

Effects of Emotional Intelligence Skills Acquisition on Students' Achievement in Senior Secondary School Geometry in Keffi Education Zone, Nasarawa State, Nigeria

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ABSTRACT--- *The purpose of this research was to determine the extent to which the acquisition of Emotional Intelligence Skills could influence students' achievement in Geometry. To guide the study four research questions and four hypotheses were generated. The design for the study was the Quasi- experimental design (non-equivalent pre-test, post- test, control group design. The Instruments used for the study were the Geometry Achievement Test (GAT) and the Emotional Intelligence Inventory (EII). The Geometry Achievement Test has reliability coefficient of 0.85 while the Emotional Intelligence Inventory has a reliability of 0.69. The population of the study was the Senior Secondary Two (SS2) students in public schools in Keffi Education Zone of Nasarawa State, Nigeria. There were 7,185 SS2 students in the Education Zone. Multi-Stage cluster sampling technique was used to select a sample of 132 students for the study. The responses of the students to the two instruments were scored and analysed using mean, standard deviation and the Analysis of Covariance (ANCOVA). The results of the data analysis indicated that: there was a significant difference in the mean emotional intelligence scores of students in the experimental group and control group in favour of the students in the experimental group who were exposed to emotional intelligence skills; there was a significant difference in the mean achievement scores in Geometry between students in the experimental group and those in the control group in favour of the students in the experimental group exposed to emotional intelligence skills; But the results showed that there was no significant difference in the mean achievement scores in Geometry between male and female students exposed to emotional intelligence skills; and there was no significant interaction effect of emotional intelligence and gender on the mean achievement scores of students in Geometry. The study concluded that: emotional intelligence of students in schools can be improved upon through exposing them to the emotional intelligence skills; acquisition of emotional intelligence skills by students could lead to the improvement of their achievement scores in Geometry; It was recommended among others that students should be exposed to the acquisition of emotional intelligence skills in schools in order to improve their achievement scores in Geometry.*

Keywords--- Emotional Intelligence Skills, Achievement, Geometry

1. INTRODUCTION

In the formal education system in Nigeria, mathematics is a compulsory subject and one of the core subjects in primary and secondary levels of education (Federal Republic of Nigeria (FRN), 2008). This is because of the importance of mathematics in national development of any country. Stressing the importance of mathematics, Ukeje (2002) argued that without mathematics there are no sciences; without sciences there is no technology; and without technology, there are no modern developments. In other words, mathematics is the precursor and the queen of science and technology and the indispensable single element in modern societal development. This is as a result of the applications of mathematics in science and technological designs, constructions, measurements and counting, information communication technology and economic planning.

Despite the importance of mathematics to the development of Nigeria, a review of the performance in internal and external examinations in Nigeria has revealed a poor and disturbing picture. Students have not been performing well in

Mathematics in most examinations. For instance, the percentage of students with Credit and above pass in West African Senior School Certificate Examination (WASSCE) Mathematics in Nigeria ranged from 34.41% in 2002 to 48.8% in 2012 (West African Examination Council (WAEC), 2012a, 2012b). In 2013 and 2014, the percentage of candidates with five credits or more including mathematics and English language in Nigeria were 36.57% and 31.28% respectively (WAEC, 2013, 2014). Also, the National Examination Council (NECO) results showed that the percentage of students with at least credit passes in Nigeria in 2011, 2012, 2013 and 2014 were 25%, 50.4%, 65.50% and 69.49% respectively (NECO, 2012, 2013, 2014) This showed a steady increase in the performance of the students. It has been asserted that academic failure is not only frustrating to the students and the parents, its effects are equally grave on the society in terms of dearth of manpower in all spheres of the economy and polity (Aremu, 2000; Morakinyo, 2003).

Some researchers have indicated that one of the aspects of mathematics that students find difficult in examinations is the Circle Geometry in the Senior Secondary two (SS2) curriculum. For instance, Awotunde and Bot (2003) stated that Geometry, though, an important part of school mathematics that has everyday application in the life of the child especially in construction, technology and spatial relationships is least understood by students thereby contributing to their low achievement in the subject. Also, the WAEC chief Examiners' Reports in Nigeria indicated that segments of circles and other circle properties are part of the areas where candidates have weaknesses. Besides, many students haphazardly attempted geometry questions or avoided them completely especially those of the essay items and problem solving type (WAEC, 2002; WAEC, 2007). Also, recent research result indicate that teachers in Nigeria perceive Plane and Circle Geometry topics as being difficult (Azuka, Durojaiye, Jakeyinfra, & Okwuoza, 2013).

