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Motivation to Learning Mathematics and Gender as Correlates of Senior Secondary School Students' Performance in Mathematics

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This study investigated senior secondary school students' motivation to learning mathematics and gender as correlates of performance in mathematics. The sample consisted of 315 students from two government senior secondary schools in Lagos State, Nigeria using the quantitative research method within the blueprint of the descriptive survey research design. Data collected were analysed using percentages, means, standard deviation, independent samples t-test, Pearson Product Moment Correlation Coefficient (PPMCC) and standard and stepwise multiple linear regression analysis. Findings from the study revealed that there was a very high level of motivation to learn mathematics among senior secondary schools' students in Nigeria. There was a significant influence of gender on students' performance in mathematics but not on motivation to learn mathematics. It was also revealed that self-efficacy, gender and intrinsic motivation were the major significant predictors of performance in mathematics among the sample studied. Based on these findings, future studies in Nigeria should attempt to investigate the psychometric properties of the motivation to learn mathematics scale.

1. Introduction

Mathematics which involves rigorous processes and elaborate computations is often considered to be highly abstract and students tend to develop a phobia for it (Awofala, 2017; Awofala & Odogwu, 2017). The anxiety regarding mathematics is not unconnected to the reduced level of motivation in learning mathematics and motivation is considered an important key to achieving success in any human learning endeavor (Awofala & Falolu, 2017). Ogunmoyero and Omasheye (2012)

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assert that human beings are characterized by tendencies towards learning and thus, human beings are naturally teachable and curious. In spite of this, there is usually the need to motivate people for achieving success in learning. However, motivation arises as a result of drive towards a goal. The drive decreases once the goal has been achieved (Ng, 2018; Nguyen & Goodin, 2016; Taiwo, 2011).

According to Glynn and Koballa (2006), motivation is an internal state which involves the arousal, direction and sustenance of students' behaviour. This explains why students work hard to achieve high academic performance in science subjects. It also explains the depth and length of time involved in such endeavour and the feelings and emotions applied in achieving success in such subjects. Glynn and Koballa (2006) explain that 'motivation to learn' encompasses students' resolve to attach meaning and value to an academic activity with a view to obtaining the benefits accruing from such activity. In this regard, students need to be motivated and inspired in order to arouse and sustain their interests in learning mathematics. This is necessary in view of the abstractions and complexities involved in mathematical operations. The major dimensions of motivational constructs involved in the study of motivation to learn science (and by extension mathematics), consist of intrinsic and extrinsic motivation, goal orientation, self-determination, self-efficacy and assessment anxiety (Glynn & Koballa, 2006).

Intrinsic motivation usually occurs as a result of a student's internal drive for superior academic performance while extrinsic motivation occurs as a response to given external stimuli e.g. award, peer recognition and acceptance, teachers' praises and other positive reinforcements (Glynn & Koballa, 2006; Pintrich & Schunk, 2002; Posamentier, 2013). Intrinsic motivation involves a student's pursuit of personal interests and the 'exercise of capabilities' and this engenders deep internal satisfaction and joy (Glynn & Koballa, 2006; Ryan & Deci, 2000; Singh, Granville & Dika, 2002). Goal orientation comprises principally of learning goals and performance goals. Learning goals involves learning for the sake of having a full understanding of a subject. Students with learning goals will therefore seek to surmount the challenges and problems they are having with a subject and would go all out to seek help in order to enhance their performance in the subject. Performance goal on the other hand involves the pursuit of the self-esteem by the learner. A student with performance goal wants to gain the accolade of his peers and teachers with a view to enhancing his social status (Ng, 2018; Glynn & Koballa, 2006).

Self-determination encompasses the ability to make a choice out of the various options available and effectively have control over the option chosen and the methodology involved in actualizing the option so chosen. Students generally want to be involved in contributing to their teaching-learning procedure and learning outcomes, and would not want to lose control over such. Self-determination is directly related to, and effectively enhances intrinsic motivation (Glynn & Koballa, 2005; Glynn & Koballa, 2006; Nguyen & Goodin, 2016). Self-efficacy refers to the students' self-confidence about their ability to achieve high performance in a subject. It is the best predictor of the grades attainable in any

