

Emotional Intelligence as a Predictor of Achievement in Algebra among Senior Secondary School Students in Idah Education Zone of Kogi State

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Abstract

The study was carried out to investigate Emotional Intelligence as a predictor of achievement in algebra among senior secondary school students in Idah Education Zone of Kogi State. Two (2) research questions guided the study and two (2) hypotheses were formulated and tested at 0.05 level of significance. The study adopted a correlational survey research design and was conducted in Idah Education Zone of Kogi State, Nigeria. The population of the study comprised 1,176 students in senior secondary school two (SSS 2) in Idah Education Zone of Kogi State. A sample size of 298 senior secondary school II students (SSS 2) was used for the study. Two instruments were used for data collection. The instruments are Algebra Achievement Test (AAT), Algebra Emotional Intelligence Questionnaire (AEIQ). The reliability index for AEIQ was arrived at to be 0.924, and a reliability index of 0.71 was obtained for AAT instrument. AAT consisting of 25 multiple-choice items was developed by the researcher using table of specification. The data for this study was analyzed using regression analysis (r). However, t -test was used to test hypotheses at 0.05 level of significance. The results revealed that the proportion of variation in students' achievement in algebra that was accountable to emotional intelligence is significant. Again, the corresponding tested hypothesis revealed that there is no significant moderating influence of gender on the proportion of variation in students' achievement in algebra that is accountable to emotional intelligence. It is recommended that teachers should create conducive learning opportunities for students to share their knowledge, strengths and weakness as this may in turn increase learners' participation in the class activities that may lead to higher achievement in mathematics.

Introduction

Mathematics deals with quantitative facts and relationships as well as with problems involving space and form. Mathematics as a language of science is a very important subject in our schools as its application cuts across all areas of human endeavor (Ugwuanyi, 2015). Mathematics is a science with the basic scientific skills and objectives. Zakariyya (2014) stated that without mathematics, there will be no science, without sciences there will be no technology and without technology there will be no modern society. From this statement, it is therefore an accepted truth that no society can reach heights of greatness unless there is an ample supply of dedicated men and women in all fields critical to its growth, and developing such experts like scientists and

technologists to satisfy the concept, there is a need for a good knowledge of mathematics in general and particularly in algebra, in order to work efficiently.

Algebra is a branch of mathematics that deals with symbols and the rules for manipulating those symbols. Algebra is an important field of learning playing considerable role in mathematical thinking, and is a mathematical language expressing itself with symbols, tables, words and graphs (Stacey & MacGregor, 2010). Considering algebra as a language helps us to see how important it is to learn algebra in order to understand the mathematics (Redish, & Kuo, 2015). Students need to apprehend the symbols and the manipulations done with symbols in order to interpret the letters used in different situations in



algebra, and the structural properties of the algebraic equations, and to solve the equations (Papadopoulos, 2019).

Algebra is the concept based on unknown values called variables. An important concept of algebra is equations; an equation is a mathematical statement that shows that two mathematical expressions are equal. It follows various rules to perform arithmetic operations. The rules are used to make sense of sets of data that involve two or more variables (Lucariello, Tine and Ganley, 2014). One way or the other, the concept of algebra will be used without realizing it. Algebra is divided into different sub-branches such as elementary algebra, advanced algebra, abstract algebra, linear algebra, and commutative algebra. This study will be focusing on algebraic fraction which is an aspect of commutative algebra. In algebra, an algebraic fraction is a fraction whose numerator and denominator are algebraic expressions. Two examples of algebraic fractions are $\frac{3x}{x^2+2x-3}$ and $\frac{\sqrt{x}+2}{x^2-3}$. Algebraic fractions are subject to the same laws as arithmetic fractions. A rational fraction is an algebraic fraction whose numerator and denominator are both polynomials. Thus $\frac{3x}{x^2+2x-3}$ is a rational fraction, but not $\frac{\sqrt{x}+2}{x^2-3}$ because the numerator contains a square root function.

