

**SELF-CONCEPT AND ATTITUDE AS DETERMINANTS OF ACADEMIC  
ACHIEVEMENT IN MATHEMATICS AMONG STUDENTS OF UPPER BASIC  
EDUCATION LEVEL IN IKOT EKPENE L.G.A OF AKWA IBOM STATE**

**Regina John Udo**

**Department of Science Education,**

**Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.**

**Email: reginaudo297@gmail.com**

**&**

**Unodiaku Stanislus Sochima, Ph.D**

**Department of Science Education,**

**University of Nigeria, Nsukka**

**Enugu State, Nigeria**

**Email: unodiakustanley@gmail.com**

***Abstract***

*The study examined self-concept and attitude as determinants of academic achievement in mathematics among students of upper basic education level. The study was guided by two research questions and one null hypothesis. The hypothesis was tested with ANOVA statistic at  $P \leq 0.05$  level of significance. The study employed ex post facto research design. The population of the study was 2554 students of upper basic education level. The sample for the study was 250 students randomly sampled from five secondary schools in Ikot Ekpene, Akwa Ibom, using simple random sampling technique. The study was guided by two research questions and two hypotheses. The hypotheses were tested at  $P \leq 0.05$  level of significance. A structured questionnaire and Mathematics Achievement Test (MAT) instruments were developed by the researchers and used for data collection. The instrument was organized into two sections (A and B). Section A addressed students' self-concept while section B addressed students' attitude. The instrument was a 4-point likert scale type. The MAT instrument contains 15 essay items developed by the researchers from the National Mathematics curriculum for upper basic education III level. The instruments were face-validated by experts. Thereafter, they were trial tested and their reliability coefficients of 0.84 and 0.89 were obtained using test retest method. Data generated with the instruments were analyzed using multiple regression and Analysis of variance (ANOVA) statistical tools at  $P \leq 0.05$  level of significance. One of the findings shows that students' self-concept and attitude to Mathematics have significant (single and joint) effect on mathematics achievement. Based on the findings of the study, the researchers recommended that the teachers should ensure that all the methods/strategies they use in teaching mathematics should be capable of making students develop and sustain self-concept and attitude in learning mathematics among others.*

**Keywords:** *Mathematics, achievement, students' self-concept and attitude.*

## **Introduction**

There is generally a widespread public concern about the students secondary school students' low attainment in mathematics at present. The yearly Basic Education Certificate Examination (BECE) results show that the percentage failure in the subject is high. Several authors believed that there are factors that are responsible for the poor performance of students on the subject. The National Mathematics Curriculum for upper basic education III has many areas of study and divided into themes.

The themes in the 9-year BEC (revised, 2012) are: Number and Numeration, Basic operations, Algebraic processes, Mensuration and Geometry and Everyday statistics. Vast majority of students perform poorly in mathematics annually especially in Algebraic processes (Achor, Imokon and Jumi, 2012). Algebra according to Rusell (2013) is an aspect of mathematics which involves the use of letters and numbers. These letters combined with figures bring a lot of confusion to the students, more so, with the letters changing value or one letter replacing another letter at intervals. The BECE Chief Examiner (2012) reported that on the questions: "Kufre is twice as old as Edet. Four years ago, he was four times as old as Edet. When will the sum of their ages be 66?" The question was not attempted by majority of the candidates correctly. The BECE Chief Examiner (2012) further added that a good number of students could not interpret the question correctly. Some others displayed poor manipulative skills and therefore, could not arrive at the correct answer. Students' poor performance in mathematic is conspicuous as evidenced in the years 2011-2017, Basic Education Certificate examination which revealed dwindling and stagnating increase in percentage pass at credit level in mathematics among the examines as revealed in the table 1 below.

Table 1: Frequency count and percentage pass of students in NECO BEC Examination.

<b>Year</b>	<b>% Pass at credit level</b>
2011	38.9
2012	19.0
2013	20.0
2014	31.3
2015	31.1
2016	33.0
2017	41.2

Several reasons have been offered in literature regarding students' poor performance on the subject. For instance, Abakpa (2012) noted that poor achievement in Mathematics is contributed by poor teaching methods, poor school environment, teachers' attitude and students' attitude towards mathematics. Other reasons reported include large class size, poor primary school background, students' self-concept, and students' lack of interest and societal perception of mathematics as a difficult subject (Okereke, 2003, Obioma, 2012 and Unodiaku, 2013).