subject. Self-efficacy is also subject-specific i.e. a learner may achieve high self-efficacy in mathematics and low self-efficacy in chemistry (Glynn & Koballa, 2006; Zusho & Pintrich, 2003; Mavrikaki, Andressa, & Dermitzaki, 2015). While some students experience some level of trepidation (i.e. anxiety) in relation to their performance in mathematics (Awofala, 2017; Awofala & Odogwu, 2017), a moderate dose of anxiety is desirable in order to enhance motivation to learn mathematics. It will become excessive, however, when students are not well prepared for a subject upon which they are to be examined. The level of anxiety also differs from students to student based on personal differences. Thus, the level of anxiety may be higher in introverts (even if they are well prepared) than in extrovert (Glynn & Koballa, 2006; Cassady & Johnson, 2002) regardless of gender.

Another area of contention is the issue of gender difference in academic performance in mathematics (Awofala, 2017). Udousoro (2011) expresses gender as a cultural construct which explains the roles and behaviour together with the mental and emotional characteristics of males and females as ascribed by the society. This concept does not necessarily suggest the dominance of males over the females in academic performance and other human endeavour. However, there has always been the belief that boys tend to perform better than girls in mathematics. This stereotype is reinforced by the findings of Isaacson (1992) working with certain female students who believed that 'girls are considered weird when they love mathematics'. Recent researches have however revealed various mixes of performances in mathematics by both sexes at the primary and secondary school levels in different nations of the world (Awofala & Lawani, 2020; Awofala & Anyikwa, 2014; Lukenbill, 1995; Hyde & Mertz, 2009; Mubeen, Saheed & Arif, 2013).

Researches on the influence of gender differences in performance in mathematics in the United States of America and United Kingdom reveal that there is an insignificant difference in performance in mathematics due to gender at the elementary school level. However, studies revealed that the difference in performance in mathematics, in the two nations, widens at the high school level weighing in favour of male students (Lukenbill, 1995; Hyde & Mertzb, 2009; Penner & Paret, 2008). Udousoro (2011) revealed that male secondary school students in Nigeria achieve higher academic performance in mathematics than their female counterparts; due primarily to 'sex role stereotyping and differential valuation of male and female roles' as ascribed by the society. This position was corroborated by the findings of The National Assessment of Educational Progress (1992), as explained by Udousoro (2011), which revealed that male students within the age brackets of 9, 13 and 17 obtained higher scores in mathematics than the girls.

In Nigeria there are conflicting reports regarding gender differences in mathematics achievement and performance (Awofala, 2008a; Awofala, 2008b). First, some studies have shown significant effect of gender on achievement in mathematics in favour of boys (Awofala, 2011; Awofala, 2010; Akinsola & Awofala, 2009). Second, some studies indicated significant effect of gender on

achievement in mathematics in support of girls (Ozofor, 2001; Ogunkunle, 2007). Third, there are studies that showed no significant influence of gender on mathematics achievement (Awofala & Lawani, 2020; Arigbabu & Mji, 2004; Fatade, Nneji, Awofala & Awofala, 2012; Awofala & Anyikwa, 2014). Whereas the first and the second groups suggest the presence of differential experiences of boys and girls within and outside the mathematics classroom the third group explained that gender differences in achievement in mathematics are declining (Awofala, 2017). The major thrust of this research therefore was to assess senior secondary school students' motivation to learn mathematics as related to gender and performance in mathematics in Nigeria. In this research work the following questions were addressed:

RQ1: What is the level of motivation to learn mathematics among senior secondary school students in Nigeria?
RQ2: Is gender a factor in performance in mathematics and motivation to learn mathematics among senior secondary schools' students in Nigeria?
RQ3: What are the composite and relative contributions of dimensions of motivation (intrinsic motivation and extrinsic motivation, goal orientation, self-determination, self-efficacy, and assessment anxiety) and gender to the explanation of the variance in senior secondary schools students' performance in mathematics?

2. Methodology

This research work made use of quantitative research methods within the blueprint of the descriptive survey design (Awofala & Anyikwa 2014). The population of this study comprises the senior secondary school students in the Education District 4 of Lagos State covering Apapa, Mainland, and Surulere local government areas i.e. Zones 1, 2 and 3 respectively. The researchers adopted the purposive sampling procedure by choosing members of the sample of the study from two accredited senior secondary schools which were considered to possess the traits being studied. The sample size of this study comprises three hundred and fifteen (315) students drawn from the senior secondary year two (SS2) arm of two accredited secondary schools in Lagos Education District 4 with average age ranging from 14 to 16 years. These schools were chosen because of their records of higher performance in mathematics in public examinations. This performance was as result of the students' high level of motivation. The SS1 students were excluded from the sample because of inadequate performance records in mathematics; having just completed one term in senior class. SS3 students were also excluded because of their forthcoming engagements in Senior Secondary School Certificate Examination (SSCE) by both the West African Examinations Council and National Examinations Council which make them otherwise unavailable.