Generally, the learning process may be affected by many factors including socio-economic background of the learner, student's personality, teacher personality, peer influence, process variables, lack of confidence by students, school resources, and the out-put of the school previously attended by students (Edun & Akanji, 2008; Gardner, 2010). Other factors are the effect of student's interest and attitude, gender and school authority and teachers' attitude to work (Azuka, 2002; Singh, Granville & Dikka, 2002; Obodo, 2005). In addition to these factors affecting academic achievement, the search light is now being focused on the emotional stability of the learner and how much emotional state of the mind can be managed. For instance, for students to achieve high academic standards, it requires hard work, dedication, sacrifice, self-discipline, motivation, positive attitude and cordial relationship between students and teachers in the school system (Goleman, 1995; Venessa, 2013). Many Researchers have attributed the problem of poor academic achievement of students to low level of Emotional Intelligence (EI) among Students and have posited that it should be included in the school curriculum (Ledoux, 2002; Oyinloye, 2005; Nelson & Low, 2005; Nasir & Masur, 2010; Fayombo, 2012). In other words, the emotional and cognitive development of a learner are necessary to build high-achieving, productive and positive attitude students. Thus, apart from the Intelligence Quotient (IQ) of students, the emotional intelligence of the students has to be considered in the equation of factors that determine the academic achievement of students.

Emotional intelligence is defined as the ability to monitor one's feelings and that of others, to discriminate among them and to use this information to guide one's actions and thinking (Salovey & Mayer, 1990). Segal (2008) pointed out that emotional intelligence consists of the following four fundamental capabilities: (a) Self-awareness- the ability to be conscious of one's emotions and recognize the impact while using gut feelings to guide decisions; (b) Self-management- the ability to control one's emotions and behaviour and adapt to changing circumstances. This involves self-control, trustworthiness, conscientiousness, adaptability, achievement drive and initiative; (c) Social-awareness- the ability to sense, understand and react to the emotions of others and feel comfortable socially; and (d) Relationship Management- the ability to inspire, influence and connect to others while managing relationship.

Emotional intelligence was made popular by Goleman (1995) who refers to it as the ability to sense, understand, value and effectively apply the power and acumen of emotions as a source of human energy, information, trust, creativity and influence. According to Goleman, Intelligence Quotient (IQ) is no more the only measure of success; emotional intelligence, social intelligence, and luck also play a big role in a person's success. According to Caruso, Mayer and Salovey (2002) emotional intelligence skills and knowledge can be developed and learned and it matters most in times of change in the social and psychological environment of any human being. Some researchers and educators have addressed the roles of schools in developing emotional intelligence of students. Goleman (1995) emphasized that schools are the one place that communities can turn to for children's deficiencies in emotional and social competences.

Education is a process that involves more than just learning fact and academic skills; it also involves fostering and building relationships with teachers and peers. It requires having impulse to make good decisions regarding behavior. It requires stress management techniques to effectively cope with the academic and emotional demands placed on the student. All these skills are components of emotional intelligence (Vanessa, 2013). It has been asserted that, the way to the

mathematical brain of a learner is through the heart. The key to opening this heart are the emotional intelligence skills. Boys and girls have different keys (Erasmus, 2013).

Many empirical studies have been carried out on the relationship between emotional intelligence and academic achievement of learners. Vanessa (2013) studied the relationship between emotional intelligence and middle school students with learning disabilities (SLD). The purpose of the study was to examine the relationship of emotional intelligence on Learning Disabled (LD) students in regards to the academic success and frequency of problem behaviours. For the purpose of the study students with LD were defined as having a fifteen point discrepancy between the achievement and full scale Intelligence Quotient (IQ) score in any of the eight areas: mathematical problem solving, or mathematical calculating, written expression, listening comprehension. Also, of interest was if gender, absenteeism, day tardy, or disciplinary demerits had any relationship with Emotional Intelligence (EI) scores. Emotional intelligence (EI) was measured using the Bar-on Emotional Quotient inventory: Youth Version (Bar-on EQ-i: YV). The results of the Bar-on EQ-i: YV was then compared to various measures of academic success. Results showed that students who scored Average to Above Average on a measure of emotional intelligence scored significantly higher in academic achievement. The student's level of Emotional Intelligence (EI) demonstrated several relationships with academic success. Students who met with academic success reported better stress management techniques, and students who were never tardy to school reported better interpersonal skills, and increased mood. Students who earned zero or more disciplinary demerits reported better mood than the peers who had more disciplinary demerits. Females did not demonstrate a higher level of EI and there proved to be no relationship with types of Students Learning Disabilities (SLD) and EI.

