Influence of Students' Self-Concept on Their Academic Achievement in Secondary School Mathematics

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*Abstract:-***This study was carried out to investigate the influence of students' self-concept on their academic achievement in secondary school mathematics. The researchers employed descriptive survey research design. Two (2) research questions and two (2) hypotheses guided the study. The population of the study comprised of two thousand, four hundred and one (2401) SS2 students from the thirty-one (31) secondary schools in Nsukka Local Government Area of Enugu State. A sample of one hundred and fifty (150) students from five (5) schools were selected through random sampling techniques. The instrument for data collection was Students' Self-Concept Questionnaire (SSQ) structured on a four point Likert scale. The instrument was validated by three (3) experts from University of Nigeria Nsukka. Cronbach Alpha formular was used to ascertain the internal consistency of the questionnaire and a reliability coefficient of 0.908 was obtained. Mean and standard deviations were used to answer the research questions while chi-square (χ^2) and t-test were used to test the null hypothesis 1 and 2 respectively at 0.05 level of significance. The findings of the study revealed that the students' self-concept influences their academic achievement in mathematics with overall mean of 2.6273 and it is statistically significant. Also, students' gender does not influence their academic achievement in mathematics with overall mean of 2.2660 which isn't statistically significant. Based on the findings of the study, it was recommended among others that classroom teachers should use some teaching strategies that would boost students' academic self-concept which will in turn promote their academic achievement in mathematics.**

Keywords: **Mathematics, self-concept, ability, Achievement and Gender.**

I. INTRODUCTION

Mathematics is a subject that studies about numbers, arithmetic, algebra, geometry, and trigonometry among others. Mathematics is studied in both primary and secondary schools as a compulsory subject. Mathematics like any other compulsory and examinable subject offered in both primary and secondary school level has a key role in shaping how individuals deal with various spheres of private, social and civil life. There is no existing field of study which does not require the use of mathematical theories or numerical computations in one way or the other. Ncube (2013) was of the view that mathematics is the bedrock and an indispensable tool for scientific, technological and economic advancement of any nation.

Mathematics is all around us, in everything we do. It is the building block for everything in our daily lives, including mobile devices, architecture (ancient and modern), art, money, engineering, and even sports (Elaine, 2013). Therefore, mathematics is a subject that education and human life cannot function effectively without it. The knowledge of mathematics is very useful and leads students to understand lessons in other subjects and thereby making them mentally alert. Mathematics knowledge indeed equips individuals with the skill to solve a wide range of practical tasks and problems they may encounter in life. Ojimba (2012) was of the view that without mathematics, there is no science, without science, there is no modern technology and without modern technology, there is no modern society.

In Nigeria, mathematics has been made a compulsory subject in the elementary and higher school curricula since it is the key for industrial and technological development. Despite the importance placed on the subject, students' mathematics achievement has been relatively poor. This may be as result of many tropical issues such as mathematics phobia, students' attitude, self-concept, teacher's methodology, inadequate use of technology in teaching, lack of motivation. The poor achievement of students in mathematics in recent years may be likened to the complex nature of mathematics content. In spite of all the important roles mathematics plays in the development of mankind, its achievement has been poor and must be investigated by researchers (Agwagah, 2004).

Academic achievement is the outcome of education which extends to what a student, teacher or institution has achieved in the educational goals. It is commonly measured by examinations or continuous assessment. Academic achievement refers to how well a student is accomplishing his or her tasks and studies. It is observed by Damrongpanit, Reungtragul and Pittayanon (2007) that in the present time, the students' academic achievement is underlined to become a major direction in the national education, because academic

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achievement refers to how well a student is accomplishing his or her tasks and studies. It is observed by Damrongpanit, Reungtragul and Pittayanon (2007) that in the present time, the students' academic achievement is underlined to become a major direction in the national education, because academic achievement of the students is the most suitable indicator to show the educational success. Thus, researchers are interested in finding the factors that affect academic achievement in mathematics not just because of the importance of mathematics but also because of the poor achievement in the subject. Research conducted by Marsh and Craven (2006) and Areepattamanni and Freeman (2008) showed a strong association among students' motivation, self-concept and academic achievement. They also disclosed that many students have the perception and belief that mathematics is complex, abstract and very hard or difficult to understand. These negative perceptions of students towards mathematics have eaten deep into the minds of students in secondary school which in turn invariably may influence their academic achievement (Mohamed & Waheed, 2011).