For the purpose of data collection, the primary data were collected through the use of the Science Motivation Questionnaire (SMQ) adapted from Glynn & Koballa (2006). The secondary data relating to the students' performance in mathematics

were obtained from the records of the schools. The adapted SMQ is a thirty-item instrument constructed on a 4 point scale ranging from Strongly Disagree (1), to Disagree (2), Agree (3) and Strongly Agree (4) with science replaced with mathematics in all the items.

The internal consistency reliability coefficient of the SMQ was computed using the Cronbach's Alpha (α) with a value of 0.81. The SMQ was administered on the students whose academic records in mathematics have been obtained by the researchers. The questionnaire was served to the students within the chosen sample of the population. Data analytical techniques used in this study include, percentages, means, standard deviation, independent samples t-test, Pearson product Moment Correlation Coefficient (PPMCC) and standard and stepwise multiple linear regression analysis. Data were subjected to preliminary analysis before proceeding to the main analysis. This was done to remove and fix any error during data coding and also to ensure data conformity to the underlying assumptions required for the parametric statistics.

3. Results and Discussion

Research Question One: What is the level of motivation to learn mathematics among senior secondary schools' students in Nigeria?

Table 1 below shows the overall motivation to learn mathematics among the students under review. Actual numbers and percentages for responses to each statement were shown in the table. The percentages were in parenthesis. The analyses in Table 1 showed that the students in the present study had a high motivation to learn mathematics as exhibited by the mean and standard deviation of 3.16 and 0.83 respectively. In relation to the dimension of intrinsic motivation, more than 90 percent (SA = 44.1 and A = 48.2) of the students asserted that they enjoyed learning mathematics; 75.6% (SA = 32.7 and A = 42.9) perceived learning to acquire knowledge in mathematics more important than the grade they receive; 81.7% (SA = 41.8 and A = 39.9) found learning mathematics interesting; 84.4% (SA = 38.3 and A = 46.1) liked mathematics because it is challenging to them; 93.3% (SA = 49.7 and A = 43.6) were of the opinion that understanding mathematics gives them a sense of accomplishment. According to Table 1 below, the students under review had a high level of intrinsic motivation to learn mathematics with mean and standard deviation of 3.23 and 0.78 respectively.

The extrinsic motivation dimension as shown in Table 1 revealed that more than 90 percent of the students being studied affirmed that they liked to do better than the other students in mathematics tests; considered earning a good grade in mathematics important; believed that learning mathematics can help them to pursue higher education. However, 74.1% were conscious of how their grades in mathematics affect their overall academic performance; 88.5% took interest in learning mathematics in order to help their future career. Table 1 below, showed that the students under review, exhibited high extrinsic motivation to learn mathematics with mean and standard deviation of 3.32 and 0.76 respectively.

According to Table 1 below, goal orientation dimension revealed that 80 percent of the students confirmed that learning mathematics is relevant to their personal goals, helpful in achieving their future endeavors, applicable to their lives and can help their future career. In Table 1 below, the students under review achieved high goal orientation to learn mathematics with mean and standard deviation of 3.14 and 0.71 respectively. The self-determination dimension (Table 1) showed that more than 80% of the students said if they had problems learning mathematics, they tried to find out why; 93.3% affirmed that they intensify efforts in learning mathematics; 89.1% employed strategies that facilitate their learning of mathematics; 90.6% confirmed that they prepared well for their mathematics tests. However, 56.2% were of the opinion that it is their fault if they do not understand mathematics. According to Table 1 above, the students under review obtained high self-determination to learn mathematics with mean and standard deviation of 3.11 and 0.82 respectively.

