British Journal of Education

Vol.9, Issue 2, pp.1-16, 2021

Online ISSN: 2054-636X

Print ISSN: 2054-6351

GENDER, FEEDBACK WITH REMEDIATION AND STUDENTS' ATTITUDE TOWARDS MATHEMATICS

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ABSTRACT: *This study investigated the effects of feedback and remediation as instructional strategies and gender on junior secondary school students' attitude towards mathematics. The sample for the study consisted of 237 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' gender (male and female). Four research instruments including three Mathematics Formative Tests I. II, III and Mathematics Attitude Scale (MAS) 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. Result from the study shows a significant effect of treatment on students' attitude towards mathematics. However, there was no significant effect of gender on students' attitude towards mathematics.*

KEYWORDS: formative test, remediation, feedback, gender, attitude towards mathematics

INTRODUCTION

Attitude refers to someone's basic liking or disliking of a familiar target, that is, a learned predisposition or tendency of an individual to respond positively or negatively to some object, situation or concept while attitude toward mathematics is a construct which plays a crucial role in mathematics teaching-learning processes. Burstein (1992), Onafowokan (1998) and Olatoye (2001) in their various studies reported that student's attitude towards science has significant direct effect on student achievement in the subject. This implies that students who do well in a subject generally have more positive attitudes towards that subject and those who have more positive attitudes towards a subject tend to perform better in that subject.

Research studies have shown that the teachers' personality and the method used by the teacher in teaching mathematics greatly accounted for students' positive attitude towards mathematics and that, without personal effort and interest in learning mathematics by the students, they can hardly perform well in the subject (Bolaji, 2005). Barton (2000) as well as Furinghetti and Pekhonen (2002) opined that the way mathematics is represented in the classroom and perceived by students, even when teachers believe they are presenting it in authentic and context dependent way tends to alienate many students from mathematics. Haladyna, Shaughnessy and Shaughnessy (1983) had earlier stated that the general attitude of the class towards mathematics is related to the quality of the teaching and the social-psychological climate of the classroom. Alao (1988) also examined six attitudinal dimensions and their effects on students' achievement and reported that students have positive attitudes towards sciences including mathematics. Keeves (1992) and McLeod (1994) opined that attitude towards science and mathematics tend to become more negative as pupils move from elementary to secondary school and that attributes such as enthusiasm and personality traits have been shown to influence students' attitude towards science and mathematics as well as other subjects. Poor attitude towards mathematics has often been cited as one of the key factors militating against the participation and success of girls in mathematics (Willis, 1995; Fullarton, 1993). Research studies have shown that girls tend to have more negative attitudes towards mathematics than boys (Frost, Hyde & Fennema, 1994, Leder, 1995) as a result of their sex-role stereotypes (Fennema & Sherman, 1977; Sherman, 1982; Leder, 1982 and Ethington, 1992). Girls are often discouraged from mathematical work in their primary years and this usually leads to their disliking mathematics in the secondary years. Poor mathematical skills in women deprived them from pursuing course in physical sciences, mathematics, engineering and computer science (Gavin, 1997) because mathematical background knowledge is the prerequisite for entrance into many of these professions.

Students' interest and attitude in a subject are the major predictors of their participation and success in that subject. Costello (1991) opined that results from all the available corroborate the commonly held view that doing mathematics is consistent with a male self-image and inconsistent with a female self-image. He further explained that this self-image is usually caused by the peer pressure and that males' students are more inclined towards mathematics than females' students making it a male dominated domain. Several measures and intervention programs has been designed for improving females attitude towards mathematics (American Association of University Women, 1992; Mulryan, 1992). And 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). Moreover, frequent testing enables students to get more involved and committed to the teaching–learning process thereby enhancing their performance (Bandura, 1982).

Bloom, Hastings and Madaus (1971) opined that formative evaluation is useful to both the students (as a way of diagnosing students' learning difficulties and the prescription of alternative remedial measures) and to the teacher (as means of locating the specific difficulties that the students are experiencing within the course content and forecast summative evaluation result). According to Gronlund and Linn (1990), formative evaluation serves three specific uses namely: (i) to plan corrective action for overcoming learning deficiencies; (ii) to aid in motivating learners and (iii) to increase retention and transfer of learning. According to them, students' responses to a formative test could be analyzed to reveal group and individual errors needing correction. Hence, formative testing is a strategy designed to identify learners' learning difficulties with a view to providing remediation measures to enhance the performance of majority of students. Some researchers have used strategies that can be seen as components of mastery learning like the use of feedback and remedial instructions (Burrows & Okey, 1979; Afemikhe, 1985; Erinosho, 1988; Ughamadu, 1990).