Obviously, if the poor performance of students in mathematics persist, there is tendency that Nigerian nation will loose out in all ramifications in national development. This is because, mathematics is not only helping us to understand the natural phenomena such as weather, thunder, biological processes, wave progation, erosion, tornadoes, decomposition and physical processes, it is a gateway to scientific and technological breakthrough. For instances according to Unodiaku (2014), Mathematics is the foundation for any meaningful scientific endeavour and any nation that must develop in science and Technology must have a strong mathematical foundation for its youths. Mathematics is one of the core and compulsory subject among the secondary school curricula. It also enables us to sustain human activities such as painting, tailoring carpentry, business transactions among others. Therefore, for Nigerian nation to understand her national phenomena and function in a global context, Mathematical knowledge is imperative for everyday lifes and activities of her citizens. Bot and Illiya (2015) opine that the progress of any nation depends upon its scientific and technological growth and development which is built on a sound mathematical knowledge.

The importance of mathematics cannot be overemphasized, since it is applied in everyday life. There is virtually nothing in human endeavour that does not require the knowledge, usefulness of mathematics and intervention in one way or the other. For instance, all domestic and business activities/transactions require the authentic knowledge and applications of addition, subtraction, multiplication and division are aspects of mathematical, computations and analysis. If someone is knowledgeable in mathematics, he/she will not be deficient in all life engagements.

This is a most needed subject but it is also the most dreaded subject by most students. Most students have no interest in the subject and therefore perform very poorly in it. This may be the reason students have been recording low attainment on the subject. In view of the

low attainment in mathematics by students, despite the importance of the subject, researchers have been investigating the factors which determine performance on the subject (mathematics). They have been able to identify two areas: the cognitive domain which includes aptitude, intelligence, perception and reasoning (Ajaji, Awani and Adeyanju, 2011). These variables are said to constitute a greater part of the predictors of academic performance. For instance, Ajaji, et al. (2011), opined that non-cognitive domain, which includes variables such as socio-economic status, students' attitude, personality determinants, peer group influence, self-concept, anxiety etc. are predictors of students academic achievement, such as in mathematics achievement.

Unfortunately, most students in Nigeria's schools are ignorant of the relevance of mathematics to their lives; this may be the major reason why they avoid mathematics classes. Their attitude towards mathematics therefore tend to be negative and hence major concern to all stakeholders in education and society generally. According to James (2010), if students can remove the impression that mathematics is a difficult subject and develop positive attitude and self-concept to its learning they will achieve greatness through the subject. Also, the students cannot relate what they have learnt in the classroom to what really happens in their environment since they are not exposed to it. Those who endeavour to complete their secondary education, still find it difficult to apply the knowledge acquired in mathematics to support their endeavors after leaving. James (2014) pointed out that their performance in higher institution and their attitude towards mathematics and other pure science courses are also issues of concern. It is pertinent, therefore, to find out how far self-concept and attitude can be used as determinants of students' academic achievement on mathematics.

Self-concept is how an individual perceives himself or herself. The components of self-concept include physical, psychological and social attributes, which can be influenced by the individual's attitude, habits, beliefs and ideas. The degree and direction of attitude towards mathematics are largely determined by the interest developed by pupils on the subject. Shavelon (2001) believed that attitude is one of the determinants of poor academic performance. Attitudes therefore, are fundamentals to the dynamics of behavior. An attitude towards mathematics can therefore be looked at as, a disposition towards mathematics that has been acquired by an individual through his or her beliefs and experiences but which could be changed. Students with high or positive self-concept and attitude exhibit faster rate of learning and are always at the top, superiority over their counterparts, high aspiration and goals, and high performance even under pressure (Mohamed & Waheed, 2011). Emotionally, physically, socially and psychologically they feel comfortable. Reports on students self-

concept and attitude appear to be move on other subject areas than mathematics. In other words, there is scarcity of research on these variables in relations to mathematics. More need to be done in determining the students' self-concept and their attitude to mathematics learning for the sole purpose of enhancing mathematics learning and achievement among the subjects.

Attitude can be more or less positive. A positive attitude towards mathematics reflects a positive emotional disposition in relation to the subject. On the other hand, a negative attitude towards mathematics relates to a negative emotional disposition (Zan & Martino, 2010). These emotional dispositions have an impact on an individual's behaviour, as one is likely to achieve better in a subject that one enjoys and have confidence in or finds useful (Esun, 2011).