Many other researchers have indicated that emotional intelligence is positively related to academic achievement of students (Lam & Kirby, 2002; Farooq, 2003; Petrides, Frederickson & Furham, 2004; Bastain, Burns & Nettelbeck, 2005; Reyes, Bracket, Rivers, White & Salovey, 2012; Fayombo, 2012; Oyesoji, Adeyinka & Adedeji, 2013). Azuka (2010) found out that emotional intelligence is positively related to students' achievement in mathematics. Erasmus (2013) studied the relationship between emotional intelligence, Study Orientation in Mathematics (SOM) and mathematics achievement of middle adolescent boys and girls. The researchers found out that the combination of EI facets and SOM dimensions were potential predictors of mathematics achievement but it differed for boys and girls. Ajani and Popoola (2013) studied the effect of emotional intelligence, mathematics teaching anxiety and self-concept on pre service teachers' achievement in mathematics. Emotional intelligence has been found to be positively related to mathematics achievement of Senior Secondary School Students. For data collected Multiple Regression Analyses of Variance was used to test for joint and relative significant effects and a correlation matrix showing relationship among the variables. The correlation coefficient was tested at 0.05 level of significance. The result revealed that all the variables made a joint contribution of 10.9% variation in the prediction of pre teachers' achievement in mathematics. Self-concept made the highest ($\beta = 0.217$; $t = 3.791$; $P < 0.05$) followed by Mathematics Teaching Anxiety with ($\beta = 0.186$; $t = 3.410$; $P < 0.05$) and Emotional Intelligence ($\beta = 0.127$; $t = 2.231$; $P < 0.05$). All the independent variables were potential predictors of pre service teachers' achievement in mathematics.

Vicki, Pamela, Sian, Yvon and Lynne (2012) investigated the role of gender and emotional intelligence in mathematics literacy. The result of the study indicated that there were some significant correlations between attitudes towards mathematics and EI for the males. For the females, the test scores were positively and significantly correlated with EI proficiency. But the females had more positive and significant correlation than the males suggesting that females possessing higher levels of EI demonstrated greater mathematical proficiency. Besides, some Researchers have found out that Emotional Intelligence instruction has positive effects on the academic achievement of students (Jaegar, 2003; Marc & Nicole, 2006; Yomi, 2007; Adeoye, 2010; Nwadinigwe & Azuka-Obieke, 2012; Azimifer, 2013).

2. STATEMENT OF THE PROBLEM

In Nigeria, the school curricula have mainly been directed at the cognitive development of students. This is because Intelligence Quotient (IQ) was seen as the major measure to determine the academic achievement of students. It is now being suggested by some researchers and theorists that Emotional Intelligence (EI) is the missing link that could enable students attain higher academic achievement in all school subjects including mathematics. However, very few experimental studies have related the acquisition of emotional intelligence skills to students' achievement in mathematics. Therefore, the problem of this study is to determine the effects of the acquisition of EI skills on the achievement in Geometry among senior secondary school students?

3. PURPOSE OF THE STUDY

The purpose of this study was to determine to what extent acquisition of Emotional intelligence skills could influence students' academic achievement in Geometry. Specifically, the objectives of the study are to:

- (i) investigate the effect of the acquisition of emotional intelligence skills on students' Emotional Intelligence scores
- (ii) determine the effect of the acquisition of emotional intelligence skills on students' achievement scores in Geometry.
- (iii) examine the effect of the acquisition of emotional intelligence skills on male and female students' achievement scores in Geometry.
- (iv) determine the interaction effect of the acquisition of EI skills and gender on students' achievement scores in Geometry.

4. RESEARCH QUESTIONS

To guide the study, the following research questions were formulated:

- RQ₁ What is the difference in the mean Emotional Intelligence scores of students who are exposed to emotional intelligence skills and those who are not?
- RQ₂ What is the difference in the mean achievement scores in Geometry of students who are exposed to emotional intelligence skills and those who are not?
- RQ₃ What is the difference in the mean achievement scores in Geometry of males and females who are exposed to emotional intelligence skills?
- RQ₄ What is the interaction effect of emotional intelligence skills and gender on the mean achievement score of students in Geometry?