Ajogbeje (2012a b, 2013); Ajogbeje, Ojo and Ojo (2013); Okey (1977) as well as Godson and Okey (1978) from different studies found that the utilization of diagnostic tests with remediation in appraising learning weaknesses enhances the acquisition and retention learning tasks among students. Pizzini, Treagust and Cody (1982) also established in their study aimed at determining whether or not formative evaluation can be effective or could facilitate goal attainment in a biochemistry course, that the use of formative evaluation can be effective in producing desired learning outcomes to facilitate goal attainment. Afemikhe (1985), Ajogbeje (2012a, b); Ajogbeje and Alonge (2012); Ajogbeje, Ojo and Ojo (2013); Burrows and Okey (1979), Erinosho (1988) as well as Ughamadu (1990) have utilized components of mastery learning such as feedback and remediation with significant results. Remediation is 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 leveling up device (Ajogbeje & Alonge, 2012; 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 Ajogbeje (2012a), Ajogbeje and Alonge (2012) as well as 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. Afemikhe (1985), Ajogbeje (2012a), Ajogbeje and Alonge (2012) all 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) also had earlier carried out a similar study 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. 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 begin also to have a different perception of himself or herself.

Research studies also revealed that feedback provides (1) reinforcement effect (Gronlund & Linn, 1990) and (2) correctional information (Ajogbeje, Ojo & Ojo, 2013; 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.

Ajogbeje (2012a), Ajogbeje and Alonge (2012) as well as 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. Ma and Kishor (1997) synthesized 113 survey studies of the relationship between attitude towards mathematics and achievement in mathematics. The causal direction of the relationship was from attitude to the achievement.

The effort to promote attitudes has been somewhat successful on the individual level. Mathematics anxiety can be reduced through systematic desensitization (Hembree, 1990) while on the whole class level, efforts to reform teaching in order to promote the desired attitude have generally been unsuccessful (McLeod, 1994). However, recent evidence suggests that collaborative approaches can promote positive attitude among students (Bouler, 1997a, b, 1999; Ridlon, 1999). The present study therefore is an attempt to investigate the effect gender and formative testing with feedback and remediation on students' attitude towards junior secondary school mathematics.

Research Hypotheses

The study was designed to test the validity or otherwise of the following hypotheses:

1. There is no significant effect of treatment on students' attitude towards mathematics.
2. There is no significant effect of gender on students' attitude towards mathematics.
3. There is no significant interaction effect of treatment and gender on students' attitude towards mathematics.

RESEARCH METHOD

The study population consisted of all junior secondary schools in Ondo State. The study employed quasi–experimental design with a sample consisting of 237 students [108 males and 129 females] drawn from three co–educational junior secondary schools in Akure South Local Government Area of Ondo State operating the same mathematics syllabus were selected 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. Four instruments namely Formative Test I, II and III (which were administered on the respondents after the coverage of each selected topic during treatment) and Mathematics Attitude Scale (MAS) which served as pretest and posttest to the respondents were used to collect all the relevant data for the study.

The three Formative Test I, II and III were reviewed and vetted for face and content validities by two experienced junior secondary school mathematics teachers and two test experts in the area of test construction with bias in mathematics. Kuder Richardson formula 21 (KR21) was used to establish a reliability coefficient estimate of 0.82, 0.78 and 0.75 for the formative tests I, II and III respectively. The Mathematics Attitude Scale (MAS) is a likert-type scale on students' attitude towards mathematics. The instrument has two parts in which the first part contains some personal background information on the respondents while the second part comprises of twenty-one items of 4 points likert-type items i.e. Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). Cronbach Coefficient Alpha was applied on the result of the pilot testing to obtain an internal consistency coefficient alpha of 0.72 for MAS. The item total correlation calculated ranged from 0.189 to 0.781. The construct validity of MAS was established convergence method of comparing measurements from two different groups of similar traits. A convergence coefficient of 0.65 was obtained for MAS. The data collected were subjected to t–test and Analysis of Covariance (ANCOVA) to test the rejection or otherwise of the stated hypotheses at 0.05 level of significance. Multiple Classification Analysis (MCA) test was used on significant variables to find out the magnitude of differences among the groups while Scheffe's Post Hoc analysis was used where a null hypothesis was rejected.
The treatment package given to the experimental groups contained the following:

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.