The assessment anxiety dimension as contained in Table 1 below, showed that 73.2% of the students were nervous about their performance in mathematics tests; 66.2% become anxious when it is time to take mathematics tests; 80.0% worry about failing mathematics tests; 78.0% were concerned that other students are performing better in mathematics. On the other hand, only 20.0% hate taking mathematics tests. According to Table 1 above, the students exhibited high assessment anxiety in mathematics with mean and standard deviation of 2.73 and 1.03 respectively. The self-efficacy measurement, as shown in Table 1 below showed that 94.9% of the students affirmed that they expected to do as well as or better than other students in mathematics; 89.4% asserted that they were confident that they will do well in mathematics assignments and projects; 92.6% believed they can master the knowledge and skills in mathematics; 91.4% were confident they will do well in mathematics tests; 93.0% believed they can earn an "A" grade in mathematics. Table 1 below shows that the students achieved high self-efficacy in mathematics with mean and standard deviation of 3.38 and 0.68 respectively. It is hereby concluded that the level of motivation to learn mathematics among senior secondary schools' students in Nigeria was very high given an average mean score of 3.16 *(based on the 4 point scale adopted in the questionnaires)* and a standard deviation of 0.83 as exhibited by the students under review.

Table 1. Descriptive analysis of students' level of motivation to learn mathematics

Intrinsic motivation	**SD**	**D**	**A**	**SA**	**M**	**STD**
I enjoy learning mathematics.	05 (1.6)	19 (6.1)	150 (48.2)	197 (44.1)	3.35	0.67
Learning to acquire knowledge in mathematics is more important to me than the grade I receive.	19 (6.1)	57 (18.3)	134 (42.9)	102 (32.7)	3.02	0.87
I find learning mathematics interesting.	16 (5.1)	41 (13.2)	124 (39.9)	130 (41.8)	3.18	0.85
I like mathematics because it challenges me.	14 (4.5)	34 (11.0)	142 (46.1)	118 (38.3)	3.18	0.80
Understanding mathematics gives me a sense of accomplishment.	3 (1.0)	18 (5.8)	136 (43.6)	155 (49.7)	3.42	0.65
Sub total					3.23	0.78

Extrinsic motivation						
I like to do better than the other students in mathematics tests.	6 (1.9)	18 (5.8)	149 (47.9)	138 (44.4)	3.35	0.68
Earning a good grade in mathematics is important to me.	3 (1.0)	6(1.9)	96 (30.6)	209 (66.6)	3.63	0.58
I think about how learning mathematics can help me to pursue higher education.	5 (1.6)	25 (8.0)	133 (42.4)	151 (48.1)	3.37	0.70
I think about how my mathematics grade will affect my overall academic performance.	25 (8.1)	55 (17.8)	119 (38.5)	110 (35.6)	3.02	0.93
I think about learning mathematics can help my future career.	9 (2.9)	27 (8.6)	157 (50.0)	121 (38.5)	3.24	0.73
Sub total					3.32	0.76
Goal orientation						
Learning mathematics relates to my personal goals.	12 (3.9)	35 (11.3)	169 (54.5)	94 (30.3)	3.11	0.75
I think about how mathematics will be helpful to my future endeavour.	12 (3.9)	23 (7.3)	165 (52.5)	114 (36.3)	3.21	0.74
I think about how I will use the mathematics I am learning.	10 (3.2)	36 (11.2)	200 (64.9)	62 (20.1)	3.02	0.67
Mathematics is relevant to my life.	8 (2.6)	36 (11.7)	164 (53.4)	99 (32.2)	3.15	0.72
Mathematics has practical values for me.	6 (1.9)	23 (7.4)	187 (59.9)	96 (30.8)	3.20	0.65
Sub total					3.14	0.71
Self determination						
If am having trouble learning mathematics, I try to find out why.	16 (5.1)	30 (9.6)	153 (49.2)	112 (36.0)	3.16	0.80
I put efforts into learning mathematics.	4 (1.3)	17 (5.4)	152 (48.7)	139 (44.6)	3.37	0.65
I use strategies that ensure that I learn mathematics well.	8 (2.6)	26 (8.3)	181 (57.8)	98 (31.3)	3.18	0.68
It is my fault if I do not understand mathematics.	58 (18.8)	77 (25.0)	117 (38.0)	56 (18.2)	2.56	1.00
I prepare well for my mathematics tests.	4 (1.3)	25 (8.1)	160 (51.8)	120 (38.8)	3.28	0.67
Sub total					3.11	0.82
Assessment anxiety						
I am nervous about how I will in mathematics tests.	29 (9.2)	54 (17.2)	138 (43.9)	93 (29.6)	2.94	0.92
I become anxious when it is time to take mathematics tests.	31 (9.9)	75 (24.0)	131 (41.9)	76 (24.3)	2.81	0.92
I worry about failing mathematics tests.	32 (10.3)	30 (9.7)	104 (33.5)	144 (46.5)	3.16	0.98
I am concerned that other students are performing better in mathematics.	19 (6.1)	49 (15.9)	158 (51.1)	83 (26.9)	2.99	0.82
I hate taking mathematics tests.	151 (48.7)	97 (31.3)	42 (13.5)	20 (6.5)	1.78	0.91
Sub total					2.73	1.03
Self-efficacy						
I expect to do as well as or better than other students in mathematics.	2(0.6)	14 (4.5)	131 (41.9)	166 (53.0)	3.47	0.62
I am confident that I will do well in mathematics assignments and projects.	9(2.9)	24 (7.7)	139 (44.4)	141 (45.0)	3.32	0.74
I believe I can master the knowledge and skills in mathematics.	6(1.9)	17 (5.4)	160 (51.3)	129 (41.3)	3.32	0.67

