to determine the magnitude and direction of the effect as shown in Table 3.

Table 3. Mmultiple classification analysis of post-test scores according to treatment groups

Variable + Category	N	Unadjusted Deviation	Eta	Adjusted for Independent+ Covariate	Beta	Adjusted Mean
Treatment Groups						
Formative Test & Feedback	82	7.09		6.28		21.24
Formative Test Only	71	0.84		0.88		17.19
Control	74	-5.93	0.58	-5.15	0.63	15.21
Multiple R^2						0.087
Multiple R						0.295

Note: Grand Mean = 20.36

The multiple classification analysis in Table 3 reveals that the grand mean is 20.36 while the control group has an adjusted mean 15.21. The formative test with feedback group has an adjusted mean of 21.24 while the formative test only group has an adjusted mean of 17.19. Table 3 also reveals that the different treatment strategies accounted for 8.7% of the variation in the students' post-test scores in mathematics.

In order to determine the treatment condition that caused the rejection of the null hypothesis, Scheffe's Post-Hoc Analysis was carried out on the adjusted mean scores of the three groups as presented in Table 4.

Table 4. Scheffe's post hoc analysis of post-test scores for treatment groups

Groups	Mean Score	Formative Test & Feedback	Formative Test Only	Control
Formative Test &Feedback	21.20			
Formative Test Only	17.08	*		
Control	14.43	*	*	

Table 4 shows that the formative test with feedback group students' achievement was significantly higher than the formative test only and control groups. Similarly, formative test only group achieved significantly better than the control group. The control group has least

effect over other groups. Hence, the stated hypothesis that there is no significant difference in the effect of treatment on students' achievement in mathematics was rejected.

Hypothesis two intends to find out the effect which gender had on the student's achievement in mathematics. To test this hypothesis, ANCOVA was computed to correct for differences that might exist at pre-test level among the subjects. The summary of ANCOVA presented in table 5 showed that the effect of gender on achievement in mathematics yields the result $F(1, 224) = 0.044$, $P > 0.05$. The obtained F-ratio of 0.044 is therefore not significant. Therefore, the null hypothesis which stated that there is no significant difference in the effect of gender on students' achievement in mathematics was not rejected since significant difference do not exist between the gender groups.

Table 5. Analysis of covariance of the post-test scores according to gender

Source of Variation	Sum of Squares	df	Mean Square	F-cal	Sig.
Corrected Model	1064.169	2	532.085	10.699*	.007
Intercepts	4556.451	1	4556.451	91.361*	.000
Pre-test	1062.819	1	1062.819	21.311*	.001
Gender	2.195	1	2.195	0.044	.647
Error	11171.626	224	49.873		
Corrected Total	12235.795	226			

Similarly, hypothesis three was intended to find out the effect which SES had on students' achievement on their post-test scores and to test this hypothesis, ANCOVA was computed to correct for differences that might exist at pre-test level among the subjects.

Table 6. Aanalysis of covariance of the post-test scores according to SES

Source of Variation	Sum of Squares	df	Mean Square	F-cal	Sig.
Corrected Model	1081.382	3	360.461	7.206*	.000
Intercepts	3611.553	1	3611.553	172.202*	.000
Pre-test	1024.641	1	1024.641	20.485*	.000
SES	17.406	2	8.703	0.174	.787
Error	11154.413	223	50.020		
Corrected Total	12235.795	226			

The summary of ANCOVA presented in table 6 showed that the effect of SES on achievement in mathematics was not significant [F (2, 223) = 0.174, P > 0.05]. The obtained F-calculated of 0.174 was not significant. Therefore, the null hypothesis which stated that there was no significant difference in the academic achievement of students from different SES groups in their post-test scores in mathematics was not rejected since no significant difference existed between the groups.

Finally, hypothesis four was intended to find out the interaction effect of gender, SES and treatment on students' achievement in their post-test scores. Table 7 contains the information on the summary of the 3 x 2 x 3 ANCOVA of the main effects, the two-way and the three-way interaction of treatment, gender and SES on students' achievement in mathematics.

The main effect for treatment F (2,208) = 5.281, $p < 0.05$ was statistically significant while the main effects for gender F (1,208) = 0.468, P > 0.05 and socio-economic status F (2, 208) = 1.561, P > 0.05 as separate factors were not statistically significant. The two-way interaction for SES-treatment F (4,208) = 2.208, $p < 0.05$ was statistically significant while the interaction effects for gender-SES F (2,208) = 0.319, P > 0.05 and gender-treatmentF (3, 208) = 0.386, P > 0.05were not statistically significant. The three-way interaction effect gender-SES-treatment F (3,208) = 2.501, $p < 0.05$ was statistically significant.

Table 7. Analysis of covariance table for post-test scores on mathematics achievement.

