EXAMINING ACHIEVEMENT GOAL ORIENTATION AND SELF-CONCEPT AS PREDICTORS OF SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN MATHEMATICS IN ANAMBRA STATE, NIGERIA

EMESI KINGSLEY, EKENE & ANYANWU ADELINE, NNE
Department of Educational Foundations Faculty of Education,
Nnamdi Azikiwe University Awka Anambra State

ABSTRACT

Achievement goal orientation and academic self-concept to be considered as adaptive learning behaviours have been a debated in educational psychology research. The study aimed to examine achievement goal orientation, and academic self-concept as predictors of secondary school students' academic achievement in Mathematics in Anambra State. Four research questions and three null hypotheses guided the study. The study adopted predictive correlational research to provide answers to the research questions and testing of the hypotheses. The population of the study comprised 21204 from which a sample of 750 was drawn. Multi-stage procedure was used to select the sample. Standardized research instruments namely; Achievement Goal Orientation Questionnaire (AGOQ) and Self-Description Questionnaire (SDQ) were used for data collection. Students' Mathematics Achievement Scores (SMAS) from the state-wide promotion examination were used to represent mathematics achievement. Cronbach's alpha was used to determine the reliability of the items in the instruments. A reliability index of 0.84, 0.72, 0.86, 0.74 and 0.87, for mastery-approach, mastery-avoidance, performance-approach, performance-avoidance and academic self-concept respectively. The standard multiple regression was used to analyze the collected data. The research question 1 was answered using multiple regression. Research question 2 was answered using unstandardized β. Research question 3 was answered using adjusted R^2. Research question 4 was answered using standardized β. The null hypothesis 1 was tested using the F-test for the regression model. The null hypothesis 2 was tested using a t-test for adjusted R^2. The null hypothesis 3 was tested using a t-test for β at a .05 level of significance. Findings showed that students' achievement goal orientation and academic self-concept scores jointly predicted their academic achievement scores in mathematics. It was indicated that mastery avoidance, and work avoidance, relatively and significantly predicted academic achievement in mathematics, while mastery-approach, performance approach, performance avoidance and academic self-concept do not relatively and significantly predict academic achievement in mathematics. Finally, it was recommended that students should adopt achievement goal orientation and academic self-concept in their learning process since the variable had jointly predicted achievement scores in mathematics.

Keywords: Achievement Goal Orientation, Academic Self-Concept and Academic Achievement.

1.0 INTRODUCTION

The rate of development of any nation is fundamentally determined by the actualization of her educational goals through effective teaching and learning. No policy on education can be formulated without first identifying the overall philosophy and goals of the nation. The Federal Republic of Nigeria (FRN, 2013) in presenting the Transformation Agenda states the new philosophy of Nigerian government as fiscal consolidation and optimization; strong, inclusive, non-inflationary growth and job creation. Thus, the Nigerian education system is the firm base upon which modern advances in human development depends. This could restructure the students' academic mindset to strive for higher academic achievement. Although, statistics had revealed that students who scored five credits and above including Mathematics and English in Anambra State total 30,094, with 19,109 female students and 14,985 male students which made state to be considered the best in May/June WASSCE 2022. Despite this, is quite acceptable that report from WASSCE achievement does not represent the real individual students' success in mathematics. As a result of poor achievement of students in the mathematics domain despite the above general statistics, parents and the significant others had lamented on this abysmal result of their children at the secondary school mathematics examination in Anambra State. The situation has really attracted the interest and concern of teachers, psychologists, researchers, parents and school administrators in Nigeria (Emesi & Anyanwu, 2022).

Apparently, active involvement of learners through the effective teaching and learning processes will bring a positive change in students' mathematics achievement when proper attention is being paid to achievement goal orientation and academic self-concept of the students. For example, the study of Niepel, Brunner, and Preckel (2014) indicated that achievement goal orientation and academic self-concept deal with the concerns or reasons why students choose to achieve academically. The variables represent patterns of beliefs that describe different ways of approaching, engaging and responding to success situations. Therefore, achievement goal orientation and academic self-concept are representing the innate potentialities that motivate students to adjust and strive for success in academic settings. Importantly, achievement goal orientation and academic self-concept are presumed to differ as a function of situational demands, also vary across individual (Ames & Archer, 2007). As a result of their association, they can be described as the underlying link to students' academic success. The changes that occur within the self of an individual is linked with the interplay that exists between achievement goal orientation and academic self-concept. This could influence and predict students' academic behaviour in the classroom situation.

Scholars believed that achievement goal orientation is partly rooted in achievement motivation, which can be conceptualized as personality predictor, facilitator and robust indicator of behavioural outcomes (Mottus, Baumert, & Back, 2020). The scholars noted that the motivation students have towards engaging in academic activities is directed by a complex set of achievement motivation which achievement goal orientation is representing. Cognitively, it is an individual's general schema or theory for approaching the task, doing the task and evaluating the performance on the task. Interestingly, achievement goal orientation is an integrated pattern of beliefs that leads to different ways of approaching, engaging in and responding to achievement situations (Ames, 1992). This is to prove that the students' motivation for studying is intrinsically oriented. For example, students seem to be heavily influenced by their individualized inherent learning beliefs such as those with task oriented and ego oriented learning behaviours. Urdan and Maehr (1995) fundamentally described

achievement goal orientation as cognitive representation of the different purposes students adopt for their learning in achievement situation. That is, students who endorsed achievement goal orientation pattern of learning in the classroom want to develop academic competence and demonstrate their competence to others through social comparison.

