

Interest and Academic Achievement of Students in Senior Secondary School Mathematics as Determined by Teachers' Self-Efficacy

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Abstract:- This study examined the degree to which Teacher's Self-efficacy determined students' interest and academic achievement in Mathematics. The study adopted correlational research design. The study was guided by two (2) research question and two (2) hypotheses. The population of the study consist of 8 Mathematics Teachers and 5125 Senior Secondary II (SS2) students. A sample of 29 mathematics teachers and 400 students was used for the study. Four instruments were employed for data collection in this study. They are Teachers' Self-efficacy scale (TSS), Students Mathematics Interest Scale (SMIS) which was developed by researcher and students' Mathematics Achievement Pro-forma (SMAP). Face validity as well as construct validity were used to the instruments. The reliability indices of the Students Mathematics Interest Scale (SMIS) and Teachers Self-efficacy scale (TSS) were computed using Cronbach's Alpha (α). Regression analysis was performed to analyse the data, and regression ANOVA was utilised to test the hypotheses at the significance level of 0.05. The study's results, among other things, demonstrated that students' interest in mathematics is determined by teachers self-efficacy (11.1%), found significant ($p > 0.05$) determinant of students Interest in Mathematics, it also showed that students' achievement in Mathematics is determined by teachers self-efficacy (11.2%), found to be significant determinants of students achievement in mathematics. Conclusion were drawn and implications of the findings of the study was highlighted. It was recommended that Teachers should strive to develop high self-efficacy, positive aversion and low anxiety towards the teaching of Mathematics in schools as to boost students' interest and achievement in mathematics; Government agencies and school administrators should train in-service and pre-service teachers for self-efficacy to enhance students' interest and academic achievement.

Keywords:- Teachers' Self-Efficacy, Interest, Achievement, Mathematics.

I. INTRODUCTION

Mathematical knowledge is acknowledged as being extremely important for both academic success and effective daily functioning. Accuracy, consistency, and mental discipline are acquired via studying mathematics and are crucial traits for making ethical decisions and solving problems in daily life. Many areas in higher education, including technical studies, engineering, economics, and finance, as well as agricultural, pharmaceutical, and health sciences, have been described as requiring a strong mathematical foundation. (Nicholas, Poladian, Mack, & Wilson, 2015). This knowledge of Mathematics can adequately be impacted to students' by the teachers whose high self-efficacy in Mathematics in other to sustain students' interest and boost their achievement in Mathematics.

Mathematics have been variously defined by many authors. Elaine (2013) considers Mathematics to be the branch of science that studies the logic of shapes, numbers, and arrangements. According to Usman and Musa (2019), there cannot be science without Mathematics, nor can there be modern technology without science, and there cannot be national development without technology. The aforementioned claim suggests that mathematics education is essential to the country's technological and economic progress.

Numerous countries have seen the importance of Mathematics both in the past and present. Due to its effectiveness, the Federal Republic of Nigeria (FRN, 2014) mandated that students take it as a required subject in both primary and secondary school. To acquire the purpose of creating a secondary level of education in Mathematics, they stated objectives that a learner in secondary school should attain. These aim and objectives include: equipping students with a solid foundation in mathematical concepts, problem-solving skills, and critical thinking abilities. The ultimate goal is to develop numerate individuals who can apply mathematical knowledge and techniques in various real-life situations, Federal Ministry of Education (FME, 2014). These objectives if accomplished may bring about desirable economic development and overall wellbeing of the nation. Since Mathematical knowledge offers widespread application both in art and social sciences, it is necessary to look into how students should improve/sustain interest and

boost achievement in mathematics. Despite the position and utility of Mathematics in Nigeria education system, and development of the nation, students need to develop interest and improve on their achievement in Mathematics both in teacher-made test and standardized examinations annually, (Ugwuanyi 2016).

