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Effect of Feedback and Remediation on Students' Achievement in Junior Secondary School Mathematics

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Abstract

The study investigated the effects of feedback and remediation as instructional strategies on junior secondary school students' achievement in mathematics. The effects of gender and socio economic status on these learning outcomes were also examined. The sample for the study consisted of 240 junior secondary 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 and Remediation, Formative Test with Feedback only and Formative Test without feedback and remediation 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 including three Formative Tests I. II and III in Mathematics, Socio Economic Status Questionnaire (SESQ) and Mathematics Achievement Test (MAT) were constructed, validated, and used for the collection of all relevant 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, remediation, feedback, gender, mathematics achievement

1. Introduction

Researchers have shown that when students' learning difficulties are identified, corrected and reinforced, an increase in their cognitive gains follows (Bello, 1985; Block & Burns, 1977). The concept of continuous assessment relates well with formative testing with remediation in that unit formative test are constructed and administered after each unit, remediation given in difficulty areas before the next unit is taken up. Ojerinde and Falayajo (1984) noted that continuous assessment is a mechanism whereby the final grading of a student in cognitive, affective and psychomotor domains of behaviors takes into account, in a systematic way, all of the performances during a given period of schooling. Such assessment, according to them, involves the use of different modes of evaluation for the purpose of guiding and improving the learning and performance of the student. In formative evaluation the student takes diagnostic tests at several points in the course of his studies and on the basis of test results (feedback) he obtains, some guidance (remediation) as to how next he should procced (Klopter, 1971). There is the likelihood that if students' learning is adequately evaluated regularly during the teaching–learning process and prompt feedback and remediation are provided, students' level of performance will improve.

Burrows and Okey (1979), Afemikhe (1985), Erinosho (1988), Ughamadu (1990) and Ajogbeje (2012) have utilized components of mastery learning such as feedback and remediation with significant results. Remediation simply refers to the process of leading learners to be aware of their errors and engaging in possible correction. It is meant to correct deficiencies in learners, either individually or as a group. The role of remediation in the classroom is to serve as a levelling up device (Ezewu, 1981), in the sense that students who failed to master certain materials are allowed or provided the opportunity to level up with those who had mastered them earlier. Findings from the study carried out by Swanson and Denton (1977) revealed that students undergoing remediation accomplished a greater number of objectives than students participating in an instructional programme that does not include remedial activities. Also remediation activities, which provide alternate

materials or instructional modes under the guidance of the teacher, appear to be superior to a student centered approach that encourages reading and reviewing of the materials used during the initial instruction.

Within the Nigerian context, some studies (Afemikhe, 1985; Ajogbeje, 2012 and Erinosho, 1988) have highlighted the benefit of formative testing with remediation. Their findings point to the fact that there is resultant improved achievement in learning as a result of diagnosis and directed remediation. Afemikhe (1985) reported that students exposed to formative testing with remediation achieved higher than students exposed to formative testing with feedback only and the students exposed to instruction only without formative testing in mathematics. Erinosho (1988) and Ajogbeje (2012) also carried out a study which was aimed at finding out the extent to which each of the components of formative evaluation (remediation, feedback, formative tests) improves performance in physics and mathematics respectively. The findings of these studies show that students provided with remediation treatment had higher performance than those who received only feedback treatment. Bardwell (1981) opined that feedback is the information, which a teacher provides a student about his/her performance on a particular task or test. He further submitted 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.

Research studies also revealed that feedback provides (1) reinforcement effect (Gronlund & Linn, 1990) and (2) correctional information (Bardwell, 1981; Erinosho, 1988 and Gronlund & Linn, 1990). Strang and Rust (1973) reported that feedback has detrimental effect while Kulharvy (1977) stated that there are two conditions under which feedback does not perform its facilitative role. Firstly, if the feedback has high availability for the learner before he responds and secondly, 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 agree that feedback on performance helps to confirm correct responses as well as to identify and correct errors. This correction 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.

Erinosho (1988) 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 and remediation strategy in the school system.

From all the studies reviewed, one could observe 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. Similarly, it was 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, pretest score or previous performance. Students are then given the task on which they were to work and consequently, feedback on their performance were randomly provided rather than given students their true score. In some of the studies reviewed, 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 posttest was administered and comparison of achievement were made between the experimental and control groups. 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 in subsequent tests and this also might have affected their performance.