Precisely, Dweck and Leggett, (1988) described achievement goal orientation as individually perceived reasons or purposes for wanting to achieve or not to achieve in any academic task. This type of goal orientation has been conceptualized as catalysts that direct energy for the realization of desired behavioural outcomes. It indicated that the pursuit of qualitatively different achievement goal orientation provides an interpretive framework that results in different patterns of emotional, behavioural and cognitive responses. That is to say that motivation in school can be understood by looking at the reasons or purposes students adopt while engaged in the academic work.

It showed that achievement goal orientation is a comprehensive semantic system of situations or contexts that has cognitive, emotional and behavioural outcomes which learners could use to interpret their performances. For this reason, Dweck and Legget (1988) insisted that achievement goal orientation represents the purpose or cognitive-dynamic focus of competence-relevant behaviour and the tradition of this goal orientation emphasized mostly on mastery goal and performance goal. That is the purposes or reasons an individual has endorsed in pursuing achievement task, could be either for mastery effort purposes or for performance competence purposes.

Apparently, Elliot and McGregor (2001) assert that achievement goal orientation would represent a structured knowledge, unit, or subjective personal conception, assumption/schema about the purposes for an achievement task as well as other elements in terms of how success, competence, the role of effort, ability, errors and standards for evaluation are defined. This, usually described students' beliefs in involvement with schooling, academics activities, or learning that deals with bahaviour and emotions that encompasses effort and persistence in school work. It is on this assumption that Elliot and McGregor (2001) bifurcated achievement goal orientation into four clusters; such as master-approach, mastery-avoidance, performance-approach, and performance-avoidance.

Precisely, mastery-approach goal orientation focuses on the development of competence through task mastery. Mastery-avoidance goal orientation deals with trying to avoid being incompetence relative to the task or personal standard. Performance-approach goal orientation deals with trying to attain competence relative to one's peers. While performance-avoidance goal orientation deals with trying to avoid being incompetent relative to one's peers. In addition to these four clusters of achievement goal orientation, Elliot and Harachkieicz (2006) introduced a fifth type of achievement goal orientation which was identified as work-avoidance goal orientation. From the perspective of the scholars, work-avoidance goal orientation described a student that tries to do as little as necessary to get his/her set goal. Students that endorse this goal orientation seek to complete their work with minimum effort. The researchers on this note, defined achievement goal orientation as dispositional preferences that has the attributes to motivate, guide and direct the students to approach, engage and respond to academic learning situation.

Suffice it to say that these qualitatively different types of achievement goal orientation were expected to yield differential effects on students' learning and achievement, but this has failed to provide strong evidence in the Nigerian academic literature. The question is could students effectively utilize these achievement goal orientation clusters relatively with their academic self-concept in the process of learning to jointly predict their academic achievement?

Historically, Rosenberg (1979, p.7) colloquially defined the composite view of self-concept as the totality of the individual's thoughts, feelings and having reference to oneself as an object. This definition has formed the theoretical foundation of contemporary self-concept research that paved way for the emergence of academic self-concept. It shows that self-concept is organized, multifaceted, hierarchical, stable, developmental, evaluative and differentiable. It is on this view that Valentine, Dubois and Cropper (2014) described academic self-concept as students' self-perception of their academic ability formed through individual experiences and interactions within the school environment. It is an indication that academic self-concept is formed and developed through interactions with students' significant others such as parents, teachers and peers, therefore dynamic as a student progresses through schooling. According to Obilor (2011), perceptual psychologists postulated that all persons create their own reality through their perceptions of what they belief to be real. It means that a person's behaviour is contingent on how an individual perceives and interprets his/her experiences. Thus, from the perspective of the perceptual psychology, it is clear that to understand an individual's behaviour, we need to know how that individual perceives and interprets his/her experiences. In relation with Obilors' view, Shavelson, Hubner and Stanton (2006) described academic self-concept as the totality of the cognitive beliefs that people have developed about themselves, which may represent everything that is known about their academic self. This means that academic self-concept is the mental representation of one's academic ability that forms the internal beliefs system which one has for one's academic ability.

Apparently, Rayner and Devis (2018) identified some key antecedents to the formation of academic self-concept such as; frames of reference, causal attribution, reflected appraisals from significant others, mastery experiences, and psychological centrality. For example, frames of reference deals with the standards against which to judge one's own traits and accomplishments. Causal attribution is the factor to which people attribute their successes and failures that are hypothesized to influence descriptive and affective aspect of their academic self-concept. Reflective appraisals from significant others describes the view people have as they imagine how others view them, i.e., the make-up of reflected appraisals from the significant others. Mastery experience described how self-schemas are created from individuals past experiences in a particular domain. Psychological centrality claims that self-concept is based on self-assessments of qualities that perceived as important or psychologically central by individuals.

In other words, to appreciate students' academic achievement, scholars need to understand how students perceive and interpret school and school subjects by investigating their academic belief systems such as academic self-concept and achievement goal orientation. In respect to the above perspectives, the researchers operationally defined academic self-concept as an internal personality construct that represents the beliefs and dispositions for one's academic ability. However, the nature of association that exists between achievement goal orientation and academic self-concept may have a link with students' academic achievement.