5. STATEMENT OF THE HYPOTHESES

The following null hypotheses were formulated and tested at $P < 0.05$:

- Ho₁: There is no significant difference in the mean Emotional Intelligence scores of students exposed to EI skills and those who are not exposed.
- H₁₁: There is a significant difference in the mean Emotional Intelligence scores of students exposed to EI skills and those who are not exposed.
- Ho₂: There is no significant difference in the mean achievement scores in Geometry of students exposed to EI skills and those who are not exposed.
- H₁₂: There is a significant difference in the mean achievement scores in Geometry of students exposed to EI skills and those who are not exposed.
- Ho₃: There is no significant difference in the mean achievement scores in Geometry of male and female students exposed to EI skills.
- H₁₃: There is a significant difference in the mean achievement scores in Geometry of male and female students exposed to EI skills.
- Ho₄: There is no significant interaction effect of EI skills and gender on the mean achievement scores of students in Geometry.
- H₁₄: There is a significant interaction effect of EI skills and gender on the mean achievement scores of students in Geometry.

6. METHODOLOGY

6.1 Research Design

The Quasi-experimental design (non- equivalent pre-test, post-test, control group design) was used for the study. This design is relevant to this study as the researcher cannot control or manipulate all the relevant variables especially the class system of the students in the school situation. For instance, the researcher could not disorganize the students who are already put in classes by the school.

6.2 Population and Sampling Techniques

The target population for the study comprised all the Senior Secondary two (SS2) students in public Secondary Schools in Keffi Education Zone of Nasarawa State of Nigeria. One hundred and thirty two (132) SS2 students from two intact classes were sampled from two public Secondary Schools in Keffi Education Zone using the multi-stage cluster sampling technique.

6.3 Instrumentation

Two instruments were used for the study. They include: Geometry Achievement Test (GAT) and Emotional Intelligence Inventory (EII). The academic achievement of SS2 students in Geometry was measured using a Geometry Achievement Test developed by the Researcher for the study. The Geometry Achievement Test (GAT) had items in the Plane and Circle Geometry topics in the National Mathematics Curriculum for Senior Secondary Two students in Nigeria published by the Nigerian Educational Research and Development Council (NERDC) and in the Scheme of Work for SS2 in Nasarawa State. There were 30 questions. The GAT for the study was subjected to face and content validation. The face validation was done by experts in mathematics education using a rating scale to obtain a rational or consensus validity of 87.3%. To further validate the items in the GAT, a table of specification was made to ensure the content validity of the items. The reliability of GAT was 0.85 obtained using split-half method and Spearman-Brown's formula.

The instrument for the measurement of the Emotional intelligence of students was adapted from the Emotional Intelligence Inventory (EII) developed by Farn-Shing, Ying-Ming, Ching-Yuan and Chia- An(2007) and consisted of 35 items covering all the major domains of emotional intelligence skills. Mathematics Educators were used to clarify and revise the wordings of each item to ensure its cultural fairness in Nigeria. The EII for the study were subjected to face and construct validation using the contrasted form of convergent validity. The reliability of EII was 0.69. The validation was to ensure that the instruments measured what they were designed to measure and be able to discriminate the students according to their abilities in the variables being measured.

6.5 Research Procedure

The treatment tools for the experiment were the Emotional Intelligence Treatment Package (EITPA) and the Geometric Activity Based Teaching Package (GABTPA). The Emotional Intelligence Training Package was adapted from Adeoye (2010). The EITPA covered all the major aspects of emotional intelligence skills. These include: Self-awareness; Self-Management; Social-awareness; Relationship Management; and Motivation. There were two groups of students for the experiment made up of the experimental group and the control group. The experimental group (E) received the treatment of the acquisition of emotional intelligence skills (X) as an advanced organizer for six weeks and was taught mathematics topics by the regular class mathematics teacher who was a Research Assistant using the Geometric Activity Based Teaching Package (GABTPA) for two weeks. The control group (C) received no treatment of acquisition of emotional intelligence skills but was taught by the class mathematics teacher who was a Research Assistant using the Geometric Activity Based Teaching Package (GABTPA). The lesson plans for the teaching of the Geometry topics were prepared by the Researcher for uniformity in the presentations of the lessons in the Experimental and Control groups classes. All the two groups were administered Pre-test and Post-test of the Geometry Achievement Test (GAT). The treatment and administration of instruments lasted for eight weeks.

6.6 Data Analysis

The research questions were answered using descriptive statistics of mean and standard deviation. With the pre-test and post test scores, Analysis of Covariance (ANCOVA) was employed to analyze the data and test each of the hypotheses. The hypotheses were tested at $\alpha = 0.05$ level of significance or 0.95 level of confidence. SPSS package version 21 was employed in the data analysis

7. RESULTS

7.1 Research Question 1 (RQ₁):

What is the difference in the mean Emotional Intelligence scores of students who are exposed to Emotional intelligence skills and those who are not?