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

continuous testing without feedback and remediation in our school system is a contributory factor to the consistent mass failures of most secondary school leavers in May/June examinations conducted by West African Examination Council (WAEC), National Examination Council (NECO) and National Business and Technical Examination Board (NABTEB) as reported by Information on Nigeria Education (2009). Hence, the present study is designed to investigate the effect of feedback and remediation on students' achievement in junior secondary school mathematics.

2. Research Hypotheses

The study was designed to test at 0.05 level of significant the validity or otherwise of the following hypotheses:

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.

3. Method

The study population consisted of all junior secondary schools in Ondo State. The study employed quasi–experimental design with a sample consisting of 240 students drawn from three co–educational junior secondary schools in Akure South Local Government Area of Ondo State using purposive sampling technique. The three selected schools were assigned to the two experimental groups (Formative Test with Feedback and Remediation Group, Formative Test with Feedback Group) and the control group (or Formative Test Group) respectively. The treatment package given to the experimental groups contained the following:

3.1 Instructional Strategy I

At the end of the expository class teaching of every unit, class test was administered. The feedback of students' performance in the test was presented to them during the lesson following the administration of the test and before the commencement of the next unit. This was followed with remediation, that is: [1] Provide feedback; [2] Divide the items into two or three sections, say, items 1–8; 9–16; 17–25; [3] Allow any of the students with highest score in each section of the test (as grouped above) to lead the class; [4] Class discussion to identify correct answer to each item in section (i.e.1–8); [5] Allow students to ask questions on difficult (or gray) area(s); [6] Ask probing questions; [7] Encourage students to provide answers to the questions among themselves; [8] Another student is called upon to lead the next section (i.e. 9–16). The steps in [iv]–[vi] are to be repeated; and [9] Teacher provides a guide and/ or assist where the need arises.

3.2 Instructional Strategy II

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. No provision was made for any remediation or discussion of their results.

3.3 Instructional Strategy III

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. No provision was made for any remediation or discussion of their results.

3.4 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 was spent for training the teachers (research assistants), one week for pretest, six weeks for treatment and the last one week for posttest. The treatment was administered for six weeks during the school regular lesson periods. It was assumed that the students had little or no previous knowledge of the topics chosen. This is 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 researcher. Thus, it could be assumed that instruction variance was minimal. The

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 and Remediation Group were exposed to the instructional units. The treatment involved expository class teaching involving teaching, note – taking and answering questions. Each unit was followed by a class test. After assessment, students were provided knowledge of their performance in the formative tests (feedback). The feedback was followed with discussion as a remediation. The discussion after feedback involved interaction between the teacher and the students and interactions among the students themselves in order to identify and discuss the correct responses to the items contained in the formative tests. The teacher only provide a guide as enumerated in the treatment manual. More examples were solved for them on those items they find very difficult and they were equally given more work to do. At the end of the discussion time, the students' scripts were collected back from them and the group then proceeds to the next unit of instruction. All the same, the remediation exercise was carried out as part of a normal teaching procedure. No form of remediation was, however, given on the posttest but the students received information on their scores. At the end of instruction on the third topic, a week was allowed before the administration of the posttest. The researcher frequently visited the classes during each treatment session to ensure that the research assistant complied with the instructions given in the manual.

Participants in the Formative Test with Feedback Group received the same treatment and formative tests as in the formative test with feedback and remediation group. The group was provided the feedback of their performances on all the tests but at every stage no remediation was provided as to identify the correct responses to the items with the students. On the formative tests, the feedback is in form of allowing the students to study their marked scripts. They were also allowed to discuss the test among their classmates. During the discussion period, the research assistant left the class so that the students would not have the opportunity of asking him 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 third formative test, the same procedure as in the formative test with feedback and remediation group was followed in administering the posttest. Similarly, the Formative Test Group Only also received instruction procedures outlined above but there was no feedback and remediation. At the end of each topic, a formative test covering all the objectives outlined for the unit was administered. These students took the tests but their marked scripts were not given and no reference was made to the test once administered. After the third formative test, the same procedure as in the formative test with feedback and remediation group was followed in administering the posttest.