I am confident I will do well in mathematics tests.	6(1.9)	21 (6.7)	150 (47.9)	136 (43.5)	3.33	0.69
I believe I can earn an "A" grade in mathematics.	5(1.6)	17 (5.4)	122 (39.0)	169 (54.0)	3.45	0.67
Sub total					3.38	0.68
Total					3.16	0.83

Research Question Two: Is gender a factor in performance in mathematics and motivation to learn mathematics among senior secondary school students in Nigeria?

Table 2. Independent samples t-test analysis of dimensions of motivations to learn mathematics and students' scores in mathematics according to gender

Variables	Gender	N	M	SD	Df	t	p	Cohen's d
Mathematics performance	Male	171	69.24	12.56	313	3.64	0.00	0.42
	Female	144	64.59	9.55				
Intrinsic motivation	Male	171	16.15	2.90	313	1.42	0.16	0.16
	Female	144	15.69	2.70				
Extrinsic motivation	Male	171	16.39	2.30	313	0.69	0.49	0.08
	Female	144	16.56	2.05				
Goal orientation	Male	171	15.50	2.75	313	0.30	0.77	0.03
	Female	144	15.41	2.45				
Self- determination	Male	171	15.27	2.32	313	0.53	0.60	0.06
	Female	144	15.40	2.13				
Assessment anxiety	Male	171	13.26	2.96	313	1.79	0.08	0.20
	Female	144	13.81	2.39				
Self-efficacy	Male	171	15.53	2.30	313	0.70	0.48	0.01
	Female	144	15.55	2.28				

In Table 2 above the descriptive statistics of mean, standard deviation and t-test values revealed the performance in mathematics and the dimensions of motivation to learn mathematics by male and female students. With respect to the aggregate mathematics score, male students (M=69.24, SD= 12.56) performed significantly better than their female counterparts (M=64.59, SD=9.55) as shown by the t =3.642 (df=313, p = 0.000, d=0.42). From the same table male students recorded slightly higher mean score (M=16.15, SD=2.90) in intrinsic motivation than their female counterparts (M=15.69, SD=2.70). However, this difference was not statistically significant (t_{313} =1.421, p=0.156, d=0.16). Also in table 2, female students recorded slightly higher mean score (M=16.56, SD=2.05) in extrinsic motivation than their male counterparts (M=16.39, SD=2.30), but the difference was not statistically significant (t_{313}=0.88, p=0.492, d=0.08). With respect to goal orientation, male students recorded slightly higher mean score (M=15.50, SD=2.75) than their female counterparts (M=15.41, SD=2.45), however, this difference in mean score was not statistically significant (t_{313}=.295, p=.768, d=0.03).