Interestingly, students' academic achievement is a fundamental priority and concern of all countries. Academic success of students enriches the human resources of the society and guarantees the future development of a country. In contrast, educational failures make communities impossible to use their potential of human capital and endanger the sustainable development in addition to great monetary losses (Bahrami & Bahrami, 2015). This is because, preparing of individuals to acquire knowledge and skill and training of man power is the main task of education system.

Importantly, the nature of students' personality construct that is adaptive to learning such as positive academic self-concept and achievement goal orientation that students brought into the classroom are among the most influential factors that determine the motivational propensity to engage in learning and achievement. This could be traceable from the academic achievement of the students. Relatively, Adeyinka, Adedeji and Olufemi (2011) described academic achievement as the attainment of success of a student in his school work among his classmates. It shows that academic achievement deals with the ability of the students to study and remember facts and being able to communicate their knowledge orally or in written form even in an examination condition. This success could be actualizing when the students' academic self-concept and achievement goal orientation are in positive condition to represent a psychologically healthy individual. On this note, academic achievement stands as a measurable index that depicts students' cognitive, affective and creative ability being observed in the learning situation. In addition to that, academic achievement is observed and measured aspects of a student's mastery of skills and subject contents that was evaluated with tests (Joe, Kpolovie, Osonwa & Werima, 2014). Supporting the above review, scholars in the present study strongly believed that academic achievement is an important educational outcome because achievement is considered as an affirmation of academic self-progress. For the purpose of this study, the researchers operationally defined academic achievement as the overall measure of students' cognitive, social, emotional, and creative outcomes that represent an indication of success or failure in the academic context irrespective of the academic domain.

Interestingly, many studies have examined the relationship that exists among these variables of study. For example, the study of Matos, Lens, and Vansteenkiste (2007) reported that mastery-approach, was positive and significantly associated with academic achievement. The study of Niepel, et al (2014) indicated that performance-approach, performance-avoidance and mastery goals were positively related with academic achievement. Also, it was noted in their study that performance-approach was positively related to academic self-concept, whereas performance-avoidance showed a negative relationship with academic self-concept. In their study, mastery goal orientation did not significantly predict academic self-concept. There was a positive predictive link between academic achievement and changes in mastery-goal orientation. In terms of predicting the academic achievement, the variables did not examine the jointly predictive nature of these variable on academic achievement scores of the students. This is one of the critical issues which the present study had sought to examine.

In the study of Anyanwu and Emesi (2020) it was indicated that mastery-approach, mastery-avoidance and performance-approach were low positively related to academic achievement, but performance-avoidance and work-avoidance were very low positively related to academic achievement. In Anyanwu and Emesi's study, the dimensions of achievement goal orientation were positively and significantly related with academic achievement. In another study,

Anyanwu and Emesi (2021) revealed a very low negative relationship between students' academic self-concept and their academic achievement in English language. The study of Emesi, Anyanwu and Ezenwosu (2022) revealed that clusters of achievement goal orientation were among the variables that relatively and jointly predicted students' academic achievement in English language. Also, the seven assumptions that were tested in their indicated that none violated the guiding rules for assumption testing which showed that the variables were fit and accurate to represent students' adaptive learning behaviour. The study of Obi, Onyegirim, Ani and Ebe (2017) recorded low negative relationship between students' academic self-concept and their academic achievement in English language. Their study also indicated that there was a significant relationship between students' self-concept and their academic achievement. The study of Sayid (2011) indicated that students' academic self-concept powerfully and positively predicted their general academic performance in literature and mathematics. The study of Obilor (2011) indicated that there is a significant positive relationship between students' mathematics self-concept and their academic achievement in mathematics. The study of Wong (2002) previously revealed that mathematics achievement was closely related with self-concept. One major problem with the affirmation studies is that they did not concentrate on predicting the relative and composite contribution of achievement goal orientation and academic self-concept scores on the academic achievement scores of the students which is the paramount reason for the present study.

Therefore, the paucity of studies on how students' achievement goal orientation and self-concept could relatively and jointly relate to predict academic achievement in mathematics in Anambra State, Nigeria is the major aim of the present study. On this back drop, the present study sought to examine achievement goal orientation and academic self-concept as predictors of secondary school students' academic achievement in mathematics in Anambra State, Nigeria.

1.1 Research Questions

The following research questions guided the study.

1. To what extent are the assumptions of multiple regression for predicting students' academic achievement scores in mathematics using achievement goal orientation and self-concept scores were met?
2. What is the nature of the regression equation for predicting students' academic achievement scores in mathematics using achievement goal orientation and self-concept scores?
3. Which of the independent variables predicts such as achievement goal orientation and self-concept scores students' academic achievement scores in mathematics?
4. What is the unique contribution of achievement goal orientation and self-concept scores to predict students' academic achievement in mathematics scores?

1.2 Hypotheses

The following null hypotheses were tested at .05 level of significance.

1. The regression equation does not significantly predict students' academic achievement scores in mathematics using scores.

2. Achievement goal orientation and self-concept scores do not significantly predict students' academic achievement scores in mathematics.
3. The unique contributions of achievement goal orientation and self-concept scores to predict students' academic achievement in mathematics scores is not significant.