Self-concept is one's perception image of one's ability and uniqueness. Self-concept is a collection of beliefs about one's own nature, unique qualities and typical behaviour, your self-concept is your mental picture of yourself. Balarabe and Bakari (2013) explained that self-concept is multi-faceted, hieratical, organized and structured, descriptive and evaluative, stable and yet increasingly situation specific. Self-concept can be positive or negative. People with positive self concept have the ability to cope and deal with the problems facing them while people with negative self-concept lack that ability.

Students' ability may have influence on their academic achievement. Hence, students' achievement may depend on their self-concept. That is, their achievement in mathematics may depend on what they thought of or believed about themselves with reference to mathematics as a subject. Students with positive self-concept and who value the importance of mathematics are more likely to attain a higher mathematics achievement than their peers with negative self-concept. Students with a positive self-concept acquire more success in areas of social, scientific and occupation. Several studies have revealed an association between students' self-concept and academic achievement. Self-concept can be divided into two distinct factors, academic and non-academic self-concepts. Academic self-concept refers to an individual's knowledge and perceptions about themselves in academic achievement situation while non-academic self-concept is about perception of oneself in non-academic activities which include their physical self and their relation with parents, friends and community (Catherine, 2013).

The students' self-concept on mathematics may differently influence their academic achievement according to gender. Gender is simply referred to as the biological, social & cultural sex of an individual either male or female. The gender of a person may go a long way in affecting how the person thinks, behaves and lives. Gender differences in secondary school are prominent issues that have the focus of many.

From the foregoing one can insinuate that students' achievement in secondary school mathematics which is at a poor state might owe to both male and female students' self-concept in the subject among other variable associated factors. Hence there is need to determine the influence of male and female students' self-concept on their secondary school mathematics achievement.

The greatest failure in secondary school external examinations such as the one conducted by WAEC, NECO and NABTEB is recorded in mathematics. This problem has generated a great concern among the members of the society, stakeholders in education, mathematics educators, parents, and even the students. Although some other strategies and methods have been tried out by some researchers in different areas in mathematics, the poor achievement still persist. As a result of this, there is need to go an extra mile of understanding the learners themselves, their self-concept towards mathematics with the aim of suggesting strategies for improvement in the teaching and learning of the subject. The problem of this study therefore is to find out how students' self-concept influences their achievement in secondary school mathematics.

The purpose of this study is to investigate the influence of self-concept on secondary school students' academic achievement in mathematics. Specifically, the study sought to: Determine the influence of students' self-concept on their achievement in mathematics and to investigate whether gender influences the students' self-concept in mathematics.

The following research questions and hypotheses have been posed to guide this study:

RQ2 What is the influence of students' self-concept on their academic achievement in secondary school mathematics?

RQ2 What is the influence of gender on students' self-concept in mathematics?

Ho$_1$: There is no significant influence of students' self-concept on their achievement in secondary school mathematics

Ho$_2$: There is no significant influence of gender on students' self-concept in mathematics

II. MATERIALS AND METHOD

The researchers employed descriptive survey research design. A survey research is one in which a group of people or items is studied by collecting and analyzing data from only a few people or items considered to be representation of the entire group (Nworgu, 2015). Descriptive survey research design is appropriate in this study because the researchers are dealing with a large population and so needs questionnaire to collect data or information that will be used to answer the research questions and to test the hypotheses.