For this reason, positive attitude towards mathematics are desirable since they may influence one's willingness to learn and also the benefits one can desire from mathematics instruction (Zan & Mattino, 2010).

Several studies have been undertaken to try to reach an understanding of the relationship between students' attitudes towards mathematics and academic achievement (Fraser & Kahle, 2017). For instance, Nicolaidou and Philippou (2013) revealed significant correlations between attitudes and performance. The study revealed that students having positive attitudes achieved better. There is need to undertake this study to see whether the findings of the study can support this finding or contradict it. Moreso, Mato and DelaTorre (2010), in their study with secondary school students showed that those with better academic performance have more positive attitudes regarding mathematics than those with poorer academic performance. These results were confirmed in wider research, concerning attitudes to mathematics study among the secondary school students of nine countries studied by Mato and Dela Torre (2010). These reports were conducted on foreign scene. It is pertinent therefore to conduct this study locally to determine the extent of agreement or otherwise on the reports from the foreign scene.

### **Statement of the Problem**

Evidence has shown that over the years there exist the problems of students' low attainment in public mathematics examinations. The problem has generated a great concern among mathematicians, mathematics educators, parents, the society and stakeholders in education.

Self-concept and attitude have been identified as determinants of poor academic achievement of students. The problem of this study posed as a question is, how far can students' self-concept and attitude be the determinant factors influencing academic performance of students of upper basic education level in mathematics?

### **Purpose of the study**

The main purpose of the study was to determine the influence of self-concept and attitude on students' academic achievements on mathematics.

Specifically the study sought to:-

1. determine the extent scores in the variables can individually predict students' achievement on mathematics.
2. find out the extent the independent variables when combined can predict students' academic achievement on mathematics.

### **Research questions**

The following research questions were formulated to guide the study.

1. To what extent do the scores in the variables can individually predict students' academic achievement on mathematics?
2. To what extent do the independent variables when combined, predict students' academic achievement on mathematics?

### **Research hypotheses**

Null hypotheses were formulated to guide the study. The hypotheses were tested at  $P \leq .05$  level of significance.

H<sub>01</sub>: Scores in the variables, individually, will not significantly predict students' academic achievement on mathematics.

H<sub>02</sub>: Scores in the variables combined will not significantly predict students' academic achievement on mathematics.

### **Method**

The study used the ex-post facto research design. The study was conducted in Ikot Ekpene Local Government Area of Akwa Ibom State. The population of the study was all the 2554 students of upper basic education level of 2017/2018 academic session.

Multi-stage sampling technique was used in composing the sample used for the study. First, simple random sampling technique was used to select three (3) schools from seven (7)

schools in the study area. The sample for the study was two hundred and fifty (250) students drawn using simple random sampling technique.

Thereafter, simple random sampling technique was adopted in selecting one intact class from each of the three (3) sampled schools. This gave a total of 250 sampled subjects used for the study. Two instruments were developed by the researchers. These were Mathematics Achievement Test (MAT) and a questionnaire. The questionnaire was composed of two sections A and B. Section A covered students' self-concept and Attitude while section B was designed to measure the respondents' self-concept and attitude and consisted of twenty items with four alternative responses, namely: Strongly Agree (SA) – 4 points, Agree (A) – 3 points, Disagree (D) – 2 points and Strongly Disagree (SD) – 1 point. The MAT contains 18 essay items was developed with well know psychometric properties and test development theories. The two instruments were subjected to face validation to three lecturers in measurement and evaluation from department of Education Foundation, University of Uyo, Uyo, to ensure content validity. The items were selected and some modified based on their comments, corrections and suggestions.

The resultant instruments were trial tested on 57 students that did not take part in the main study for the purpose of establishing the reliabilities of the instruments using Cronbach alpha and test retest methods for MAT and questionnaire respectively. A reliability coefficient of 0.87 and 0.89 respectively. The administration of the questionnaire and MAT were carried out directly by the researchers. The results obtained were analyzed using mean and standard deviations (S.D.) while the multiple regressions analysis was used on testing the hypotheses at  $P \leq .05$  level of significance.

## **Results**

The result of the study were presented in line with the research questions and hypotheses.

**Research question one:** The research question one was answered using Table 1 below.

Table: Relative influence of the independent variables on students' academic achievement on mathematics.