2.0 METHOD

The researchers used a predictive correlational research design and questionnaires to collect data for the study. The population of the study consisted of 21204 being the total number of students in senior Anambra State. A sample size of 750 questionnaires were administered to respondents and collected for data analysis. Multi-stage sampling procedure was used to select the respondents. The procedures for the selection were as follows: In stage one, three education zones were selected from the six education zones in the state by simple random sampling. Then in stage two, from each sampled education zone, one local government area (L.G.A) was selected through simple random sampling given a total of three (3) L.G.As. In stage three, from each sampled L.G.A, 10 schools were randomly selected giving a total of 30 schools. Then, from each of the schools, 25 SSII students were selected for the study using a table of simple random sampling. This gave a total number of 750 students used in the study. The study adapted two standardized research questionnaires namely, Marsh (1990) Self-Description Questionnaire (SDQ) and Elliot and Church (1997) Achievement Goal Orientation Questionnaire (AGOQ). The Students' Achievement Scores in Mathematics (SASM) were obtained from the schools before the start of the administration of the other two instruments. This represents students' achievement scores in mathematics from the state wide senior secondary one (SS1) promotion examination.

The methods used for validating the instruments were face and construct validity by the three experts from the Faculty of Education, Nnamdi Azikiwe University Awka. Cronbach's alpha reliability method was used to determine the internal consistency of the items in the research questions such as 0.84, 0.72, 0.86, 0.74 and 0.87 were obtained for mastery-approach, mastery-avoidance, performance-approach, performance-avoidance and self-concept. The data were analyzed using standard multiple regression analyses. The research question 1 was answered using multiple regression equation. Research question 2 was answered using unstandardized β. Research question 3 was answered using adjusted R^2. Research question 4 was answered using standardized β. Hypothesis 1 was tested using F-test for regression model. Hypothesis 2 was tested using t-test for adjusted R^2. Hypothesis 3 was tested using t-test for β, at .05 alpha level of significance.

2.1 Presentation of Results

The data were first screened for missing values, and 61 respondents had missing representing 8.13%. Hence likewise deletion approach was adopted. After deleting the 61 respondents, the sample size was reduced to 689. Thereafter, analysis of the study was carried out using standard multiple regression analysis with SPSS 26. While 8.85% of the 689 questionnaires were originally returned for the study.

Research Question 1: To what extent are the assumptions of the regression equation for predicting students' academic achievement scores in mathematics using achievement goal orientation, and academic self-concept sores met?

Table 1: Descriptive statistics of independent and dependent variables in the regression model for the study (N = 689).

Variables	MAP	MAV	PAP	PAV	WA	ASC	AA	X	SD	Var	Skew	K urt	VIF	TF
MAP	1							21.4	2.86	8.2	.354	.071	1.021	.980
MAV	.086	1						20.7	3.34	11.3	-.382	1.058	1.088	.919
PAP	.088	.133	1					21.6	3.32	11.2	.494	2.146	1.079	.927
PAV	.092	.044	.215	1				21.1	2.94	8.6	.094	.301	1.058	.945
WA	-.003	.241	.120	.037	1			20.6	3.40	11.8	.229	1.142	1.072	.932
ASC	-.024	.081	-.022	-.057	.040	1		57.4	8.37	70.2	.168	-.667	1.012	.988
AA	.063	-.142	-.015	.945	-.128	.130	1	53.9	9.26	85.9	.448	-.468	-----------	---------

Std. Residual Min = -1.994, Std. Residual Max = 3.515, Durbin Waston statistics = 1.554

MAP = Mastery Approach, MAV = Mastery Avoidance, PAP = Performance Approach, PAV = Performance Avoidance, WA = Work Avoidance, ASC = Academic Self-Concept, AA = Academic Achievement, X = Mean, SD = Standard Deviation, Var = Variance, Skew = Skewness, Kurt = Kurtosis, VIF = Variance Inflated Factor and TF = Tolerance Factor.
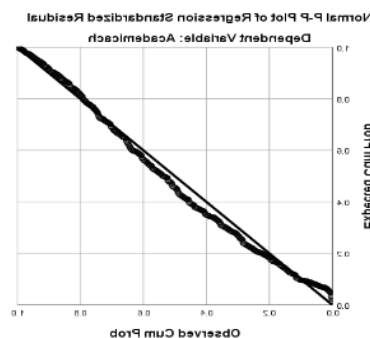

Fig 1: the normal P-P plot of standardized residuals data points of academic achievement.
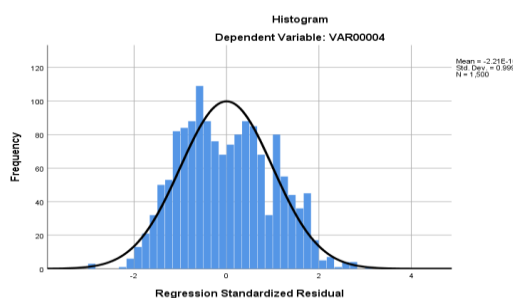
Fig 2: the normal distribution curve of the standardized residuals data points of academic achievement.

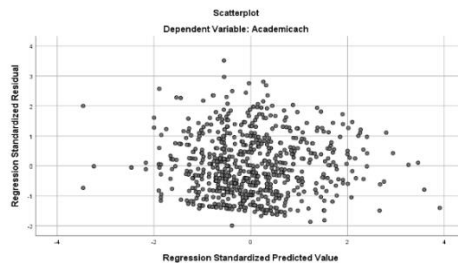Scatterplot
Dependent Variable: Academicach

Fig 3: scatter plot of standardized predicted values of academic achievement.