Table 1: Pre- Test Mean, Post- Test Mean and Standard Deviations of Emotional Intelligence Inventory Scores of Experimental and Control Groups.

Variable	Pre- EII test			Post EII test		Maximum Score	Mean Difference
Group	N	Mean	SD	Mean	SD		
Control	69	115.28	15.92	120.74	15.24	175	5.46
Experimental	63	112.34	15.68	132.11	19.79	175	19.77

Table1 shows that the post-test mean emotional intelligence scores for both groups indicated that both groups improved on their mean emotional intelligence scores after the treatment. However, the difference between the pre-test and the post-test mean emotional intelligence scores of students in the control and experimental group were 5.46 and 19.77 respectively. This implies that the students that were exposed to emotional intelligence skills had more improvement on the emotional intelligence than their counterparts who were not exposed to the emotional intelligence skills

7.2 Null Hypothesis H0₁ :

There is no significant difference in the mean Emotional Intelligence scores of students exposed to EI skills and those who are not exposed.

Table 2: Results of One Way Analysis of Covariance of Scores for the Experimental and Control Groups in Emotional Intelligence Inventory

Source	Type Sum Squares	III of	Df	Mean Square	F	Sig.
Corrected Model	14001.24 ^a		2	7000.62	29.73	0.00
Intercept	7028.93		1	7028.93	29.84	0.00
Pre	9742.44		1	9742.44	41.36	0.00
Group	5604.81		1	5604.81	23.79	0.00
Error	30383.09		129	235.53		
Total	2145564.00		132			
Corrected Total	44384.33		131			

a. R squared =0. 32 (Adjusted R Squared = 0 .31
 b. Computed using alpha = 0.05

From Table 2, the significant of F-value (p-value) is 0.000. Since the p- value of .00 is less than 0.05, therefore the null hypothesis is rejected. This implies that there is a significant difference in the mean emotional intelligence scores between students exposed to emotional intelligence skills and those not exposed to emotional intelligence skills. Thus, the students exposed to emotional intelligence skills significantly improved their emotional intelligence more than students who were not exposed to emotional intelligence skills. The adjusted R squared is 0.31. This suggests that 31% of the variance in the mean emotional intelligence scores of the students can be explained by the emotional intelligence treatment.

7.3 Research Question 2 (RQ₂):

What is the difference in the mean achievement scores in Geometry of students who are exposed to emotional intelligence skills and those who are not?

Table 3: Pre-Test Mean, Post- Test Mean and Standard Deviations of Geometry Achievement Test Scores in Geometry of the Experimental and Control Groups

Variable	Pre GAT			Post GAT		Maximum Score	Mean Difference
Group	N	Mean	SD	Mean	SD		
Control	69	7.69	0.33	11.78	3.66	30	4.09
Experimental	63	7.03	0.34	14.83	2.96	30	7.80

Table 3 shows that the post-test mean Geometry Achievement Test scores for both groups indicated that both groups improved on their mean GAT scores after the treatment. However, the difference between the pre-test and the post-test mean GAT scores of students in the control and experimental group were 4.09 and 7.80 respectively. This implies that the students that were exposed to emotional intelligence skills had more improvement on their Geometry achievement scores in plane and circle geometry than their counterparts who were not exposed.

7.4 Null Hypothesis H₀ :

There is no significant difference in the mean achievement scores in Geometry of students exposed to emotional intelligence skills and those who are not exposed.

Table 4: Results of One Way Analysis of Covariance of Mean Geometry Achievement Test Scores for the Experimental and Control Groups.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	669.68 ^a	2	334.84	39.56	0.00
Intercept	1210.38	1	1210.38	142.98	0.00
Pre	364.78	1	364.78	43.09	0.00
Group	386.32	1	386.32	45.64	0.00
Error	1092.04	129	8.47		
Total	24883.00	132			
Corrected Total	1761.72	131			

a. R squared = 0.38 (Adjusted R Squared = 0.37)

b. Computed using alpha =.05

From Table 4, the significant of F-value (p-value) is 0.00. Since the p-value of 0.00 is less than 0.05, then the null hypothesis is rejected. This implies that there is a significant difference in the mean GAT scores between students exposed to emotional intelligence skills and those not exposed to emotional intelligence skills. Thus, the students exposed to emotional intelligence skills significantly improved their Geometry achievement test scores in Plane and Circle Geometry more than students who were not exposed to emotional intelligence skills. The adjusted R Squared is = 0.37. This suggests that 37% of the variance in the mean Achievement Test scores of the students can be explained by the emotional intelligence treatment.