The population of the study comprised of two thousand four hundred and one (2401) SS2 students from the thirty-one secondary schools in Nsukka Local Government Area of Enugu State in 2018/2019 session. The sample of this study consists of one hundred and fifty (150) SS2 students randomly selected from five (5) schools out of the thirty-one (31) secondary schools in Nsukka L.G.A. Simple random sampling was also used in selecting the five (5) schools. Instrument used for data collection was Students' Self-concept Questionnaire (SSQ). The instrument was validated by three (3) experts. Two (2) from the department of Science Education and one (1) from department of Educational Foundation, all from University of Nigeria Nsukka.. The reliability of the instrument was ascertained using Cronbach Alpha which gave a reliability index of 0.908

The data collected with the instrument was analyzed using mean and standard deviation to answer the research questions while chi-square (χ^2) and t-test were employed in testing the hypotheses 1 and 2 respectively at 0.05 level of significance. The level of acceptance of the criterion mean is 2.50.

III. RESULTS

Data were analyzed, summarized and presented in the following tables below according to their respective research questions and hypotheses.

Research Question One: What is the influence of students' self-concept on their academic achievement in secondary school mathematics?

TABLE I: DESCRIPTIVE STATISTICS of the INFLUENCE OF STUDENTS' SELF-CONCEPT on their ACADEMIC ACHIEVEMENT in SECONDARY SCHOOL MATHEMATICS

S/N	Item Description	N	Mean	Std. Deviation	Remarks
1	I am dependent as far as mathematics is concerned	150	2.6000	.94123	Accepted
2	I make good grades in mathematics	150	2.9933	.76410	Accepted
3	It is only people with special talents that can solve mathematics	150	1.8600	1.03645	Rejected
4	I can't see any relevance in most of the mathematics work	150	2.1467	1.03228	Rejected
5	My teacher thinks am good in mathematics	150	2.8533	.85441	Accepted
6	Mathematics is important in life	150	3.4867	.84135	Accepted
7	I am satisfied with my mathematics grades	150	2.5533	1.09014	Accepted
8	Majority of students fail mathematics	150	3.0200	.93744	Accepted
9	Among the subjects taught, mathematics is my favorite	150	2.4467	1.08397	Rejected
10	My friends think am not good in mathematics	150	2.3133	.88338	Rejected
	GRAND MEAN		2.6273	.34406	Accepted

The data presented in Table I shows that item 1, 2, 5,6, 7 and 8 has mean response values which ranges from 2.5533 to 3.4867 are all above the benchmark of 2.5 and thus were all accepted. Their standard deviations range from .76410 to 1.09014 shows that their individual responses are relatively not far from one another. However, item 3, 4, 9, 10 has mean response values which ranges from 1.8600 to 2.4467 are all rejected since their mean response are below the benchmark of 2.5. Also the standard deviation of items 3, 4, 9, 10 ranges from .88338 to 1.08397 also shows that their individual responses are relatively not far from one another. The grand mean of 2.6273 implies that students' self-concept influences their academic achievement in mathematics.

Research Question Two: What is the influence of gender on students' self-concept in mathematics?

TABLE II: DESCRIPTIVE STATISTICS on the EXTENT TO WHICH STUDENTS' GENDER INFLUENCE their SELF-CONCEPT in MATHEMATICS

S/N	Item Description	N	Mean	Std. Deviation	Remarks
11	Being a male or female affects my learning of mathematics	150	1.5600	.83930	Rejected
12	Females love mathematics more than males	150	2.2667	1.07957	Rejected
13	It is abnormal for a female to study mathematics in higher education	150	1.8467	1.08521	Rejected
14	Males find mathematics more interesting than females	150	2.5000	1.04753	Accepted
15	Female students are not curious in learning mathematics	150	2.2867	.92204	Rejected
16	Female students hardly attend mathematics classes	150	2.0133	.96229	Rejected
17	Female students are more active in mathematics class	150	2.4200	1.0572	Rejected
18	Both male and female students do well in mathematics	150	3.2733	.81014	Accepted
19	Male students have poor attitude towards mathematics	150	2.5400	.85137	Accepted
20	Male students have higher self concept when it comes to mathematics than females	150	2.4933	1.04108	Rejected
	Grand mean		2.2660	.47144	Rejected