To answer research question 1, seven assumptions of multiple linear regression were tested in this study. First, the assumptions of normality of the data were tested using Skewness and Kurtosis. The assumptions were made since none of the Skewness and Kurtosis values of each of the variables do not exceed + 3 and – 3 as recommended. Second, the assumptions of absence of multivariate outliers was checked using standardized residual statistics and Cook distance statistics (1977). Result of standardized residual values indicated that the (Std, Residual Min = -1.994, Std, Residual Max = 3.515). It lies between -3 to 3 as recommended by (Tabachnick and Fidell, 2018). While the result of the Cook distance shows a maximum value of .016 which is less than 1 as recommended by (Cook, 1977). Hence, the assumptions of absence of multivariate outliers was not violated. Third, the assumptions of absence of multicollinearity among the predicting variables were checked using Variance Inflated Factor (VIF), and Tolerance Factor (TF). The Tolerance Factors and Variance Inflated Factors (mastery-approach, TF = .980, VIF = 1.021; master-avoidance, TF = .919, VIF = 1.088; performance-approach, TF = .927, VIF = 1.079; performance-avoidance, TF = .945, VIF = 1.058; work-avoidance, TF = .932, VIF = 1.072; academic self-concept, TF = .988, VIF = 1.012 of the independent variables show that the values were less than 10 for Variance Inflated Factor and greater than .20 for Tolerance Factor respectively as recommended by (Schumaker, 2015). Hence, this assumption of absence of multicollinearity was made. Forth, the assumption of independent of error was tested using Durbin Waston statistics. The result shown a Durbin Waston statistics of 1.554 which is less than 4 but greater than 0 as recommended by (Denis, 2020). Hence, the assumption of independent of error was not violated. Fifth, the assumptions of normality of error distribution were tested using normal P.P plot of standardized residual. Figure 2 shows that the normal P.P plot of standardized residual data points were normally distributed. Histogram of the standardized residual in figure 3 also testified to that. Sixth, the assumption of homogeneity of variance and linearity was tested using scatter plot of standardized predicted values. The result in figure 4 shows that the data met the assumption of homogeneity of variance and linearity as the predicted values were distributed above zero in both dimensions and do not show any pattern. Seventh, the assumptions of non-zero variance were tested using variance statistics and the data also met the assumptions of non-zero variances (Mastery-approach, Variance = 8.181; Mastery-avoidance, Variance = 11.177; Performance-approach, Variance = 11.067; Performance-avoidance, Variance = 8.624; Work-avoidance, Variance = 11.577; Academic self-concept, Variance = 70.088; Academic achievement, Variance = 85.778) as there is no zero variance for the variables in the study as shown in the table 1.

Research Question 2: What is the nature of the regression equation for predicting students' academic achievement scores in mathematics using achievement goal orientation, and academic self-concept, scores?

Table 2: Regression coefficient for achievement goal orientation, and academic self-concept scores (N = 689).

Model	Unstandardized β	Std. Error	Standardized β
Constant	64.633	5.098	
Mastery-approach	.236	.123	.073
Mastery-avoidance	-.336	.109	-.121
Performance-approach	.026	.109	.009
Performance-avoidance	-.056	.122	-.019
Work-avoidance	-.264	.106	-.097
Academic self-concept	-.048	.042	-.043

Using the information in table 2, the nature of the regression equation for predicting students' academic achievement in mathematics using achievement goal orientation, and academic self-concept scores follows:

$Y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + b_6 x_6$

$Y = 64.633 + .236 x_1 + -.336 x_2 + .026 x_3 + -.056 x_4 + -.264 x_5 + -.048$

$Ach = 64.633 + 0.236 - 0.672 + 0.078 - 0.224 - 1.32 - 0.258$

$Achievement = 64.633 + 0.236 MAP - 0.672 MAV + 0.078 PAP - 0.224 PAV - 1.32 WA - 0.258 ASC$

MAP = Mastery Approach, MAV = Mastery Avoidance, PAP = Performance Approach, PAV = Performance Avoidance, WA = Work Avoidance, ASC = Academic Self-Concept.

The equation shows that for every unit increase in mastery-approach, achievement increased by 0.236. For every unit decrease in mastery-avoidance, achievement decreased by – 0.672. For every unit increase in performance-approach, achievement increased by 0.078. For every unit decrease in performance-avoidance, achievement decreased by – 0.224. For every unit decrease in work-avoidance, achievement decreased by – 1.32. For every unit decrease in academic self-concept, achievement decreased by – 0.258.

Research Question 3: Which of the independent variables such as achievement goal orientation and academic self-concept scores predicts students' academic achievement scores in mathematics?

Table 3: Regression coefficient for students' academic achievement scores in mathematics using achievement goal orientation, academic engagement, and creativity scores (N = 689).