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.

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.

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. Discussion after feedback involved closer interaction among the students and between the teacher and the students to identify and discuss the correct responses to the items contained in the formative tests. The teacher only provides 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. At the end of instruction on the third topic, a week was allowed before the administration of MAS. 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 normally excused himself from 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 MAS.

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 MAS.

RESULTS

The results of the data analysis carried out are presented below. Hypothesis one was aimed at determining whether formative evaluation would result in significantly higher achievement or not. The mean scores and standard deviations of the posttest scores are shown in table 1. The descriptive statistics of students' posttest attitude scores as shown in Table 1 revealed that the four groups had appreciably high posttest attitude scores. The magnitude of scores, however, between the three experimental groups on one side and the control group on the other would appear lower.

Table 1: Mean and standard deviation of students' posttest attitude scores for treatment groups

Groups	Formative Test With Feedback & Remediation		Formative Test With Feedback		Formative Test Only	
	Mean	S D.	Mean	S D	Mean	S D
Pretest	24.09	4.05	23.11	5.00	22.88	3.93
Posttest	24.77	2.53	23.69	1.98	23.05	2.29
	84		82		71	

Specifically, the formative test with feedback and remediation group had a mean score of 24.77; formative test with feedback group had 23.69 while formative test group only (control group) had 23.05. To ascertain if any statistically significant difference exists among the mean scores of the treatment groups, an analysis of covariance was computed as presented in Table 2.

Table 2: ANCOVA of the posttest attitude scores of participants according to treatment groups

Source of variation	Sum of squares	df	Mean square	F	Sig
Corrected Model	5504.156	3	1834.719	110.055*	.000
Intercepts	4171.246	1	4171.246	250.210*	.000
Pretest	40.479	1	40.479	2.428	.061
Treatment	4262.812	2	2131.406	127.851*	.000
Error	3884.386	2	3316.671		
Corrected Total	10224.975	236			

*P < 0.05

The summary of ANCOVA revealed that the main effect of treatment on students' posttest attitude score was significant [F (2, 233) = 127.851, P < 0.05]. The obtained F-calculated of 127.851 was significant, therefore the null hypothesis which stated that there was no significant difference in effect of treatment on students' posttest attitude scores was rejected since significant differences existed between the groups. The data was further subjected to multiple classification analysis (MCA) in order to determine the magnitude and direction of the effect as presented in Table 3.

Table 3: MCA of posttest attitude scores according to treatments

Variable + Category	N	Unadjusted Deviation	Eta	Adjusted for Independent +Covariate	Beta	Adjusted Mean
Feedback with Remediation	85	5.25		4.68		25.10
Feedback without Remediation	82	0.95		0.66		21.18
Formative Test Only	71	-2.09	0.67	-1.16	0.61	19.26
Multiple R^2						0.527
Multiple R						0.729

Grand Mean = 20.42
The Formative Test Only (Control) group has an adjusted mean of 19.26 while the formative test with feedback and remediation group had 25.10.The formative test with feedback group had 21.18. The multiple R^2 in Table 3 reveals that only 52.7% of the variation of the performance in the posttest attitude scores is accounted for by the different treatment strategies.

Based on the results shown in Tables 1, 2 and 3, the null hypothesis of no significant difference is rejected. To detect the treatment condition that has contributed to the rejection of the null hypothesis, Scheffe Post Hoc analysis (as shown in Table 4) was carried out on the adjusted mean scores of the four groups

Table 4: Scheffe's post hoc analysis for posttest attitude scores of treatment groups

Groups	Mean Score	Feedback with Remediation	Feedback without Remediation	Formative Test Only
Feedback with Remediation	24.77			
Feedback without Remediation	23.69	*		
Formative Test Only	23.05	*	*	

The Scheffe procedure summarized in Table 4 reveals that the formative test with feedback and remediation group produced a significantly higher improvement on attitude towards mathematics than that of the formative test with feedback group and formative test only group. The formative test with feedback group also achieved significantly better than the formative test only group. The formative test only group has the least effect over other groups.