7.5 Research Question 3 (RQ₃):

Is there any difference in the mean achievement scores in Geometry of male and female students who are exposed to emotional intelligence skills?

Table 5: Pre- Test Mean, Post- Test Mean and Standard Deviations of Geometry Achievement Test Scores in Geometry according to Gender in the Experimental Group

Variable	Pre GAT			Post GAT		Maximum Score	Mean Difference
Gender	N	Mean	SD	Mean	SD		
Male	32	7.13	2.84	14.63	3.32	30	7.5
Female	31	6.94	2.65	15.03	2.59	30	8.09

Table 5 shows that the SS2 male students had Pre-GAT mean score of 7.13 and Post-GAT mean score of 14.63 showing an increase in mean score of 7.5. The SS2 female students had Pre-GAT mean score of 6.94 and Post-GAT mean score of 15.03 showing an increase in mean score of 8.09. This indicates that both male and female students exposed to emotional intelligence skills had improvements in their mean academic achievement scores in Geometry but the females had slightly more gained scores than the males.

7.6 Null Hypothesis H₀₃ :

There is no significant difference in the mean achievement scores in Geometry of male and female students exposed to Emotional intelligence skills.

Table 6: Results of One Way Analysis of Covariance of Geometry Achievement Test Scores according to Gender in the Experimental Groups in Geometry.

Source	Type III Squares	Sum of Df	Mean Square	F	Sig.
Corrected Model	211.22 ^a	2	105.61	18.98	0.00
Intercept	824.74	1	824.74	148.22	0.00
PRE	208.61	1	208.61	37.49	0.00
GROUP	4.50	1	4.50	.81	0.37
Error	333.86	60	5.56		
Total	14392.00	63			
Corrected Total	545.08	62			

- a. R Squared = 0.39 (Adjusted R Squared = 0.37)
- b. Computed using alpha 0.05

From Table 6, the significant of F-value (p-value) is 0.37. Since the p-value of 0.37 is greater than 0.05, then the null hypothesis is upheld. This implies that there is no significant difference in the mean GAT scores between SS2 male students and SS2 female students exposed to emotional intelligence skills. Thus, between the SS2 male and SS2 female students exposed to emotional intelligence skills there is no significant difference in their levels of improvement in the Geometry Achievement Test scores in Plane and Circle Geometry. The adjusted R squared is 0.37. This suggests that 37% of the variance in the mean Geometry Achievement Test scores of SS2 male and female students can be explained by the emotional intelligence treatment.

7.7 Research Question 4 (RQ₄):

What is the interaction effect of emotional intelligence skills and gender on the mean achievement score of students in Geometry?

Table 7: Descriptive Statistics of the Post GAT Scores by Gender in the Control and Experimental Groups

Gender	Group	Mean	Std. Deviation	N
Male	Control	11.72	3.82477	39
	Experimental	14.63	3.31906	32
	Total	13.03	3.86550	71
Female	Control	11.87	3.50107	30
	Experimental	15.03	2.58823	31
	Total	13.48	3.43805	61
Total	Control	11.78	3.66168	69
	Experimental	14.83	2.96506	63
	Total	13.23	3.66718	132

From Table 7, the SS2 male students in the experimental group had a higher mean Post-GAT score of 14.63 than the SS2 male students in the control group score of 11.72. Also, the SS2 female students in the experimental group had a higher Post GAT score of 15.03 than the SS2 female students in the control group score of 11.87. Thus, both the SS2 males and females students in the experimental group had improvements in their mean GAT scores above their counterparts in the control group.

7.8 Null Hypothesis Ho₄:

There is no significant interaction effect of EI skills and gender on the mean achievement score of students in Geometry.

Table 8: Results of Two- Way Analysis of Covariance of the Interaction Effects of Emotional Intelligence and Gender on the GAT Scores of students in the Control and Experimental Groups

Source	Type III Squares	Sum of Df	Mean Square	F	Sig.
Corrected Model	674.20 ^a	4	168.55	19.68	0.00
Intercept	1206.57	1	1206.57	140.90	0.00
Pre	366.31	1	366.31	42.78	0.00
Sex	3.27	1	3.29	.38	0.54
Group	382.63	1	382.63	44.68	0.00
Sex * Group	1.41	1	1.41	.17	0.69
Error	1087.52	127	8.56		
Total	24883.00	132			
Corrected Total	1761.72	131			

- a. R Squared = 0 .38 (Adjusted R Squared = 0.36)
- b. Computed using alpha = .05

From the table, value of the significant of F-value (p-value) is 0.69. Since the p-value of 0.69 is greater than 0.05, then the null hypothesis is upheld. This implies that there is no significant interaction effect of emotional intelligence skills and gender on the mean Geometry Achievement Test score of SS2 students in Plane and Circle Geometry. This interaction effect suggests that males and females do not respond differently to the treatments. Hence, gender does not affect the effect of the treatment on the students. The adjusted R Squared is 0.36. This implies that 36% the variance in the Geometry Scores is attributed to the treatment of the independent variable. Hence, emotional intelligence treatment contributes more than gender on the achievement of the students.