The poor achievement was re-affirmed over the years by some authors and examination bodies. Authors like Agwagah, (2012); Obioma, (2015); Maduabum and Odili, (2016) and Okereke, (2016) had observed that students lack interest in the subject and achieve poorly in it. Also, Awofala, (2016) affirm that majority of secondary school students often dread and show negative interest towards Mathematics and the trends of their achievement in the senior secondary school which thereby lead to poor academic achievement in mathematics. Students' achievement scores in senior secondary schools in unified examinations in Ogoja Education Zone of Cross River State still show poor (Cross River State Education Evaluation team report, 2022). This report did not tally with the stated WAEC Performance statistics above which show a contradiction of the Cause of low interest and poor achievement in subject especially in Ogoja Education Zone. This could be as a result of students focusing on passing the external examination or involving in examination malpractice. Due to these reasons, many researches such as -: Effect of self-instruction strategy on pupils' achievement and interest in Mathematics (Obiweluozo, 2014), Relationship among test anxiety, academic achievement and interest of senior secondary school students in geometry (Chukwu, 2014), Effect of slide game on student's achievements (Ali, 2015) and so many others have been conducted to determine possible factors responsible for the poor and sustainability of students' interest and achievement in the subject.

Some factors that could be the cause of the obstacles preventing students from achieving well in Mathematics have been identified by various authors. According to Unodiaku (2012), for example, students' low interest and poor academic achievement in Mathematics can be attributed to factors such as their poor school background, lack of interest on their part, incompetent teachers, and the perception that Mathematics is a difficult subject. According to Ugwuanyi (2014), the size of the class, the method of instruction, and the students' poor retention skills are to blame for their lack of interest in and performance in mathematics. Additionally, Chukwu (2014) noted that low student interest and subpar achievement in Mathematics can be attributed to a variety of factors, including the curriculum, examination bodies, teachers, students, parents, and environmental factors. Poor performance in Mathematics classes was attributed by Anigbo (2016) to student anxiety, phone distraction, and the sheer number of students. Students' poor performance and lack of interest in Mathematics persist despite the findings of these studies and the recommendations put forth. Therefore, additional research is needed to look into more potential influences on students' interest in and performance in Mathematics.

One crucial factor in learning Mathematics is student's interest. According to Ugwuanyi and Owara (2019), interest is defined as the desire to learn more about a subject or an individual. The wish or eagerness to start and carry on with any activity that brings one pleasure is known as interest (Andortan (2019). Interest, according to Ekechukwu (2019), is a psychological and hormonal state of preparedness that is organized through experience and has a direct and dynamic impact on how a person reacts to all things and circumstances that are related to it. Interest is a person's inclination to partake in a particular activity, according to Okeke, Aneshie-Otakpa, Orga, and Nwanchor (2021).

Over the years, research has focused a lot on student achievement. Academic achievement, according to Adeyemo (2011), is the success a student has in school as measured by their test scores. Academic achievement, in the opinion of Onyeocha (2021), consists of a student's capacity to learn and retain information as well as his or her capacity to express that information in writing or orally during a test. This means that the grades, certifications, proficiencies, skills, and talents that students acquire as a result of their education are all regarded as indicators of academic achievement. Academic success is a crucial sign of how far a student has come. As a result, underachievers risk stagnating in both their academic and professional careers. The scores and grades students receive in school are used in the current study to define students' academic achievement. According to earlier research, students perform poorly in many academic subjects, particularly mathematics. The students' poor performance in mathematics is attributed to a variety of factors. Reports, however, indicate that a lot of teachers were unable to cover the topics in mathematics. According to the authors, teachers should work harder to help students raise their achievement levels and foster an interest in math by lessening math's abstract nature. It becomes necessary to look for areas where teachers' performance could be enhanced in order to support students.

Students' interest and achievement may be influenced by teachers' self-efficacy. According to Gavora (2010), self-efficacy is the belief in oneself that one can complete a task appropriately and successfully. Self-efficacy is the belief or perception about one's ability to perform at a certain level on a task, according to Han, Liou-Mark, Yu, and Zeng (2015). A teacher's self-efficacy can be defined as their belief, conviction, or confidence in their subject matter competence and ability to successfully complete assigned tasks. Teachers' self-efficacy, according to Künsting, Neuber, and Lipowsky (2016), is their belief in their capacity to advance their students' learning. It might be interpreted as the degree to which educators feel that they can support students' learning even in the face of challenging circumstances. A teacher who exudes confidence in their abilities will enhance student learning and achievement. In order to improve achievement, Katz and Stupel (2016) recognized the significance of construct self-efficacy among teachers when instructing mathematics to students, particularly at the secondary school level.