Despite the place of algebra in mathematics, however, many research reports show that the achievement of students in mathematics especially algebra at all levels of our educational system is poor (Steinmayr, Meiner, Weideinger, & Wirthwein, 2014). Poor academic achievement describes poor academic outcomes that indicate the extent to which a student has poorly achieved their learning goals. Research reports show that achievement in Mathematics has continued to be low. Students' achievement in Mathematics has remained very low as many of the candidates earn less than 40% (WAEC chief examiners report, 2020). Analysis of achievement of students in general mathematics in the May/June West Africa Senior Secondary Certificate Examinations (WASSCE) in Nigeria between 2016 to 2020 indicated abysmal achievement in mathematics, with 27.31% of students obtaining credits and above while 72.69% had pass and below. Students' achievement keeps getting worse in Mathematics in national examinations, particularly from Algebra

according to WAEC report. The poor achievement of students in mathematics is a serious concern to the researcher.

Academic achievement is the amount of knowledge derived from learning. The child gains knowledge by instructions received at school and is organized around a set of core activities in which a teacher assigns tasks to pupils and evaluates and compares the quality of their work. The school provides a wide variety of achievement experiences than does the family. In educational institutions, academic achievement is the outcome of educational goals that are achieved either by students or the teacher that is how well a student meets standards set by local school authority or the institution (Hughes, 2021). Academic achievement refers to how students deal with their studies and how they cope with or accomplish different tasks given to them by their teacher (Sutarno, 2019). It is the ability to study and remember facts and being able to communicate your knowledge verbally or down on paper. Achievement is the capability to operate efficiently, react quickly or perfectly to a given task.

The researcher also views achievement in mathematics as the ability of the learner to operate efficiently, react quickly or perfectly to a given mathematics problem. Thus, to achieve is to accomplish, to acquire or to gain by effort or do something successfully with an effort or skill. It describes the level of success in relation to a task or job carried out. Academic achievement reflects the extent to which students have attained educational objectives as well as students' cognitive attainment in the many subjects at school level. In order to develop an identity in the society, children are becoming more concerned about their academic achievement in order not to attain poor achievement

Many researchers attributed poor achievement in mathematics to different factors. Saad's et al (2014) revealed some reasons behind students' low achievement in Mathematics which are the teacher's method of teaching, students, and the quality of teaching. Mathematics has been one of the major challenges and concerns of educators. It is often considered as a subject that students find it hard to understand so that they went far away from it (Prakash, 2014). Many factors may be responsible for students' poor academic achievement in mathematics. Some of these factors include; intelligence quotient (IQ), study habits, age, parents' educational attainment, environmental factor, examination

malpractice, interest of the student and personal factors (Andrea & Roldan, 2016).

Emotional Intelligence is the ability to process information related to one's emotions and the ability to use the information as a guide for understanding and acting. Emotional intelligence (otherwise known as emotional quotient or EQ) is the ability to understand, use, and manage your own emotions in positive ways to relieve stress, communicate effectively, empathize with others, overcome challenges and defuse conflict (Goleman, 2021). Emotional intelligence helps you build stronger relationships, succeed at school and work, and achieve your career and personal goals. It can also help you to connect with your feelings, turn intention into action, and make informed decisions about what matters most to you. According to Mayer and Salovey 1990 the components of emotional intelligence are; perceiving emotion, managing emotion, understanding emotion and facilitating thought using emotion. The researcher also sees emotional intelligence as the capacity to be aware of, and express one's emotion, and to handle interpersonal relationships judiciously and empathetically.