Five research instruments including three Formative Tests I, II and III in Mathematics, Socio Economic Status Questionnaire (SESQ) and Mathematics Achievement Test (MAT) were used for the collection of all relevant data. The MAT, 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 0.72 for MAT, 0.82, 0.78 and 0.75 for the formative tests I, II and III respectively. Data collected were subjected to Analysis of Covariance (ANCOVA) and Scheffe's Post–Hoc Analysis test at 0.05 significant level.

Finally, 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 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 participants 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) 1–6 points.

4. 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 posttest scores are shown in table 1.

Table 1. Mean and standard deviation of posttest scores for the treatment groups

Treatment Group	Feedback With Remediation		Feedback Without Remediation		Control	
	84		82		74	
	Mean	S.D	Mean	S.D	Mean	S.D
Posttest	27.45	3.38	21.20	4.56	14.43	3.34

As shown in Table 1 all the three groups had appreciably high posttest scores. The feedback with remediation group performed best with a mean score of 27.45, followed by the feedback without remediation group with mean 21.20 while control group had a mean 14.43. 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. Analysis of covariance of posttest scores according to treatment groups

Source of Variation	Sum of Squares	df	Mean Square	F – cal.	Sig.
Corrected Model	7736.157	3	2578.719	135.252*	.000
Intercepts	7516.848	1	7516.848	394.254*	.000
Pretest	47.907	1	47.907	2.513	.072
Treatment	6672.181	2	3336.091	174.976*	.000
Error	4499.638	236	19.066		
Corrected Total	2235.795	239			

Table 2 above reveals a significant difference in the students' achievement among the three groups. The obtained F – ratio is F (2, 236) = 174.976, $P < 0.05$, with this F – value, the decision was to reject the stated hypothesis that there is no significant difference in the effect of treatment on students' achievement in mathematics since significant differences exist among the three groups.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. 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 feedback with remediation group has an adjusted mean of 26.64 while the feedback without remediation has adjusted mean of 21.24. Table 3 also reveals that the different treatment strategies accounted for 39.69% of the variation in the students' posttest scores in mathematics.

Table 3. Multiple classification analysis of posttest scores according to treatment groups

Variable + Category	N	Unadjusted Deviation	Eta	Adjusted for Independent+ Covariate	Beta	AdjustedMean
Treatment Groups						
Feedback with Remediation	84	7.09		6.28		26.64
Feedback without Remediation	82	0.84		0.88		21.24
Control	74	-5.93	0.58	-5.15	0.63	15.21
MultipleR^2						0.487
MultipleR						0.595

Grand Mean = 20.36

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 posttest scores for treatment groups

Groups	Mean Score	Feedback &Remediation	Feedback noRemediation	Control
Feedback &Remediation	27.45			
Feedback noRemediation	21.20	*		
Control	14.43	*	*	

Table 4 shows that the feedback with remediation group students' achievement was significantly higher than the feedback without remediation and control groups. Similarly, feedback without remediation 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 pretest level among the subjects.

Table 5. Analysis of covariance of the posttest scores according to gender

Source	Sum of Squares	df	Mean Square	F – cal.	Sig.
Corrected Model	1064.169	2	532.085	11.288*	.000
Intercepts	4556.451	1	4556.451	96.662*	.000
Pretest	1062.819	1	1062.819	22.547*	.000
Gender	0.194	1	0.194	0.004	.942
Error	11171.626	237	47.138		
Corrected Total	12235.795	239			

*P < 0.05

The summary of ANCOVA presented in table 5 showed that the effect of gender on achievement in mathematics yields the result F (1, 237) = 0.004, P > 0.05. The obtained F – ratio of 0.004 is not significant. Therefore, the null hypothesis which stated that there 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.

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

Table 6. Analysis of covariance of the posttest scores according to SES

Source	Sum of Squares	df	Mean Square	F – cal.	Sig.
Corrected Model	1081.382	3	360.461	9.953*	.000
Intercepts	3611.553	1	3611.553	99.724*	.000
Pretest	1024.641	1	1024.641	28.293*	.000
SES	17.406	2	8.703	0.240	.787
Error	11154.413	236	36.216		
Corrected Total	12235.795	239			

The summary of ANCOVA showed that the effect of SES on achievement in mathematics was not significant [F (2, 308) = 0.240, P > 0.05]. The obtained F – calculated of 0.240 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 posttest 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 posttest scores.