Model	Unstandardized β	Std. Error	Standardized β
Constant	64.633	5.098	
Mastery-approach	.236	.123	.073
Mastery-avoidance	-.336	.109	-.121
Performance-approach	.026	.109	.009
Performance-avoidance	-.056	.122	-.019
Work-avoidance	-.264	.106	-.097
Academic self-concept	-.048	.042	-.043

To answer research question 3, the standardized regression coefficient (β) in Table 4 was used for comparison. The regression coefficients presented in table 4 shows unstandardized (β) and standardized regression coefficient (β) for mastery-approach scores are .236 and .073. For mastery-avoidance scores are -.336 and -.121. For performance-approach scores are .026 and .009. For performance-avoidance scores are -.056 and -.019. For work-avoidance scores are -.264 and -.097. For academic scores are -.048 and -.043 respectively. Using the standardized β for comparison, mastery-approach is mostly predicted students' academic achievement in mathematics as shown by the β of .073. Performance-approach is the second most predicted students' academic achievement in mathematics as shown by the β of .009. Mastery-avoidance is the third most predicted students' academic achievement in mathematics as shown by the β of -.121. Work-avoidance is the fourth predicted students' academic achievement in mathematics as shown by the β of -.097. Academic self-concept is the fifth predicted students' academic achievement in mathematics as shown by the β of -.043. While performance-avoidance is the sixth predicted students' academic achievement in mathematics as shown by the β of -.019.

Research Question 4: What is the unique contributions of achievement goal orientation, and academic self-concept scores to predict students' academic achievement in mathematics scores?

Table 4: Regression model summary of achievement goal orientation, and academic self-concept scores on students' academic achievement scores in mathematics (N = 689).

Model	R	R-Square	Adjusted R-Square	Std. Error of the Estimate
	.192[a]	.037	.028	1.129

To answer research question 4 the adjusted multiple regression R square in 3 was used. The result of study shows that using achievement goal orientation and academic self-concept scores yielded an adjusted R squared of .028. This implies that predictors accounted for about 2.8% of the variance scores in mathematics academic achievement.

Hypothesis 1: The regression model does not significantly predict academic achievement scores in mathematics.

Table 5: F- test for regression model of achievement goal orientation, and academic self-concept scores on students' academic achievement in mathematics scores (N = 689).

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	2173.211	6	362.202	4.346	.000[b]
Residual	56842.055	682	83.346		
Total	59015.266	688			

The analysis of variance in the table shows that the regression equation was significant (6, 682) = 4.346, p < .05. This implies that at least one of the independent variables significantly predicted the academic achievement in mathematics.

Hypothesis 2: Achievement goal orientation and academic self-concept scores does not significantly predict students' academic achievement in mathematics.

Table 6: t-Test of regression coefficient of students' academic achievement scores in mathematics using achievement goal orientation and academic self-concept scores (N = 689).

Model	Unstandardized β	Std. Error	Standardized β	T	p-value	remark
Constant	64.633	5.098		12.678	.000	S
Mastery-approach	.236	.123	.073	1.923	.055	S
Mastery-avoidance	-.336	.109	-.121	-3.096	.002	S
Performance-approach	.026	.109	.009	.237	.813	NS
Performance-avoidance	-.056	.122	-.019	-.459	.647	NS
Work-avoidance	-.264	.106	-.097	-2.497	.013	S
Academic self-concept	-.048	.042	-.043	-1.139	.255	NS

Table 6 shows that mastery-avoidance and work-avoidance scores significantly predict students' academic achievement scores in mathematics since the p-value is less than .05. Then, mastery-approach, performance-approach, performance-avoidance, and academic self-concept scores does not significantly predict academic achievement scores in mathematics since their p-values are greater than .05.

Hypothesis 3: The unique contributions of achievement goal orientation, and academic self-concept scores to predict students' academic achievement in mathematics scores is not significant.

Table 7. T-Test of adjusted R square of the regression model for the study (N = 689).

Model	R	R- Square	Adjusted R- Square	Std. Error Estimate	t – cal for adj. R^2	DF	t- crt.	Remark
	.192ᵃ	.037	.028	9.129	5.1282	687	1.960	S

To test hypothesis 3, t-test for adjustment R square was conducted. Results of the study shown in table 7 indicates that t-critical for adjusted R square is 1.960 while that of the calculated is 5.1282. Since the t-calculated for adjusted R square 5.1282 is greater than t-critical 1.960, the null hypothesis which states that the unique contributions of students' achievement goal orientation, and academic self-concept scores to predict students' academic achievement scores in mathematics is not significant is rejected and the alternative hypothesis is accepted. In other words, the unique contributions of students' achievement goal orientation, and academic self-concept scores to predict students' academic achievement scores in mathematics is statistically significant. Effect sizes were also evaluated using adjusted R2 comparing it with Cohen's d statistics guideline, where d < 0.20 indicates a minimal effects size, 0.20 < d < 0.50 indicates a small effect size, 0.50 < d < 0.80 indicates a moderate effect size, and d > 0.80 indicates a large effect size. The value of R adjusted square .028 indicates a minimal effect.

3.0 DISCUSSION

The findings from the result revealed that the seven assumptions tested in the study were met, statistically fit and accurate to examine students' achievement goal orientation and academic self-concept. Meeting the assumptions of the regression model implies that the data are suitable and amenable to the analysis. The present result supported the result from the study of Emesi, Anyanwu and Ezenwosu (2022) that examined achievement goal orientation and self-regulated learning strategy as predictors of academic achievement. In their study, it was discovered that the seven assumptions tested in the study were statistically fit and accurate to examine students' motivational propensity to engage and achieve academically.