Methods

The study adopted a correlational survey research design. According to Ezech (2015), a correlation survey research design is a scientific investigation into the relationship between two or more variables. This design is considered appropriate for this study because the study investigated the predictive power of emotional intelligence on academic achievement of secondary school students in algebra. The population of this study was 1176 senior secondary school II (SS2) students, made up of 638 males and 538 females. The sample consist of 298 (169 males and 129 females) SSS 2 students drawn using Taro Yamane formula 1976. The sample size was drawn from eight (8) mixed public secondary schools in the two (2) selected Local Government Areas through multistage sampling procedure. Two

instruments were used for data collection. The instruments are Algebra Achievement Test (AAT), and Algebra Emotional Intelligence Questionnaire (AEIQ). AAT consisting of (25) multiple-choice items were developed by the researcher with the guideline of the table of specification. The instruments (AAT and AEIQ) were thoroughly scrutinized to ascertain the face validation. Content validation was established for AAT while construct validation was ascertained for AEIQ. To determine the face validity for AAT and AEIQ, the instruments were subjected to three (3) experts; one from Psychology unit (Education Foundation Department), one from Mathematics unit and one from Research, Measurement and Evaluation unit (Science Education Department), all from faculty of Education, University of Nigeria Nsukka (UNN). Copies of the AAT and AEIQ, together with the title of the study, purpose of the study, research questions, hypotheses, marking guide, table of specification and the instruments adapted (Goleman, 1995; Liu and Wang, 2005) were sent to the experts. The face validation of these instruments was done to ensure that; the items were clearly stated and unambiguous, no spelling errors, proper numberings were done, and no item was double-barreled, suitability of the items relative to the class of the students. To determine the content validity of AAT, the development was guided by a table of specification constructed by the researcher using the topic (Algebra) for the study. To determine the construct validity of AEIQ, the corrections and inputs made by these experts were used to modify AEIQ with the items still at twenty-five (25) for the instrument. The reliability index for AEIQ was arrived at to be 0.924.

The internal consistency reliability for the AAT instrument was established using Kuder-Richardson 20 (KR-20.). A reliability index of 0.71 was obtained for AAT. Analysis of the data was done using Statistical Package for Social Science (SPSS) version 20 to get regression analysis (r) outputs. Specifically, regression t-test was used to test the hypotheses at 0.05 level of significance.

Results

Research Question

1. What amount of variation in students' achievement in algebra is accountable to emotional intelligence?

Table 1: Regression analysis of the amount of variation in students' achievement in algebra that is accountable to emotional intelligence

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.229 ^a	.052	.049	17.69692

a. Predictors: (Constant), Emotional Intelligence

Table 1 show that the correlation coefficient between students' achievement in algebra and their emotional intelligence is .229 with an associated coefficient of determination of .052. Thus, the coefficient of determination of .052 indicates that the

amount of variation in students' achievement in algebra that is accountable to emotional intelligence is 5.2%. In other words, 94.8% variation in the achievement of students in algebra is attributed to other factors excluding their emotional intelligence.

2. What is the moderating influence of gender on the proportion of students' achievement in algebra that is accountable to emotional intelligence?

Table 2: t-test analysis of the moderating influence of gender on the proportion of students' achievement in algebra that is accountable to emotional intelligence.

Gender					T	Sig.
Model		R	R Square	Adjusted R Square		
1	Male	.161 ^a	.026	.020	-.650	.516
	Female	.336 ^a	.113	.106		

Table 2 shows that the correlation coefficient between male students' achievement in algebra and their emotional intelligence is .161 with an associated coefficient of determination of .026, while the correlation coefficient between female students' achievement in algebra and their emotional intelligence is .336 with an associated coefficient of determination of .113. The coefficients of

determination of .026 and .113 for the male and female students respectively, indicate that the amount of variation in male students' achievement in algebra that is accountable to their emotional intelligence is 2.6% while those of the female students is 11.3%. Hence, the predictive power of emotional intelligence on students' achievement in algebra is higher for female students than male students.

Hypotheses

1. The amount of variation in students' achievement in algebra that is accountable to emotional intelligence is not significant.

Table 3: t-test analysis of the amount of variation in students' achievement in algebra that is accountable to emotional intelligence

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	12.692	6.307		2.012	.045
	EmotionalIntelligence	.473	.115	.229	4.124	.000

a. Dependent Variable: Achievement

Table 3 revealed that the amount of variation in students' achievement in algebra that is accountable to emotional intelligence is significant, $t = 4.124$, $p =$

.000. Thus, the null hypothesis was rejected ($p < .05$). This implies that emotional intelligence significantly predicts students' achievement in algebra.