8. DISCUSSION OF RESULTS

The results of the descriptive analysis implied that the students that were exposed to emotional intelligence skills had more improvement on the emotional intelligence scores than their counterparts who were not exposed to the emotional intelligence skills. The ANCOVA results showed that there was a significant difference in the mean emotional intelligence scores of SS2 students exposed to emotional intelligence skills and those not exposed to emotional intelligence skills in favour of students in the experimental group exposed to emotional intelligence skills. Thus, the SS2 students exposed to emotional intelligence skills significantly improved their emotional intelligence scores more than students who were not exposed to emotional intelligence skills. These results are in line with the positions of Goleman (1995) that emotional intelligence competencies are not innate talents, but rather learned capabilities that must be worked on and developed to achieve outstanding performance. It lends support to other researchers who posit that emotional intelligence develops over time and it can be improved upon through training programming and therapy (Mayer & Salovey, 1997; Bar-On, 2006). The acquisition of emotional intelligence skills gives the students the opportunity to understand themselves and others around them. This result also supports the research findings by Malek et al (2011) who reported that there was a significant difference between University students exposed to emotional intelligence skills and those not exposed to emotional intelligence skills on the level of emotional intelligence. This result also supports the research findings by Bellamy, Gore and Sturgis (2012) who reported that emotional intelligence of gifted students exposed to emotional intelligence skills had higher mean scores on emotional intelligence during the post test in comparison to pre-test scores. One research assistant in this study reported that the students were very excited at the therapy and this positively affected their behaviours in the class and even their cooperation with their classmates and teachers.

This result supports many other researchers who indicated that emotional intelligence skills and knowledge can be developed and learned and recommended that it should be part of the curriculum (Farn et al., 2000; Caruso, Mayer & Salovey, 2002; Nelson & Low, 2005; Marc & Nicole, 2006; Rahil et al, 2007, Habibah et al., 2007; Dick, 2012). The result of this present study supports that of Jaeger (2003) on the effects of emotional intelligence instruction on students. He reported that there was a statistically significant increase in emotional quotient inventory scores among students who completed the emotional intelligence curriculum compared with the scores of students in the group that was not given the emotional intelligence curriculum, although scores in both groups improved. Mean Emotional Intelligence Quotient Inventory (EQi) scores in the emotional intelligence curriculum group improved from 101.16 to 111.06 ($p < 0.01$) and the non-emotional intelligence curriculum group from 101.92 to 103.7 ($p < 0.01$). These findings led Jaeger to conclude that emotional intelligence could be taught or learned and is not a fixed parameter.

The result of this study showed that students exposed to emotional intelligence skills had more improvements in their Geometry achievement score than those that were not exposed to emotional intelligence skills. This supports many researchers who had reported that emotional intelligence instruction improves students' academic achievement score in mathematics (Aasen & Thurik, 2000; Yomi, 2009; Grant, 2009; Joseph, Rogers & Kriston, 2011; Nwadinigwe & Azuka-Obieke, 2012; Azimifer, 2013). The findings of this study also lend credence to the many research findings that emotional intelligence instruction leads to improvements in any academic school subjects (Mayer & Salovey, 1997; Jaeger, 2003; Marc & Nicole, 2006; Yomi, 2007; Grant, 2009; Adeoye, 2010; Nwadinigwe & Azuka-Obieke, 2012). Also, the results of this study support the research reports that emotional intelligence skills are positively related to students' academic achievement in mathematics (Vicki, Pamela, Sian, Yvon & Lynne, 2012; Erasmus, 2013; Ajani & Popoola, 2013; Vanessa, 2013; Oyesoji, Adeyinka & Adedeji, 2013). Also, the result of this study supports the earlier Research Reports that emotional intelligence scores is positively related to academic achievement of students (Faroq, 2003; Frank, Jeft, Cain & Kelly, 2006; Hassan, 2010; Azuka, 2010; Muhammed, Aijaz & Saira, 2011; Fayombo, 2012). However, the results of this study contradicted some researchers who had shown that the relationship between emotional intelligence and academic performance is weak and inconsistent (Newsday & Catano, 2000; O'connor & Little, 2003; Audrey & Eagar, 2007; Natalie, Jackson & Segrest, 2011; Azimifer, 2013). The cause of the contradiction could be due to the methodology employed in their research studies. More studies in this area should be carried out using pure experimental studies.