Results on self-determination in table 2 revealed that female students recorded slightly higher mean score (M=15.40, SD=2.13) in self- determination than male

counterparts (M= 15.27, SD=2.32) with the difference in mean score not statistically significant (t_{313}=0.530, p=.597, d=0.06). Similarly, findings on assessment anxiety in table 2 revealed that female students recorded slightly higher mean score (M=13.81, SD=2.39) in assessment anxiety than their male counterparts (M= 13.26, SD=2.96), but the difference in mean score was not statistically significant (t_{313}=1.785, p=.075, d=0.20). Likewise, findings on self-efficacy in table 2 revealed that female students recorded slightly higher mean score (M=15.55, SD=2.28) in self-efficacy than their male counterparts (M= 15.53, SD=2.30) and the difference in mean score was not statistically significant (t_{313}=0.703, p=.483, d=0.01). Thus, we concluded that gender was a significant factor in students' performance in mathematics. However, gender did not significantly influence students' motivation (i.e. intrinsic and extrinsic motivation, goal orientation, self-determination, assessment anxiety and self-efficacy) to learn mathematics among senior secondary school students under review.

Research Questions Three: What are the composite and relative contributions of dimensions of motivation to learn mathematics (intrinsic motivation, extrinsic motivation, goal orientation, self- determination, assessment anxiety and self-efficacy) and gender to the explanation of the variance in the students' performance in mathematics?

The results in Table 3 below revealed the relationship between and among the various dimensions of motivation, gender and performance in mathematics. Table 3 showed that there was a significant negative correlation between gender and students' mathematics scores (r=-.202, p<.001). However, none of the various dimensions of motivation had a significant correlation with gender. We also observed in Table 3 below that mathematics score had a significant positive correlation with intrinsic motivation (r=.251, p<.001), extrinsic motivation (r=.128, p<.05) and self-determination (r=.164, p<.001). It, however, exhibited significant negative correlation with assessment anxiety (r=-.118, p<.05) and self-efficacy (r=-.255, p<.001). On the other hand, no statistically significant correlation was observed between mathematics score and students' goal orientation.

Table 3. Correlation matrix of the relationship between dimensions of motivations to learn mathematics, gender and students' academic performance in mathematics

	1	2	3	4	5	6	7	8
1. Gender	1							
2. Math Score	-.20**	1						
3. Intrinsic Motivation	-.08	.25**	1					
4. Extrinsic Motivation	.04	.13*	.57**	1				
5. Goal Orientation	-.02	.11	.61**	.56**	1			
6. Self-Determination	.03	.16**	.54**	.47**	.46**	1		
7. Anxiety Assessment	.10	-.12*	-.06	.10	-.01	.05	1	
8. Self-Efficacy	.04	-.26**	-.60**	-.51**	-.52**	-.49**	.10	1

***p < .001, *p <.05*

Furthermore, in Table 3 above intrinsic motivation had a moderate positive relationship with extrinsic motivation (r=.569, p<.001), goal orientation (r=.605, p<.001), self- determination (r=.0.542, p<.001) and a weak negative relationship with self-efficacy (r=-.600, p<.001). Nevertheless, no statistically significant correlation was observed between intrinsic motivation and assessment anxiety. Table 3 above also revealed that extrinsic motivation had a moderate positive correlation with goal orientation (r=.560, p<.001), self-determination (r=.473, p<.001) and a weak negative relationship with self-efficacy (r=-.512, p<.001). Nevertheless, no statistically significant correlation was observed between extrinsic motivation and assessment anxiety. The findings also showed that goal orientation had a moderate positive relationship with self-determination (r=.456, p<.001), and a weak negative relationship with self-efficacy (r=-.521, p<.001). Nevertheless, no statistically significant correlation was observed between goal orientation and assessment anxiety.

The results in Table 4 below show that the independent variables (gender, intrinsic motivation, extrinsic motivation, goal orientation, self-determination, assessment anxiety and self-efficacy) jointly contributed a coefficient of multiple regression of 0.356 and a multiple correlation square of 0.127 to the prediction of students' performance in mathematics. By implication, only 12.7% of the total variance of the dependent variable (performance in mathematics) was accounted for by the combination of the seven independent variables. The result further revealed that the analysis of variance of the multiple regression data produced an F-ratio value significant at 0.001 level ($F_{(7, 307)} = 6.381$, $p<0.001$).