Ho₂: There is no significant moderating influence of gender on the proportion of variation in students' achievement in algebra that is accountable to emotional intelligence.

Table 4: t-test analysis of the moderating influence of gender on the proportion of students' achievement in algebra that is accountable to emotional intelligence

Gender					T	Sig.
Model		R	R Square	Adjusted R Square		
1	Male	.161 ^a	.026	.020	-.650	.516
	Female	.336 ^a	.113	.106		

Table 4 revealed that there is no significant moderating influence of gender on the proportion of variation in students' achievement in algebra that is accountable to emotional intelligence, $t = -.650$, $p = .516$. Thus, the null hypothesis was not rejected since the associated probability value of .516 is greater than the .05 level of significance.

Discussion of findings

The result of the findings showed that, there was a positive low relationship between emotional intelligence and students' academic achievement in algebra. With the low coefficient of determination indicated that the amount of variation in students' achievement in algebra that is accountable to emotional intelligence was low. In other words, high percentage of variation in the achievement of students in algebra was attributed to other factors excluding their emotional intelligence. These other factors could be retention, test anxiety among others, which might have attributed to the high percentages in variation in the achievement of students in algebra.

From the test of hypotheses one, it was revealed that the amount of variation in students' achievement in algebra that is accountable to emotional intelligence is significant. Thus, the null hypothesis was rejected. This implies that emotional intelligence significantly predicts students' achievement in algebra.

The result of the analysis of the data showed that there was a difference in the coefficients of determination of male and female students

respectively. The result indicated that the amount of variation in male students' achievement in algebra that is accountable to their emotional intelligence is lower than that of the female students. Hence, the predictive power of emotional intelligence on students' achievement in algebra is higher for female students than male students. This showed that emotional intelligence could be a hindrance to higher achievement in mathematics to any student irrespective of gender. Learners at all levels must be emotionally stable in order to study and improve in their academic achievement whether male or female.

The corresponding tested hypothesis revealed that there is no significant moderating influence of gender on the proportion of variation in students' achievement in algebra that is accountable to emotional intelligence. Thus, the null hypothesis was not rejected since the associated probability value is greater than the level of significance. This means that, emotional intelligence cannot be judged on the students' academic achievement based on gender.

This finding of this study disagrees with the findings of Wapano (2021) that gender significantly moderates the relationship between emotional intelligence and students' academic achievement in algebra. The finding of this study also disagrees with the findings of Saleem and Rahman (2021) that gender significantly moderates the prediction of emotional intelligence on students' academic achievement. This disagreement may be due to the nature of learners used to the study, teaching environment and teacher's factors such as teaching methods, experience, and

qualification among others. This finding however, agrees with the finding of Shirvani and Shirvani (2021) that gender has no significant influence on students' academic achievement that is predicted by emotional intelligence.

Conclusion

From the findings of study, the following conclusions were made that: Emotional intelligence significantly predicts the academic achievement of student in algebra. However, it was concluded from the findings of the study that the proportion of variation in students' achievement in algebra that is accountable to emotional intelligence has no significant influence on gender. Emotional intelligence has significant predicting power on students' academic achievement in algebra among senior secondary school students in Idah Education Zone.

Recommendations

In the light of the findings of this study, the following recommendations were made:

1. The amount of variation in students' achievement in algebra that is accountable for emotional intelligence was found to be a significant predictor of academic achievement. Therefore, teachers should create conducive learning opportunities for students to share their knowledge, strengths and weakness as this may in turn increase learners' participation in the class activities.
2. Federal and State Ministry as well as relevant education stakeholders should ensure that workshop; conferences and seminars on how to cope and manage students' emotional intelligence are organized for students, teachers and parents on regular basis so as to help the students cope academically.
3. Adequate learning materials, functional and conducive learning environment should be provided in order to enable students learn well. This will help them to be mentally ready for any form of examinations.

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