Some of the possible explanations of these findings are explained below. Education is a process that involves more than just learning of facts and academic skills; it involves fostering and building relationship with teachers and students. It

requires having impulse to make good decisions regarding behaviour. It requires stress management techniques to effectively cope with the academic and emotional demands placed on the students. All these skills are components of emotional intelligence (Vanessa, 2013). To achieve academic success, students require sacrifice, self-discipline, motivation and cordial relationship between students and teachers. They need good mental health to succeed in their academics (Salami, 2010). Also, students who have high emotional intelligence are happy and motivated to participate in relevant academic activities and develop positive attitudes that lead to success in schools (Duckworth & Seligman, 2005). Apparently, anything that affects the child's emotional state is likely to affect his or her school performance. Anxious, unhappy and angry youngsters do not make ideal students and people who are caught in these states do not take in information efficiently or deal with it well (Goleman, 1995). Attention and memorization are crucial in learning and influenced by emotional adjustment and therefore regulation of emotional intelligence plays important role in students' academic performance above and beyond their cognitive ability (Abdullahi, Ellias, Mahyuddin & Uli, 2004)

Findings from this research also support the work of Jaeger (2003) who suggested that students who are generally attuned to their emotions as well as the emotions of others can adapt to emotionally driven situations and are more likely to attain higher levels of academic achievement. Findings from this research suggest that students with higher emotional intelligence scores better-manage the demands and pressures of academic life. When students learn specific skills such as self-control, the skills help them to prioritize the time needed for study as opposed to other activities.

Another reason for the outcome of this study among students sampled may be due to the fact that emotional intelligence is very important in life accomplishments which according to Salovey and Mayer (1990) is a form of social intelligence that involves the ability to monitor one's own and others' feelings and that the key skills and qualities needed to be successful came from within rather than from cognitive intelligence (Snarey & Vaillant, 1985). The students who attend to their emotions and are aware of them are likely to think about the causes of their emotions in order to solve them intelligently which may facilitate productive academic activities.

The present findings also lend credence to Nasir and Masrur's (2010) assertion that effective learning takes place when students have an understanding of how to learn and this understanding requires emotional skills as well as their finding that emotional intelligence significantly predicts academic achievement among the students in International Islamic University Islamabad. Generally, emotional intelligence helps one to build up good mood and positive mood can enhance student's motivation to approach learning tasks; whereas negative mood can trigger mood-congruent avoidance motivation (Pekrun, 2009)

The result of this present study also showed that both the SS2 male and female students had improvements in their Geometry Achievement Test scores and the ANCOVA results showed that there was no significant difference in the Geometry Achievement Test score between the SS2 male students and SS2 female students exposed to emotional intelligence skills. Also, there was no interaction effect of gender and EI on the academic achievement scores of SS2 students in Plane and Circle Geometry. This supports some researchers who found out that there is no significant difference in academic achievement of male students and female students in college mathematics; and the inter-relationship of gender and mathematics has been reported to have no significant influence on gender difference in academic achievement in mathematics (Wit-Rose, 2003; Grassi, 2004; Abubakar & Eze, 2009; Abubakar & Adegboyega, 2012)

9. CONCLUSION AND RECOMMENDATIONS

In conclusion, the findings from this study reveal that: Emotional intelligence of students in Secondary Schools could be improved upon by exposing them to the emotional intelligence skills; Acquisition of emotional intelligence skills by students leads to improvement in academic achievement of students in Geometry; Acquisition of emotional intelligence skills by students improves the academic achievement of both male and female students in Geometry; Gender is not a factor in designing the emotional intelligence treatment interventions for students

Based on the findings and conclusion from this study, the following recommendations are made: Students should be exposed to the acquisition of emotional intelligence skills in schools in order to improve their academic achievement in mathematics; the study of emotional intelligence should be included in the curriculum of secondary schools. It could be integrated into some school subjects; School personnel including administrators and teachers should be trained on emotional intelligence and how to improve the emotional intelligence of students; Schools authorities should design appropriate strategies such as emotional intelligence literacy activities to enhance the emotional intelligence of students in schools.

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