Although studies have been conducted on the relationship between student's self-efficacy and their interest and achievement in Mathematics, many of these studies have focused on the relationship between one or two of the variables and student achievement in Mathematics, leaving out teacher's self-efficacy. Furthermore, the vast majority of them are international works of literature. The current analysis was prompted by these gaps in the literature in the Nigerian setting specifically in Cross River State. The study's purpose was to see how teachers' self-efficacy determine students' interest and academic achievement in mathematics in Ogoja Education Zone in Cross River State.

II. PURPOSE OF THE STUDY

The main purpose of this study is to examine Mathematics teachers' self-efficacy as determinants of students' interest and academic achievement in Mathematics. Specifically, the study examined the degree to which Mathematics teachers'

- Self-efficacy account for students' interest in Mathematics
- Self-efficacy account for students' academic achievement in Mathematics

A. Research Questions.

The following questions were posed to guide the study.

- What is the amount of variation in students' interest in Mathematics that is attributed to Mathematics teachers' self-efficacy?
- What is the degree of variation in students' academic achievement in Mathematics that is attributed to Mathematics teachers' self-efficacy?

B. Hypotheses

The following null hypotheses were postulated for the study and was tested at 0.05 level of significance.

- H0₁: The amount of variation in students' interest in Mathematics that is attributed to Mathematics teachers' self-efficacy is not statistically significant.
- H0₂: The degree of variation in students' academic achievement in Mathematics that is attributed for by Mathematics teachers' self-efficacy is not statistically significant.

IV. RESULTS

A. Research Question One:

What is the amount of variation in students' interest in Mathematics that is attributed to Mathematics teachers' self-efficacy?

Table 1: Pearson's Product Moment Correlation Analysis on the Amount of Variation in Students' Interest in Mathematics that is Attributed to Mathematics Teachers' Self-Efficacy

Variable	N	$\bar{X}$	SD	r	r ²
Students' interest in Mathematics	400	61.06	8.34	0.33	0.111
Teachers' self-efficacy	29	64.03	7.18		

III. METHODOLOGY

This study employed correlation design. The choice of this design is appropriate for the study because this study seeks to find out the degree of relationship between Mathematics teachers' self-efficacy on students' interest and academic achievement in Mathematics. SSII Students and their Mathematics Teachers in public secondary schools in Ogoja Education Zone of Cross River State. The Zone have 83 public secondary schools with the total of 5125 students of SSII and 83 Mathematics teachers. The study adopted Multi-stage sampling procedure, which was carried out in four stages: sampling of local government, sampling of school, sampling of students and sampling of teachers. The sample for the study comprised 400 students and 29 Mathematics Teachers from Ogoja Education Zone. The instruments that was used for data collection for the study are titled Teachers' Self-efficacy scale (TSS), Students' Mathematics Interest Scale (SMIS) and Students' Mathematics Achievement Proforma (SMAP). Three Copies of the instruments with the purpose, research questions and hypotheses were given to three (3) experts for face validation. One expert from Mathematics Education programme area and one from Measurement and Evaluation programme area both in Department of Science Education and one from Psychology of education programme unit in educational foundations all in Faculty of Education, University of Nigeria Nsukka. Also TSS and SMIS was subjected to Factor Analysis. The reliability coefficients for TSS and SMIS were .76 and .81 respectively. These reliability coefficients showed that the instruments were highly reliable and hence suitable for the study. The reason for on-the-spot administration and retrieval was to ensure a high return rate of the instrument. Data collected was analysed using simple linear regression analysis on SPSS (statistical Package for Social Sciences). The correlation coefficients (r) and coefficients of determination (r²) was used to answer all the research questions. The reason for answering the research questions using correlation coefficients (r) and coefficients of determination (r²) is because, it helps in establishing the magnitude of the relationship or correlation between TSS and SMIS, SMAP. Regression ANOVA was adopted in testing the hypotheses because it is applicable in testing the significance of the regression model of the correlation among two or more variables. The decision rule for testing the hypotheses was as thus: Reject the null hypothesis if the exact or associated probability to the F-statistic is less than 0.05 level of significance, otherwise do not reject.