Variables	standard Reg.wt( $\beta$ )	Std. Error	t-value	Prob. P<.05	Remark
Self-concept	.028	.501	.371	.027	*s
Attitude	-.021	.131	.301	.036	*s

Table 1 shows the relative influence of self-concept and attitude to mathematics achievement of the students. From the table, self-concept has t-value of .371 and significant at .027. This significant value (.371) is less than  $\alpha = .05$ . (i.e.,  $.371 < p < .05$ ). Therefore, t is significant at  $\alpha = .05$ . Similarly, attitude has t-value of .301 and significant at .036. Thus, significant value of .036 is less than .05 (i.e.,  $.036 < p < .05$ ). Therefore, t is significant at  $\alpha = .05$ . That is scores in the variables will significantly predict students' academic achievement on mathematics.

**Research question two:** The research question two was answered using table 2 below:

Table 2(a) Regression Analysis on students' self-concept and attitude to mathematics achievement test data.

Multiple R	.348
Square ( $R^2$ )	.042
Adjusted $R^2$	.035
Standard error of Estimate	4.019

Table 2 shows that the two independent variables had significant multiple correlation on the students' academic achievement on mathematics when taken together ( $R = .348$ ;  $R^2 = .042$ ).

The result further showed that 3.5% of the variation in students academic achievement in mathematics was accounted for by the independent variables.

#### (b) ANOVA result

Sources of variation	df	Sum of squares (SS)	Mean square (MS)	F	Sig.	Remark
Regression	2	434.618	217.309	8.813	.45	*S
Residual	247	6090.771	24.659			
Total	249	65114.013				

\*S = Significant

The result of table 2(b) showed that the F-value of 8.813 at  $P < .05$  is significant. However, the multiple correlations which is positive in the regressed mathematics achievement test data is due to the two factors taken together. Concerning the relative influence of the independent variables on students' mathematics achievement, the correlation coefficients of the individual variables indicated significant results. This means that relationship exists between the independent variables and students' achievement on mathematics. With adjusted multiple regression coefficient R of .348, there is significant multiple relationship between self-concept and attitude, and students' achievement on



mathematics. Hypothesis two was therefore rejected ( $P < .05$ ). That means scores in the independent variables significantly predict students' academic achievement on mathematics.

## **Discussion**

The values of self –concept and attitude as factors of students' academic performance cannot be overemphasized. The findings of this study showed that self concept and attitude are factors influencing students' mathematics achievement. These factors were found to be significantly influencing the students' academic achievement on mathematics ( $p < .05$ ). In other words, these independent variables were effective in predicting students' mathematics achievement, particularly among students of upper basic education level. Moreso, the study showed that the two independent variables had significant positive multiple correlation on students' mathematics achievement when take together ( $R = .348, R^2 = .042$ ). The observed F-ratio is significant at  $p < .05$ . This clearly indicated that the effectiveness of a combination of the independent variables in predicting students' mathematics achievement, the magnitude of the relationships between students' achievement in learning mathematics and a combination of independent variables is reflected in the values of coefficient of multiple regressions  $R$  (.348) and multiple  $R$  squared (.042). Therefore, variability in students' mathematics achievement at upper basic education level is accounted for by a linear combination of the two independent variables. This finding is in consonance with earlier reports (Mato & Dela, 2010; Kurumeh, 2010), who all reported that self-concept and attitude are predictors of students' academic performance. The result appears to suggest that the performance of child (positive or negative) depends on the way the child sees himself or herself, the approach of the teacher, the methodology of the teacher's instruction and the family background of the child.

The result of Table 2(a) showed that correlation coefficients of variables, self concept and attitude have positive relationship with students' mathematics achievement. Moreso, the values of the standardized regression weight associated with these variables shows that the variables self-pt is the most potent contributor with  $\beta = .028$ . However, the t-value does not associate with any of the independent variables.

The self-concept is the most potent variable that influence students' mathematics achievement among the subjects based on the finding' this finding is the agreement with earlier reports (Ajaji, Lawani & Adeyanju, 2011; Fraster & Kahel, 2017), who all reported

that self-concept is a powerful predictor of academic achievement. This report of the authors is clearly evidenced in this finding.

## **Conclusion**

Based on the findings of the study, it was concluded that self-concept and attitude are significant predictors of academic achievement of students in upper basic education level on mathematics. The variables, self-concept and attitude were positively related to students' academic achievement on mathematics, especially among students of upper basic education level.