Hypothesis two seek to determine the effect of gender on students' attitude towards mathematics. To test the hypothesis, analysis of covariance (ANCOVA) of the posttest attitude scores of students according to gender was computed to correct for differences that might exist at pretest level among the participants and the result is presented in Table 5.

Table 5: ANCOVA of the posttest attitude scores of participants according to gender

Source of variation	Sum of squares	df	Mean square	F	Sig
Corrected Model	2112.106	2	1056.053	30.325*	.001
Intercepts	3021.462	1	3021.462	86.764*	.000
Pretest	1075.916	1	1075.916	30.896*	.001
Gender	9.409	1	9.409	0.270	.534
Error	8148.861	234	34.824		
Corrected Total	10221.205	236			

*P < 0.05

Table 5 reveals no significant difference between the students' posttest attitude scores according to gender. The F-value obtained F (1, 234) = 0.270, P > 0.05 is not significant. Therefore the null

hypothesis which stated that there is no significant main effect of gender on students' attitude towards mathematics is not rejected.

Hypothesis three intends to find out the interaction effects treatment and gender on student's attitude towards mathematics. 2-way ANCOVA was used to test the interaction effect of treatment and gender on students' attitude towards mathematics.
Table 6 shows the 2-way ANCOVA table for the students' posttest attitude scores. The combined main effect $F(6, 230) = 19.455$, $P < 0.05$ and the treatment effect $F(2, 230) = 8.475$, $P < 0.05$ was significant. However, the gender effect $F(1, 230) = 1.311$, $P > 0.05$ and gender – treatment $F(2, 230) = 1.500$, $P > 0.05$ interaction effects were not significant.

Table 6: Two-way ANCOVA of treatment and gender of students on their posttest attitude scores

Source of Variation	Sum of Squares	df	Mean Square	F cal.	Sig.
Corrected Model	478.237	6	79.706	19.455*	.000
Intercepts	893.583	1	893.583	218.107*	.000
Pretest	176.359	1	176.359	43.046*	.000
Gender	5.372	1	5.372	1.311	.225
Treatment	69.443	2	34.722	8.475*	.000
Gender x Treatment	12.293	2	6.147	1.500	.224
Error	942.378	230	4.097		
Corrected Total	1420.615	236			

*$P < 0.05$

Therefore, the null hypothesis which stated that there was no significant difference in the interaction effects of treatment and gender on students' posttest attitude scores was rejected since significant differences existed between the groups. The data was further subjected to multiple classification analysis (MCA) in order to determine the magnitude and direction of the effect as presented in Table 7.

Table 7: MCA of the ANCOVA on students' posttest attitude scores

Variable + Category	N	Unadjusted Deviation	Eta	Adjusted for Independent +Covariate	Beta	Adjusted Mean
Treatment						
Feedback with Remediation	85	1.00		1.06		22.64
Feedback without Remediation	82	0.38		0.41		21.99
Formative Test Only	71	-0.16	0.41	-0.20	0.52	21.38
Gender						
Male	108	0.16		0.10		21.68
Female	129	-0.13	0.16	-0.08	0.21	21.50
Multiple R^2						0.584
Multiple R						0.741

Grand Mean = 21.58

Table 7 shows that the formative test with feedback and remediation had an adjusted mean score of 22.64. The formative test with feedback group had an adjusted mean of 21.99 while the formative test group had an adjusted mean score of 21.38. The table also reveals an adjusted mean score of 21.68 for male which is marginally higher than that of 21.50 for female. The multiple R^2 in Table 7 reveals that only 58.4% of the variation of the performance in the posttest attitude scores is accounted for by gender and the different treatment strategies.

DISCUSSION

The results of the study indicate that the performance of the treatment groups – Formative Test with Feedback and Remediation, Formative Test with Feedback only and the Control differs significantly in the posttest mathematics attitude test. The two experimental groups performed significantly better than the control group. The result of the study also indicates that feedback and remediation are more effective than mere regular testing in promoting attending behavior in the participants. The finding is not unexpected in that the participants were eager to know the results of their performances. This could have compelled them to pay attention to their academic work. In addition, closer interaction and health competition among the participants as to who leads the class discussion tend to make students more favorably disposed to mathematics. The knowledge of results (feedback) helps to motivate the learners and sustain their interest in the subject. This result is in line with the findings of Bridgeman (1974), Bardwell (1981) that feedback from tests motivates students intrinsically. That is, 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.