Note: N = Number of respondents, $\bar{X}$ = Mean, SD = Standard Deviation, r = Correlation coefficient, r^2 = Coefficient of determination. The interpretation of the correlation coefficient (r) is in line with Nwana's (1979) criteria, where an r of 0.00 - 0.19 implies very low relationship, 0.20 - 0.39 implies low relationship, 0.40 - 0.59 implies medium/moderate relationship, 0.60 - 0.79 implies high relationship while 0.80 and above implies very high relationship.

Result in Table 1 shows that the respondents' scores from students' interest in Mathematics were correlated with the scores from teachers' self-efficacy in teaching Mathematics. The correlation coefficient (r) of 0.33 and a coefficient of determination (r^2) of 0.111 were obtained. The correlation coefficient (r) of 0.33 indicates that there is a

positive but low relationship between the variables. In other words, there is a positively low relationship ($r = 0.33$) between students' interest in Mathematics and teachers' self-efficacy in Mathematics. Furthermore, the coefficient of determination (r^2) of 0.111 implies that 11.1% of secondary school students' interest in Mathematics is accounted for by their teachers' self-efficacy in Mathematics. To check whether the amount of variation in students' interest in Mathematics that is attributed to Mathematics teachers' self-efficacy is statistically significant, see hypothesis one.

➤ *Hypothesis One:*

The amount of variation in students' interest in Mathematics that is attributed to Mathematics teachers' self-efficacy is not statistically significant.

Table 2: ANOVA of the Significance of the Amount of Variation in Students' Interest in Mathematics that is Attributed to Mathematics Teachers' Self-Efficacy

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	3082.998	1	3082.998	49.765	.000 ^b
	Residual	24656.679	398	61.951		
	Total	27739.678	399			
a. Dependent Variable: students' interest						
b. Predictors: (Constant), teachers' self-efficacy						

The result in Table 2 shows that an f-ratio of ($F(1, 398) = 49.77$, $p < .05$) was obtained. Since the associated probability (p) value of 0.000 when compared with the 0.05 level of significance ($\alpha = 0.05$) for testing the hypothesis was found significant because 0.00 is less than 0.05, the null hypothesis one which states that The amount of variation in students' interest in Mathematics that is attributed to Mathematics teachers' self-efficacy is not statistically significant was therefore rejected. Thus, the conclusion

drawn is that amount of variation in students' interest in Mathematics that is attributed to Mathematics teachers' self-efficacy is significant.

B. *Research Question Two:*

What is the degree of variation in students' academic achievement in Mathematics that is attributed to Mathematics teachers' self-efficacy?

Table 3: Pearson's Product Moment Correlation Analysis on the Degree of Variation in Students' Academic Achievement in Mathematics that is Attributed to Mathematics Teachers' Self-Efficacy

Variable	N	$\bar{X}$	SD	R	r^2
Students' achievement in Mathematics	400	62.73	8.54	0.335	0.112
Teachers' self-efficacy	29	59.34	7.18		

The result in Table 3 shows that the respondents' scores from the students' achievement in Mathematics were correlated with teachers' self-efficacy towards Mathematics. The correlation coefficient (r) of 0.335 and a coefficient of determination (r^2) of 0.112 were obtained. The correlation coefficient (r) of 0.335 portrays that there is a low relationship between the variables. That is to say, there is a positively but low direct relationship ($r = 0.335$) between students' achievement in Mathematics and teachers' self-efficacy towards Mathematics. Additionally, the coefficient of determination (r^2) of 0.112 shows that 11.2% of students' achievement in Mathematics is attributed to teachers' self-efficacy towards Mathematics. To check whether the degree of variation in students' academic achievement in Mathematics that is attributed to Mathematics teachers' self-efficacy is statistically significant, see hypothesis two.

➤ *Hypothesis Two:*

The degree of variation in students' academic achievement in Mathematics that is attributed to Mathematics teachers' self-efficacy is not statistically significant.