The findings from the result using unstandardized β revealed that the on the nature of regression equation, mastery-approach and performance-approach have positive contributions to the predicting model while mastery-avoidance, performance-avoidance, work-avoidance and academic self-concept have negative contributions to the predicting model. This implies that both mastery-approach and performance-approach have positive influence on students'

academic achievement while mastery-avoidance, performance-avoidance, work-avoidance and academic self-concept have negative influence on students' academic achievement. These findings partly supported the study of Emesi et al (2022) which revealed that mastery-approach, performance-approach, mastery-avoidance and performance-avoidance have positive contributions to the predicting model while work-avoidance has negative contribution to the predicting model. The result from the study also revealed that mastery-avoidance, and work-avoidance scores relatively and significantly predicted students' academic achievement in mathematics, while mastery-approach, performance-approach, performance-avoidance and academic self-concept scores does not significantly predict academic achievement in mathematics. These findings partly supported the study of Niepel, et al (2014) which recorded that performance-approach, performance-approach and academic self-concept did not explain academic achievement of the students. While a positive predictive link between academic achievement and changes in mastery-goal orientation was recorded.

In the present study, findings from the result using multiple regression R square stands to prove a dynamic relationship link between students' achievement goal orientation and academic self-concept as they jointly predict achievement scores. The small percentage (2.8%) of these variables in predicting academic achievement scores indicated that the constructs are salient predictors of learning outcomes. This supported the study of Emesi et al (2022) which revealed that the variables in their study recorded a small percentage (2.5) in predicting academic achievement.

Findings from the result using a standardized β indicate that the independent variables have roles to play on students' academic achievement in mathematics. For example, when students' level of mastery-approach is positive their level of willingness to adjust and engage in learning of mathematics will be positively high. Also, when students' level of performance-approach is positive their level of demonstrating social/ego comparison in solving mathematical problems will be positively high. However, when the level students' mastery-avoidance is negative low, students' may be willing to invest little interest to master and learn mathematics instructions. When students' performance-avoidance is at the negative level, the desire to avoid failure in the learning of mathematics will be high. As the students' work-avoidance revealed a negative low level, there will be a direct and divert attention to less wiliness to invest much social interaction that could have influence their attention to respond, approach and adjust to learning activity. It was also noted that as students' academic self-concept is negatively low, it indicates that students will show negative self-beliefs and perception to engage in the learning of mathematics. These findings partly supported the study of Emesi et al (2022) which observed that the level of students' mastery-approach, mastery-avoidance, performance-approach and performance-avoidance were positively low in determining academic achievement. While on the aspect of students' work-avoidance low negative level of motivation to achieve academically was observed. It is an indication that the students' desire to adjust, approach and respond to the learning of mathematics is still low.

Finding from result revealed that the analysis of variance for regression equation was significant using clusters achievement goal orientation and academic self-concept scores of the students. This indicates that the variables are adaptive learning behaviours across divers individual student's characteristics in the learning task. This supported the study of Emesi et al

(2022) which recorded that clusters of achievement goal orientation and other variables significant predicted academic achievement scores in mathematics.

Finding from the result revealed that the unique contributions of achievement goal orientation and academic self-concept scores to students' academic achievement in mathematics is statistically significant. Using effect sizes to evaluate its adjusted R2 to compare it with Cohen's d statistics guideline, the value of R adjusted square .028 indicates a minimal effect. This shows that the size effects which the independent variables have contributed in predicting academic achievement scores in mathematics is minimal. It is an indication that there is students' motivational apathy to respond, adjust and engage in learning to achieve in the mathematics task. The finding supported the study of Emesi et al (2022) which recorded that indicated that the value of R adjusted square .025 indicates a minimal effect. Finally, effect sizes were also evaluated using adjusted R2 comparing it with Cohen's d statistics guideline, where $d < 0.20$ indicates a minimal effects size, $0.20 < d < 0.50$ indicates a small effect size, $0.50 < d < 0.80$ indicates a moderate effect size, and $d > 0.80$ indicates a large effect size. The value of R adjusted square .028 indicates a small effect. The major problem with present study is that no known study was found in the Nigerian academic literature to support the findings.

4.0 CONCLUSION

The present study concluded that the association between students' achievement goal orientation and academic self-concept scores jointly and significantly predicted academic achievement scores in mathematics.

4.1 Recommendations

1. It was recommended that students should adopt achievement goal orientation and academic self-concept in their learning process since the variable had jointly predicted achievement scores in mathematics.
2. Teachers should provide emotional support that will enable the students to direct their learning beliefs towards achievement goal orientation and academic self-concept in their learning context since the variables relatively predicted academic achievement scores in mathematics.
3. Then future researchers should adopt another research design such as hierarchical regression research design to examine the multiple dimensions of these variables in the subsequent studies.

REFERENCES

Adeninka, T., Adedeji, T. & Olufemi (2011). Locus of control, interest in school and self-efficacy as predictors of academic achievement among junior secondary school students in Osun State, Nigeria. New, Horizons in Education, 59(1), 25-35.

Ames, C. & Archer, J. (2007). Achievement goals in the classroom: Student learning strategies and motivation processes. A paper presented at Annual Meeting of Educational Research Association, Washington DC.

Ames, C. (1992). Classroom: Goals, structures, and student motivation. Journal of Educational Psychology, 84, 261-271.