Source of Variation	Sum of Squares	df	Mean Square	F-cal	Sig.
Corrected Model	263.490	18	14.638	2.244*	.000
Intercepts	4138.950	1	4138.950	634.614*	.000
Pre-test	55.385	1	55.385	8.492*	.001
Gender	3.054	1	3.054	0.468	.342
SES	20.359	2	10.179	1.561	.151
Treatment	68.881	2	34.441	5.281*	.003
Gender x SES	4.164	2	2.082	0.319	.611
Gender x Treatment	7.554	3	2.518	0.386	.465
SES x Treatment	57.600	4	14.400	2.208*	.034
Gender x SES x Treatment	48.927	3	16.309	2.501*	.041
Error	1356.584	208	6.522		
Corrected Total	1620.074	226			

Table 8. Multiple classification analysis of post-test scores on mathematics

Variable + Category	N	Unadjusted Deviation	Eta	Adjusted for Independent+ Covariate	Beta	Adjusted Mean
Treatment						
Formative Test & Feedback	82	0.21		-0.10		24.09
Formative Test Only	71	-0.51		0.21		24.40
Control	74	0.65	0.24	0.14	0.29	24.33
Gender: 1. Male	104	0.03		-0.06		24.13
2. Female	123	-0.03	0.01	0.04	0.06	24.23
SES: 1. HSES	97	-0.17		-0.01		24.18
2. MSES	89	0.15		-0.03		24.16
3. LSES	41	0.36	0.05	0.44	0.09	24.63
Multiple R^2						0.380
Multiple R						0.617

Note: Grand Mean = 24.19

Table 8 presents the results of MCA for the post-test scores in mathematics. The results showed that the formative test with feedback group had an adjusted mean 24.40; followed by the control group

with adjusted post-test scores of 24.33 while the formative test with feedback and remediation group had an adjusted mean score of 24.09. Table 8 also revealed that the treatment accounted for 8.4% $(0.29)^2$ of the variance in student's post-test scores in mathematics.

4. Discussion

The result of this study revealed that the students who were provided with feedback performed better than those provided with formative test only. The least performance came from the control group that was provided with expository teaching only without any formative test or feedback. The result of this study further revealed that within the two experimental groups significant differences were obtained in favour of the formative test with feedback group. These results agreed with the findings of Kirkland (1971), Bridgeman (1974), Bardwell (1981) and Ajogbeje (2012a, c) that feedback from tests motivates students intrinsically. Kirkland (1971) had earlier reported that test score feedback may affect the motivational, self-confidence and anxiety level of a student. Thus, a person who is informed of his successful performance on a test would begin to develop interest in the area and explore means by which he will continue to do well in subsequent tasks. He will then begin to perceive himself positively and also become assured of his competence in the area.

However, these findings contrasted the reported finding of Erinosho (1988) that formative test with feedback treatment was not more effective than formative test treatment only. The outcome of formative test only also agreed with the findings of Saudargas, Madsen and Scott (1977) and Pizzini, Treagust and Cody (1982) but contrasted that of Erinosho (1988). The findings of Saudargas, Madsen and Scott (1977) showed that the use of formative testing led to effective outcome in that students developed more consistent study habits when they were tested daily than when they were tested weekly or within three weeks intervals. The observed low performance in respect of the control group might be due to the fact that they did not have opportunities to explore their problems with the teacher. This result suggests that regular teaching alone was not effective in improving performance in mathematics. This is in agreement with the findings of Erinosho (1988) and Ajogbeje (2012b) where it was reported that constant teaching alone without regular testing and feedback did not provide enough stimuli for physics and mathematics learning respectively. Hence, the current trend of continuous teaching without feedback and regular testing coupled with take home assignments in our school system is a contributory factor in inhibiting rather than promoting learning. This needs to be addressed to enhance learners' performance in both internally and externally conducted examinations.

The non-significant result obtained when gender was considered agreed with the findings of Wood (1976), Afemikhe (1985), Oladunni (1995) and Ajogbeje (2012a, b, c) which found no gender differences in the junior high school. However, the result contrasts studies carried out by Campbell and Beaudry (1998) and U. S. Department of Education (2000, 2001) which found sex-related differences in mathematics achievement. Similarly, the non-significant difference between subjects of different SES background supported the findings of Afemikhe (1985), Lee and Smith (1996), Caldas and Bankson (1997) and Ajogbeje (2012a, b, c) but contrasted that of Yoloye (1970) and Stronick (1974) which both reported that the children from low socio-economic status families do not perform as well in school as children from high socio-economic status families when education is used as the status index. Stronick (1974) reported that children whose parents were in science-oriented professions scored higher in science than children whose parents were in non-science related occupations. Erinosho (1984) also found, in a case study at a secondary school in Ibadan that father's occupation and education contributed largely to the variance that was obtained on performance in physics. The non-significant result obtained in this study tends to suggest that the group of students sampled in this study seems to have a higher aspiration or ambition to rise above their own social class and limitations.

The findings of this study have shown that feedback and remediation would afford learners opportunity to go through the appropriate answers thereby providing further insight on the content which would also induce improved performance in subsequent attempts. In fact, the study showed that a combination of feedback with remediation would be more effective in facilitating students' learning in junior secondary school mathematics. The findings of the study further revealed that gender and socio-economic status of students were found to exert no significant effect on learners' cognitive attainment in junior secondary school mathematics.

The study recommended that mathematics teachers in junior secondary school need to motivate their students and help them to build positive attitude towards mathematics by providing the learners with regular diagnostic tests and adequate feedback on their test scores. The present system of continuous testing without feedback in our schools should be discontinued by the teacher. School administrators should allow and provide necessary incentives for teachers to attend seminars, workshops, conferences and in-service programmes to keep them abreast of current research findings in teaching strategies and methodologies in order to enhance their effectiveness. Head teachers should emphasize to their teachers on regular basis the need for formative test with adequate feedback. Finally, effective formative testing with feedback requires extra effort and time. With the current population explosions in our schools, government should employ more qualified mathematics teachers to handle the teaching of mathematics with regular assessment and feedback to be provided the learners.

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