Table 4: ANOVA of the Significance of the Degree of Variation in Students' Academic Achievement in Mathematics that is Attributed for by Mathematics Teachers' Self-Efficacy

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	3258.335	1	3258.335	50.223	.000 ^b
	Residual	25821.175	398	64.877		
	Total	29079.510	399			

a. Dependent Variable: students' achievement b. Predictors: (Constant), teachers' self-efficacy

The result in Table 2 shows that an f-ratio of ($F(1, 398) = 50.223$, $p < .05$) was obtained. Given the fact that the associated probability (p) value of 0.000 when compared with the 0.05 level of significance ($\alpha = 0.05$) for testing the hypothesis was found significant because 0.00 is less than 0.05, the null hypothesis four which states that the degree of variation in students' academic achievement in Mathematics that is attributed for by Mathematics teachers' self-efficacy is not statistically is consequently rejected. Thus, the conclusion drawn is that the degree of variation in students' academic achievement in Mathematics that is attributed to Mathematics teachers' self-efficacy is significant.

V. DISCUSSION

A. The Degree to Which Mathematics Teachers' Self-Efficacy Account for Students' Interest in Mathematics is Significant

Result revealed that amount of variation in students' interest in Mathematics that is attributed to Mathematics teachers' self-efficacy is significant. This means that teachers' self-efficacy is responsible for students' interest in Mathematics. This finding corroborate with previous findings of Muhammad, Muhammad and Muhammed (2017) whose findings showed that teachers' self-efficacy is directly related to students' interest in mathematics. Similarly the study is also in line with the findings of Anigbo (2016) and Oldham (2018) in their different studies revealed that teachers' factors were effective in predicting secondary school students' interest to learn Mathematics. The above finding implies that teachers who have high self-efficacy get students more interested in learning and vice versa. This is true because students appear to imitate and copy their teachers. So, any disposition expressed by the teacher will be imitated by students. Beside, teachers with high self-efficacy also express more enthusiasm in teaching which could influence students' interest in learning. Therefore, the findings of the study which show that there is a direct positive and significant relationship between teachers' self-efficacy and students' interest in Mathematics is in order.

B. The Degree to which Mathematics Teachers' Self-Efficacy Account for Students' Achievement in Mathematics is Significant

Analysis of hypothesis shows that the degree of variation in students' academic achievement in Mathematics that is attributed to Mathematics teachers' self-efficacy is significant. This implies that a great proportion of students' achievement in Mathematics is due to their teachers' self-efficacy towards Mathematics. The above finding support the previous studies by Muhammad, Muhammad and Muhammed (2017) who revealed that teachers' self-efficacy is directly related to students' academic achievement and

overall learning. Also the finding agrees with Gulistan, Hussain and Mushtag (2017) who reveal that there is a strong correlation between mathematics teachers' self-efficacy and their students' academic achievement in Mathematics. The findings also agree with previous findings from Alade, Aletan and Sekenu (2018) who revealed that there is a significant relationship between teachers' Mathematics teaching self-efficacy and students' achievement in Mathematics; the two predictor variables jointly accounted for 45.2% variations in students' academic achievement in Mathematics. Hence, the findings that secondary school students' achievement in Mathematics is attributed to teachers' self-efficacy. This is because teachers with high level of self-efficacy are most often very competence and confident in teaching. This self-confidence may help them teach efficiently which may help the students learn better thereby enhancing their academic achievement.

VI. CONCLUSION

Based on the findings of the study and interpretation of the results, it is therefore concluded that teachers' high self-efficacy promotes and boost students' interest in studying mathematics thereby enhancing their achievement in the subject. Hence, the amount of variation of students' interest that is accounted for by Mathematics teachers' self-efficacy is significant. It was further concluded that students' achievement in Mathematics is attributed to Mathematics teachers' self-efficacy.

RECOMMENDATION

- *Based on the Findings of the Study, the Recommendation is Made:*
- Teachers should strive to develop high self-efficacy, towards the teaching of Mathematics in schools so as to boost students' interest and enhancing their academic achievement

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