Table 4: Model summary, coefficient and t-value of standard regression analysis of students' motivation to learn mathematics, gender and outcome measure in mathematics

Model Summary
Multiple R = 0.356
Multiple R^2 = 0.127
Multiple R^2 (Adjusted) = 0.107
Standard error Estimate = 10.872
$F_{(7, 307)} = 6.381$, *p<0.001*

Model	**Unstandardized coefficients**		**Standardized coefficients**	**T**	**Sig.**
	B	**Std. Error**	**Beta**		
(Constant)	73.909	8.081		9.146	0.000
Gender	-4.069	1.247	-0.176	3.263	0.001
Intrinsic motivation	0.699	0.324	0.171	2.156	0.032
Extrinsic motivation	-0.031	0.379	-0.006	0.081	0.936
Goal orientation	-0.470	0.319	-0.107	1.476	0.141
Self-determination	0.250	0.347	0.048	0.720	0.472
Assessment anxiety	-0.322	0.232	-0.076	1.388	0.166
Self-efficacy	-6.849	2.851	-0.173	2.402	0.017

The result of the relative contribution of the independent variables to the prediction of senior secondary students' performance in mathematics showed that gender was the most potent significant contributor to the prediction of students'

academic performance in mathematics (β= -0.176, t = 3.263, p<0.001), while self-efficacy made the next significant negative contribution to the prediction of the dependent variable (β = -0.173, t = 2.402, p<0.001). This was followed by intrinsic motivation (β = 0.171, t = 2.156, p<0.05) with a positive contribution to mathematics performance. Extrinsic motivation (β = -0.006, t = 0.082, p>0.05), goal orientation (β = -0.107, t = 1.476, p>0.05), self-determination (β = 0.048, t = 0.720, p>0.05), assessment anxiety (β = -0.076, t = 1.388, p>0.05) did not make any significant contribution to the prediction of students' academic performance in mathematics. According to the standardized coefficients the regression model is as follows: Performance in mathematics$_{predicted}$ = 73.91 - 4.069 gender + 0.699 intrinsic motivation - 0.031 extrinsic motivation - 0.470 goal orientation +0.250 self-determination – 0.322 assessment anxiety - 6.849 self-efficacy.

A stepwise regression analysis was used to determine the contribution of each of these variables in predicting students' performance in mathematics. A reduced model explaining the predictive capacity of the three variables (gender, intrinsic motivation and self-efficacy) on students' performance in mathematics is outlined in Table 5 below. Model 1 which includes self-efficacy scores accounted for 6.5% of the variances in students' performance in mathematics. The inclusion of gender into Model 2 resulted in 10.2% of the variance being explained. This means that gender alone accounted for 3.7% of the variance in students' performance in mathematics. More so, the addition of intrinsic motivation in Model 3 resulted in 11.4% of the variance being explained. This means that intrinsic motivation alone accounted for 1.2% of the variance in students' performance in mathematics. Consequently, self-efficacy, gender and intrinsic motivation accounted for 6.5%, 3.7% and 1.2% variations in students' academic performance in mathematics respectively. Thus, 1.3% contribution to the prediction in performance in mathematics was accounted for by the other independent variables though this was adjudged not statistically significant. Therefore, the remaining 87.3% is to be accounted for by other factors not considered in the study.

Table 5. Summary of stepwise regression model with self- efficacy, gender and intrinsic motivation entered in the final model to explain students' performance in mathematics.

Model	Independent Variable	B	SEB	B	t	p	R	R^2	F	P
1	Constant	72.58	1.33		54.55	0.00	0.26	0.07	21.70	0.00
	Self-Efficacy	-10.10	2.17	-0.26	-4.66	0.00				
2	Constant	78.86	2.19		35.99	0.00	0.32	0.10	17.64	0.00
	Self-Efficacy	-9.80	2.13	-0.25	-4.60	0.00				
	Gender	-4.42	1.24	-0.19	-3.57	0.00				
3	Constant	67.84	5.77		11.76	0.00	0.34	0.11	13.30	0.00
	Self-Efficacy	-6.52	2.65	-0.16	-2.46	0.01				

Gender	-4.24	1.24	-0.18	-3.44	0.00
Intrinsic Motivation	0.56	0.27	0.14	2.06	0.04

The results of the present study revealed that there was a high level of motivation to learn mathematics among senior secondary school students in Nigeria. The students under review exhibited high level of enthusiasm and interest in learning mathematics as explained by their high scores on the dimensions of motivation *(i.e. intrinsic motivation, extrinsic motivation, goal orientation, self-determination, assessment anxiety and self-efficacy)* being tested as shown in Table 1. This result supported the study of Areepattamannil, Freeman and Klinger (2011) which revealed that Indian students who migrated to Canada had a higher motivation and academic achievement level than Canadian students. However, it is instructive to note that female students exhibited higher level of assessment anxiety than their male counterparts in the present study. In all, the students achieved a mean score of 3.16 *(based on the 4 point scale adopted in the questionnaires)* and a standard deviation of 0.83 signifying very high level of motivation to learn mathematics.