Table 7. Analysis of covariance table for posttest scores on mathematics achievement.

Source of Variation	Sum of Squares	df	Mean Square	F cal.	Sig.
Corrected Model	263.490	18	14.638	2.385*	.000
Intercepts	4138.950	1	4138.950	674.316*	.000
Pretest	55.385	1	55.385	9.023*	.001
Gender	3.054	1	3.054	0.498	.420
SES	20.359	2	10.179	1.658	.115
Treatment	68.881	2	34.441	5.611*	.002
Gender x SES	4.164	2	2.082	0.339	.641
Gender x Treatment	7.554	3	2.518	0.410	.656
SES x Treatment	86.398	6	14.400	2.346*	.049
Gender x SES x Treatment	48.927	3	16.309	2.657*	.049
Error	1356.584	221	6.138		
Corrected Total	1620.074	239			

*P < 0.05

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 (3,290) = 4.908, $p < 0.05$ was statistically significant while the main effects for gender F (1,221) = 0.498, $P > 0.05$ and socio-economic status F (2, 221) = 1.658, $P > 0.05$ as separate factors were not statistically significant. The two–way interaction for SES-treatment F (6,221) = 2.346, $p < 0.05$ was statistically significant while the interaction effects for gender-SES F (2,221) = 0.339, $P > 0.05$ and gender–SES F (3, 221) = 0.410, $P > 0.05$ were not statistically significant. The three–way interaction effect gender–SES–treatment F (3,221) = 2.657, $p < 0.05$ was statistically significant. Table 8 showed the results of MCA for the posttest 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 posttest 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 8.41% $(0.29)^2$ of the variance in student's posttest scores in mathematics.

Table 8. Multiple classification analysis of posttest scores on mathematics

Variable + Category	N	Unadjusted Deviation Covariate	Eta	Adjusted for Independent +	Beta	Adjusted Mean
Treatment						
Feedback & Remediation	84	0.21	-0.10	24.09		
Feedback no Remediation	82	-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	136	-0.03	0.01	0.04	0.06	24.23
SES: 1. HSES	115	-0.17	-0.01	24.18		
2. MSES	104	0.15	-0.03	24.16		
3. LSES	21	0.36	0.05	0.44	0.09	24.63
Multiple R^2		0.380				
Multiple R						
0.617						

Grand Mean = 24.19

5. Discussion

The result of the study showed that the students provided with feedback and remediation performed better than those provided with feedback without remediation. The least performance came from the control group that was provided with test only without feedback or remediation. The results of the study also show that within the two experimental groups significant differences were obtained in favour of the remediation group. These results are in line with the findings of Afemikhe (1985), Erinosho (1988), Ughamadu (1990) and Ajogbeje (2012) who found out that students undergoing remediation attains higher level of cognitive achievement than students undergoing instructional programme without remediation. This outcome could be explained in terms of the feedback and remediation which the students received. Remediation offered students opportunity to go through their marked scripts and identify their strengths and weaknesses. Thus, remediation was expected to help in correcting the mistakes made. Apart from this, studies have shown that students become intrinsically motivated if they know precisely what the task or learning is (Bridgeman, 1974; Scannel & Tracy, 1975; Bardwell, 1981).

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 testing alone was not effective in improving performance in mathematics. This is in agreement with the findings of Erinosho (1988) and Ajogbeje (2012) where it was reported that constant testing alone did not provide enough stimulus for physics and mathematics learning respectively. Hence, the current trend of continuous testing without feedback and remediation 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) and Oladunni (1995) 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.

The non-significant difference between subjects of different SES background was unexpected because students of high SES background would be expected to be better stimulated and motivated than the lower groups and thus perform better. However, this result supported the findings of Afemikhe (1985), Lee and Smith (1996) and Caldas and Bankson (1997) 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) also 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 could be explained in terms of the nature of data used and thrust of work. The result also 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.

6. Conclusion

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 with necessary remediation. The present system of continuous testing without feedback or remediation 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 and remediation. Finally, effective feedback and remediation require extra effort and time and with the current population explosions in our schools, government should employ more mathematics teachers to handle the teaching of mathematics with regular assessment and remediation to be provided the learners.

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