Anyanwu, A.N., & Emesi, K.E. (2020). Secondary school students' self-esteem and achievement goal orientation as correlate of academic achievement in mathematics in Anambra state. International Journal of Multidisciplinary and Current Educational Research, 2(5), 218-226.

Anyanwu, A.N. & Emesi, K.E. (2021). Secondary school students' learning strategies and self-directed learning as correlates of critical thinking in Anambra State. African Journal of Educational Management, Teaching and Entrepreneurship Studies, 3, https://ajemates.org.

Baharami, D. & Baharami, M.A (2015). Correlation of self-esteem and achievement goals. The Case of Iranian students. World Applied Science Journal, 33 (4), 557-563.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences. New York, NY: Routledge Academic.

Cook, R.D. (1977). Detection of influential observations in linear regression. Technometrics, American Statistical Association.

Denis, D.J. (2020). Univariate, Bivariate and Mutivariate Statistics Using R: Quantitative Tools for Data Analysis and Data Science. India: Wiley Publication.

Dweck, C.S., & Leggett, E.L. (1988). A social-cognitive approach to motivation and personality. Psychological Review, 95(2), 256-273.

Elliot, A.J., & McGregor, H.A. (2001). A 2x2 achievement goal framework. Journal of Personality and Social Psychology, 80(3), 501-519.

Elliot, A.J., & Church, M.A. (1997). A hierarchical model of approach and avoidance achievement motivation. Journal of Personality and Social Psychology, 72(1), 218-232.

Elliot, A.J., & Harackiewicz, J. M. (2006). Approach and avoidance achievement goal and intrinsic motivation: A mediational analysis. Journal of Personality and Social Psychology, 70(3), 461-475.

Emesi, K.E., & Anyanwu, A.N. (2022). Creativity as predictor of secondary school students' academic achievement in mathematics in Anambra State. International journal of Educational Research,5(5), 47-56. Doi: 10.5231, zenodo.6759387.

Emesi, K.E., & Anyanwu, A.N. & Ezenwosu, N.E. (2022). Using achievement goal orientation and self-regulated learning strategy as predictors of academic achievement in English language among the secondary school students' in Anambra State, Nigeria. International Journal of Education and Evaluation Research, 8(7), 50-64. Doi:

10.56201/ijee.v8.no7.2022.pg50.64. www.iiardjournals.org. Federal Republic of Nigeria. (2013). National policy on education. Yaba: Nerdc.'

Joe, A.N., Kpolovie, P.J., Osonwa, K.E., & Werima, C.E. (2014). Modes of admission and academic achievement in Nigerian Universities. Retrieved from http://meritresearcherjuornals.or/er/content/2014/Pkolovie%20et%20al.pdf.

Marsh, H.W. (1990). Self-Description Questionnaire (SDQ) II: A theoretical and empirical basis for the measurement of multiple dimensions of adolescent self-concept: An interim test manual and a research monograph. San Antonio Texas: The psychological corporation.

Matos, Lens, W., & Vansteenkiste, M. (2007). Achievement goals, learning strategies and language achievement among Peruvian, high school students. Psychologica Belgica, 47(12), 51-70.

Mottus, R, Baumert, A., & Bank, M.D. (2020). Descriptive, predictive and explanatory personality research: Different goals, different approaches, but a shared need to move beyond the big few traits. European Journal of Personality, 15(6), 38-56.

Niepel, C. Brunner, M., & Preckel, F. (2014). Achievement goal, academic self-concept, and school grades in mathematics: longitudinal reciprocal relations in above average ability secondary school students. Contemporary Educational Psychology, 39, 301-313.

Obi, A., Onyegirim, B.O., Ani., D.N., & Ebe, K.N. (2017). Relationship between students' and self-concept and their academic achievement in English language in Enugu State, Nigeria. International Journal of Education, Development, Society and Technology, 5 (15), 151-158.

Obilor, I.E. (2011). Relationship between self-concept and mathematics achievement of senior secondary students in Port Harcourt metropolis. Journal of Educational and Social Research, 1(4), 39-44.

Rayner, S.G., & Devis, U. (2018). Self-esteem and self-perceptions in the classroom: valuing circle time? In: Riding, R. J., and Rayner, S. G. (eds.). International Perspective on Individual Differences, 2: Self Perception, Ablex, Westport, CO. pp.171-208.

Rosenberg, M. (1979). Society and the adolescent self-image. Princeton, New Jersy: Princeton University Press.

Sayid, D.G. (2011). Relationships between academic self-concept and academic performance of high school students. Social and Behavioural Sciences, 15, 103-109.

Schumacher, R.E. (2015). Using R with multivariate statistics. A premier. London: Sage Publication.

Shavelson, R.J., Hubner, J., & Stanton, G. C. (2006). Self-concept: Validation of construct interpretations. Review of Educational Research, 46, 407-441.

Tabchnick, G.B., & Fidell, L.S. (2018). Using multivariate statistics. New York: Pearson.

Urdan, T.C., & Maehr, M.L. (1995). Beyond a two-goal theory of motivation and achievement. A case for social goals. Review of Educational Research, 65(3), 213-243.

Valentine, J.C., Dubois, D.L., Copper, H. (2014). The relations between self-beliefs and academic achievement: A systematic review. Educational Psychology, 39, 111-133.

Wong, N. (2002). The Relationship among Mathematics Achievement, Affective Variable and Home Background. Mathematics Education Research Journal, 4, 32 – 42.