The findings on the gender difference in performance in mathematics and motivation to learn mathematics showed a different mixes of results based on the independent t-test analysis in Table 2. The results of this study showed that male students achieved significantly better than their female counterparts in mathematics performance. This is in agreement with the findings of a previous study which establish that there is a significant difference in the performance of male and female students in mathematics in favour of the male subset (Awofala, 2010; 2011; Akinsola & Awofala, 2009). However, the result is at variance with other findings as well (Awofala & Anyikwa, 2014; Awofala & Lawani, 2020). This significant influence of gender on students' performance in mathematics may be as a result of gender stereotyping of mathematics (Kane & Mertz, 2012; Awofala, 2017) as a masculine domain which is prevalent in Nigeria. More so, the difference may be attributed to differential treatment of both male and female students which in most cases favoured the male gender in the mathematics classroom (Awofala, 2017). The significant correlation between performance in mathematics and intrinsic motivation, extrinsic motivation, self-determination, assessment anxiety and self-efficacy coincided with the findings of Awofala and Falolu (2017). On the dimensions of motivation, female students scored higher than male students on extrinsic motivation, self-determination, assessment anxiety and self-efficacy; while the male subset scored higher on intrinsic motivation and goal orientation. These differences in mean scores between male and female students regarding the dimension of motivation to learn mathematics were however not statistically significant. However, it is noteworthy that the correlations established between gender and the dimensions of motivation were not statistically significant.

The present study showed that gender, intrinsic motivation and self-efficacy are good predictors of senior secondary school students' performance in mathematics.

This result coincided with the finding of Komarraju, Karau and Schmeck (2009) in which they found that amotivation and intrinsic motivation were the best predictors of achievement. This result corroborated the widely accepted finding that there are significant relationships between motivation and student achievement (Yazici & Altun, 2013; Azizoglu, Aslan, & Pekcan, 2015) and that motivation has a vital role in student achievement (Karagüven, 2012; Kaya, 2013). However, the result disagreed with the finding that academic motivation is not a significant predictor of GPA in Turkish and US students (Çetin, 2015). According to Bandura (1997) students with high self-efficacy move with the consciousness that tasks can be accomplished and have high tendency to actualize the tasks whereas students with low self-efficacy are prone to avoiding tasks because they always believe that the tasks cannot be accomplished. Intrinsically motivated students do not need to be forced, pressured or intimidated to be serious in their school work, they do the right things: assignments, reading, etc. at the right time and they are not easily discouraged (Awofala & Falolu, 2017).

4. Conclusion

It should be noted that the findings from this present study may not be used for generalization to all senior secondary school students in Nigeria as the sample size was not necessarily representative of all senior secondary school students in Nigeria. In spite of the small sample size (n=315), it is instructive to note that the composite and relative contributions of the independent variables (gender, intrinsic motivation, extrinsic motivation, goal orientation, self-determination, assessment anxiety and self-efficacy) to the explanation of variance in performance in mathematics was somewhat low and inadmissible for generalization. The 87.3% of the variance in performance in mathematics being unexplained by current data showed that there might be other independent variables requiring further investigation on their contribution to the prediction of senior secondary schools students' performance in mathematics. The present study was based on the use of Science Motivation Questionnaire (SMQ) adapted from Glynn and Koballa (2006) which were first used in an environment that was culturally diverse from our environment. This may have contributed to the inconclusiveness of the factor analysis which was planned to be part of the findings of this study; and the low composite and relative contributions of the independent variable to the variance in the performance in mathematics. It should also be noted that the responses of the students may have been tainted by personal biases.

In spite of the observation made above, it should be noted that the present study has gone a long way in exposing the motivation of senior secondary school students to learn mathematics and the impact of gender and the dimensions of motivation on senior secondary school students' performance in mathematics. Thus, the findings from this study could serve as a baseline for future study on the impact of gender and the dimensions of motivation on senior secondary school students' performance in mathematics in Nigeria.

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