The data presented in Table II shows that item 14, 18, and 19 has mean response values which ranges from 2.5000 to 3.2733 are all either at or above the benchmark of 2.5 and thus were all accepted. Their standard deviations range from .81014 to 1.04753 shows that their individual responses

are relatively not far from one another. However, item 11, 12, 13, 15, 16, 17, 20 has mean response values which ranges from 1.5600 to 2.4933 are all rejected since their mean response are below the benchmark of 2.5. Also their standard deviations range from .83930 to 1.08521 also shows that their individual responses are relatively not far from one another. The grand mean of 2.2660 implies that students' gender does not influence their self-concept in mathematics.

Ho$_1$: There is no significant influence of students' self-concept on their achievement in secondary school mathematics

TABLE III: DISTRIBUTION OF THE OBSERVED AND EXPECTED FREQUENCIES OF RESPONDENTS IN RESPECT TO THE INFLUENCE OF STUDENTS' SELF-CONCEPT ON THEIR MATHEMATICS ACHIEVEMENT.

S/N	Statement	SA	A	D	SD	Total
11	I am dependent as far as mathematics is concerned	23 (36.3)	69 (50.5)	33 (34.2)	25 (29)	150
12	I make good grades in mathematics	37 (36.3)	81 (50.5)	26 (34.2)	6 (29)	150
13	It is only people with special talent that can solve mathematics	19 (36.3)	14 (50.5)	44 (34.2)	73 (29)	150
14	I can't see any relevance in most of the mathematics work	17 (36.3)	41 (50.5)	39 (34.2)	53 (29)	150
15	My teacher thinks am good in mathematics	34 (36.3)	71 (50.5)	34 (34.2)	11 (29)	150
16	Mathematics is important in life	99 (36.3)	33 (50.5)	10 (34.2)	8 (29)	150
17	I am satisfied with my mathematics grades	37 (36.3)	42 (50.5)	38 (34.2)	33 (29)	150
18	Majority of students fail mathematics	53 (36.3)	61 (50.5)	22 (34.2)	14 (29)	150
19	Among the subjects taught, mathematics is my favourite	31 (36.3)	43 (50.5)	38 (34.2)	38 (29)	150
20	My friends think am not good in mathematics	13 (36.3)	50 (50.5)	58 (34.2)	29 (29)	150
	Total	**363**	**505**	**342**	**290**	**1500**

In table III above, the figures in the parentheses are the expected frequencies derived from the observed frequencies as noted in the method of data analysis.

TABLE IV: CHI-SQUARE DISTRIBUTION ON THE INFLUENCE OF STUDENTS' SELF-CONCEPT ON THEIR MATHEMATICS ACHIEVEMENT.

Observed values (O_i)	Expected values (E_j)	$(O_i - E_j)^2$	$(O_i - E_j)^2/E_j$
23	36.3	176.89	4.873
69	50.5	342.25	6.777
33	34.2	1.44	0.042
25	29	16	0.552
37	36.3	0.49	0.025
81	50.5	930.25	18.42
26	34.2	67.24	1.966
6	29	529	18.241
19	36.3	299.29	8.245
14	50.5	1332.25	26.381
44	34.2	96.04	2.808
73	29	1936	66.759
17	36.3	372.49	10.261
41	50.5	90.25	1.787
39	34.2	23.04	0.674
53	29	576	19.862
34	36.3	5.29	0.146
71	50.5	420.25	8.322
34	34.2	0.04	0.001
11	29	324	11.172
99	36.3	3931.29	108.3
33	50.5	306.25	6.064
10	34.2	585.64	17.124
8	29	441	15.207
37	36.3	0.49	0.013
42	50.5	72.25	1.431
38	34.2	14.44	0.422
33	29	16	0.552
53	36.3	278.89	7.683
61	50.5	110.25	2.183
22	34.2	148.84	4.352
14	29	225	7.759
31	36.3	28.09	0.774
43	50.5	56.25	1.114
38	34.2	14.44	0.422
38	29	81	2.793
13	36.3	542.89	14.956

50	50.5	0.25	0.004
58	34.2	566.44	16.563
29	29	0	0
Total			415.03

Chi – square (χ^2) calculated = 415.03

df = (r-1) (c-1)   from table III : r = 10, c = 4
= (10-1) (4-1) = 9(3) = 27.