## **Recommendations**

Based on the findings of the study, the following recommendations were made:

1. Teachers should desist from making statements that can make students develop poor self-concepts and attitude in mathematics.
2. Individual self-concept and attitude are important factors in the choice of goals and expected level of performance in mathematics. Mathematics teachers are therefore tasked to know their his students and strengthen their self-concept.
3. Parents should use their economic status positively whether high or low to influence their children's academic achievement in mathematics.
4. Parents should co-operate with their children so as to arouse their children's interest, self-concept, attitude and even self-efficacy, all of which constitute social factors that influence students' mathematics achievements.

## **Reference**

- Abakpa, B. O. (2012). Meeting the challenges of Upper Basic Education through Acquisition of Basic mathematics Skills. *Proceedings of 53rd Annual Conference of Science Teachers' Association of Nigeria*, 324-331.
- Achor, E. E., Imoko, B. I., and Jumin, N. (2012). Improving some Nigerian secondary school students' Achievement in Geometry; A field Report on Team Teaching. *New York Science Journal* 5(1): 37-43.
- Retrieved March 3, 2014 from <http://www.sciencepub.net/newyork/ny0501/0077175ny05013143pdf>.
- Ajaji, K. O; Lawani, A. O. and Adeyanju, H. I. (2011). Effects of Students' Attitude and Self-concept on Achievement in Senior Secondary School Mathematics. *Journal of Research in National Development* 9(2), 81-86.

- Bot, T. D. and Illiya, G. (2015). Effectiveness of Programmed Instructional Strategy on Senior Secondary School Students' Achievement in Trigonometry in Mangu, Plateau State. *Abacus: Journal of the Mathematical Association of Nigeria (MAN)* 40(1):101-111.
- Eshun, B. (2004). "Sex Differences in Attitude of students towards mathematics in secondary schools". *Mathematics connection* 4, 1-13.
- James, T. O; Ahmed, A.; Nwogu, J. and Onwuka, G. I. (2014). Analysis of students' performances mode of entrances and their Attitude toward Mathematics and Pure Science Courses: A case study of Mathematics and Biochemistry Departments KSUSTA. *Equity Journal of Science and Technology*, 2(1): 137-140. ISSN:2354-1814.
- Jane, S. A. and Janet, E. M. (2016). Gender, Culture and mathematics performance [www.pnas.or/content/106/22/880.full](http://www.pnas.or/content/106/22/880.full).
- Mato, M. and De la Torre, E. (2010). "Evaluation De Las Actividades Hacia Las Matematicas Vel Rendiment Academico". *PNA* 5(1), 197-208.
- Mohamed, L. and Waheed, H. (2011). Secondary Students' Attitude toward Mathematics in a selected school of Maldives. *International Journal of Humanities and Social Science* 1 (15), 277-281.
- Nicolaidou, M. and Philippou, G. (2003). Attitudes Towards mathematics, Self- Efficacy and Achievement in problem solving. *European Research in Mathematics Education* III, 1-11 University of Pisa, Pisa, Italy.
- Obioma, G. O. (2012). Immerging Issues in Mathematics Education in Nigeria with Emphasis on Effective Teaching and Learning of Word Problems and Algebraic Expression. *Journal of Issues of mathematics panel of Science Teachers' Association of Nigeria*.
- Okereke, S. C. (2012). Effects of prior knowledge of Implications of Mathematical Tasks/Concepts to Career Types and Gender Students' Achievement, Interest and Retention. In U. Nzewi (Ed) *STAN Proceedings of the 44<sup>th</sup> Annual Conference*, 223-259.
- Olasehinde, K. and Olatoye, R. A. (2014). Academic Outcome of Public and Private High School Students. [www.statch.gc.ca.hom.publiccations./soo/ami](http://www.statch.gc.ca.hom.publiccations./soo/ami).
- Unodiaku, S. S. (2014). Correlates of Some Factors Affecting Students' mathematics Readiness in Secondary Schools in Enugu State, Nigeria. *International Journal of Education (IJOE). Journal of the faculty of Education* (1), 13-28. Godfrey Okoye University, Enugu.
- Unodiaku, S. S. (2013). Influence of Sex and Ability level on students' Mathematics Readiness in Enugu State, Nigeria. *Journal of Educational Institute for Science, Technology and Education (IISTE)*, 4(14), 73-78, USA.

Shavelson, R. J. (2001). Self concept: "The Interplay of Theory and Method". *Journal of Educational Research* 74(1), 13-17.

Zan, R. & Martino, P. (2010). Attitude toward Mathematics:  
overcoming the Positive/Negative Dichotomy in Beliefs about Mathematics.  
Enthusiast: Monograph series in Mathematics Education,  
197-214.