Afemikhe (1985) also reported that children learn and feel better about school work in general when they are informed as to where they stand at all times in their studies; and that lack of feedback constitutes hindrance to learning. This was probably responsible for the low performance recorded in respect of control group that was subjected to class tests without any feedback or remediation. The remediation received by students should act as an incentive which is expected to increase students' motivation and attitude. Similarly, the feedback received by students should also encourage them to put in more efforts and interest in the subject. This was reflected in the improved performance of remediation and feedback. This in turn is expected to enhance students' interest and attitude towards mathematics as reflected in the findings of this study.

The non–significant result obtained when gender was considered implies that gender does not contribute significantly to students' attitude towards mathematics. That is, male and female participants exposed to the same treatment could develop positive and negative attitude towards mathematics and this in turn would influence their achievement in the subject. It seems therefore that boys and girls responded to treatment equally. This finding contradicts the view expressed by Fennema and Sherman (1978) that sex–related attitudes are more important to girls learning

of mathematics than to that of boys and that male student's stereotyped mathematics as a male domain at higher levels than female students. Recent findings suggest that gender differences in mathematics achievement up to the high school level have diminished (Eisenberg, Martin, & Fabes, 1996), but various researchers report that gender differences in the mathematics attitudes of American and European students may still be prevalent (Catsambis, 1994; Wigfield, Eccles, & Pintrich, 1996). It seems that boys and girls report equal confidence in their mathematics ability during elementary school, but when it gets to high school, boys are more confident.

Pintrich and De Groot (1990), Seegers and Boekaerts (1996) as well as Wigfield, Eccles, MacIver, Reuman and Midgley (1991) all reported that boys at middle school tend to rate themselves more efficacious than girls. Girls are thought to show less interest in mathematics and report higher levels of anxiety (Catsambis, 1994). Some researchers have suggested that may in part be due to the tendency of boys to be more self-congratulatory in their responses to efficacy instruments and of girls to be more modest (Wigfield *et al.,* 1996) and middle school years have been identified as the time during which gender differences in confidence between girls' and boys' self-perceptions of ability emerges (Fennema & Hart, 1994; Wigfield *et al.,* 1991). The probable reason for the finding of this study could be traceable to the realization of the participants that the inclusion of mathematics as a core subject in primary and secondary school curriculum is an attempt by the educational policy makers to solve quantitative problems in daily life. And that a rudimentary knowledge of mathematics is highly needed for citizens to function effectively in present day society. Mathematics is not only a compulsory subject in the curriculum of primary and secondary schools; it is also a pre–requisite to the study of science and other allied courses in Colleges and Universities.

CONCLUSION

Based on the findings of this study, it could be concluded that when formative tests are used for diagnostic purposes, students' attitude towards mathematics are better than when formative tests given as a series of summative tests. Formative tests could be used as a basis for finding out the sources of students' difficulties in order to provide necessary remediation and correctives; this would in turn affect students' attitude towards mathematics. It was recommended that school administrators should emphasize to their teachers on regular basis that the teaching of mathematics in junior secondary schools, should be carried out by providing regular diagnostic tests and adequate feedback and remediation for the learners in order to enhance students' attitude towards mathematics.

Student's confidence is another ingredient for education of mathematics because having a positive attitude towards mathematics means generally enjoying working with mathematics and having confidence in one's own ability to do it but it does not mean that a student will display this positive attitude towards the whole area of mathematics all the time. It is the attitude of the student which contributes a lot towards his perception about mathematics. Hence, mathematics

teachers should endeavor to know that teaching-learning process in mathematics depends upon the positive attitude towards mathematics and serious efforts should be made to develop and gauge students' positive attitude towards mathematics.

Finally, curriculum designers should take into cognizance while designing the learning tasks for learners that learning in mathematics is not solely a cognitive affair because disappointment, disaffection, distaste, aversion as well as challenge, enjoyment, pleasure, and fulfillment play a significant role in the immediate and long term appreciation and learning of mathematics. To ignore this is to exclude consideration of a seinal part of the learning that takes place in science in both formal and informal settings (Ajogbeje 2012a). Hence, mathematics curriculum should be designed to include the use of methods /strategies and material/media which would make the learning of mathematics very active, investigative and adventurous.

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