Level of significance = 0.05.

Chi-square tabulated = χ^2 (27, 0.05) = 40.11

From the Table IV, one observes that, chi-square calculated is 415.03 while the Chi-square tabulated is 40.11at 0.05 level of significance and 27 as the degree of freedom (df).Since the calculated value 415.03 exceed the tabulated value 40.11 we then reject the null hypothesis. This implies that there is a significant influence of students' self-concept on their mathematics achievement.

Ho₂: There is no significant influence of gender on students' self-concept in mathematics.

TABLE V: T-TEST ON THE INFLUENCE OF GENDER ON STUDENTS' SELF-CONCEPT IN MATHEMATICS.

Students Gender	N	Mean	Std. Deviation	df	Sig (2-tailed)	Remarks
Male	75	2.3640	.44224	148	.060	NS
Female	75	2.1680	.48216			

The data presented in Table V shows that the aggregate mean responses of male and female respondents are 2.3640and 2.1680 with a total number of 75 and 75 respectively. The corresponding aggregate values of standard deviations are 0.44224 and 0.48216. The table reveals a t-value of 2.594 at 148 degree of freedom with a sig (2-tailed) or p-value of 0.06. Since the p-value (0.06) is greater than the criterion value (0.05), the null hypothesis is then accepted. Hence there is no significant influence of gender on students' self-concept in mathematics.

IV. DISCUSSION OF FINDINGS

The result from Table I revealed that students' self-concept has a significant influence on their mathematics achievement in secondary school. This means that the higher a student's self concept, the higher the achievement. This is in agreement with the findings of many researchers such as Areepattamanni and Freeman (2008), Naranjo (2007), Marsh and Craven, (2006), Lotfabadi (2004) that revealed from their various studies a clear positive relationship between self-concept and academic achievement of students. However, the findings of this study showed a divergence from the findings of Jen & Chien (2008) who claims that academic self concept does not influence academic achievement but rather past achievement influences the formation of academic self-concept.

The result of Table II revealed that gender does not influence students' self-concept in mathematics. This means that being a male or female does not affect a student's self-concept on mathematics. This finding is in line with the finding of Farooq and Shah (2008) who found from their different studies that there is no significant influence of gender on attitude towards and self- concept of students on mathematics. However the finding of this study disagrees with Andrea (2011), Tella & Tella (2005) who found that there is a significant influence of gender on self-concept of students in mathematics.

V. CONCLUSION

The study examined the influence of self-concept on secondary school students' academic achievement in mathematics. The study revealed that the students' self-concept influences their academic achievement in secondary school mathematics. It also shows that gender does not significantly influence the students' self-concept. The study concluded that students with positive or high self-concept will invariably have high achievement in mathematics. The converse is also true irrespective of gender.

VI. RECOMMENDATIONS

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

1. Students should develop a high self-concept in themselves.
2. Classroom teachers should use some teaching strategies that would boast students' academic self-concept will in turn promote academic achievement in mathematics.
3. The curriculum designers and the teachers should articulate well on the usefulness and applicability of mathematics in general so that students create positive minds towards the subject and subsequently strive to achieve higher.
4. Teachers, parents and the society at large should help both male and female students not to see mathematics as a unisex endeavor.
5. Teachers should provide the male and female students the enabling environment to learn and solve mathematical problems cooperatively in order to maintain equity in mathematics achievement.

COMPLIANCE WITH ETHICAL STANDARD

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DECLARATION OF INTEREST STATEMENT

The researchers do not have any conflict of interest.

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