Social Goal Orientation, Academic Engagement and Creativity as Predictors of Secondary School Students’ Academic Achievement in Mathematics in Anambra State, Nigeria

Kingsley Ekene Emesi
Department of Educational Foundations Faculty of Education, Nnamdi Azikiwe University Awka Anambra State, Nigeria

Adeline Nne Anyanwu
Department of Educational Foundations Faculty of Education, Nnamdi Azikiwe University Awka Anambra State, Nigeria

Abstract:
Social goal orientation, academic engagement and creativity are strong indicators and facilitators for effective learning. The association among these variables to jointly predict academic achievement has been vague and nebulous in the field of educational psychology. The study aimed to explore the students’ social goal orientation, academic engagement, and creativity as predictors of academic achievement in mathematics in Anambra State. Four research questions and three null hypotheses were formulated for the study. The study adopted a predictive correlational design. The population comprised of 21,204 SS II students from which a sample of 1560 was drawn using probability sampling procedure.

Standardized research instruments such as; Social Goal Orientation Questionnaire (SGOQ), Students’ Academic Engagement Questionnaire (SAEQ) and Epstein Creativity Competencies Inventory (ECCI) developed by Epstein were used for data collection. Students’ mathematics achievement scores 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 indices were found to be .88, .82, and .92 for SGOQ, SAEQ and ECCI respectively. These scores made the instruments fit for the study. The standard multiple regression was used to analyze the collected data.

The research question 1 was answered using multiple regression. The research question 2 was answered using unstandardized β. The research question 3 was answered using adjusted R². The research question 4 was answered using standardized β. The null hypothesis 1 was tested using F-test for regression model. The null hypothesis 2 was tested using t-test for adjusted R². The null hypothesis 3 was tested using t-test for β at .05 level of significance. Findings showed that students social orientation, academic engagement and creativity scores yielded an adjusted R square of .007. This implies that predictors accounted for about 0.7% of the variance scores in academic achievement. Also, the analysis of variance indicated that the regression equation was significant in predicting academic achievement in mathematics. This implies that at least one of the independent variables significantly predicted academic achievement in mathematics. Based on these findings, it was recommended that students should consider social goal orientation, academic engagement and creativity as adaptive motivational variables that have jointly predict academic achievement.
Keywords: Social Goal Orientation, Academic Engagement, Creativity and Academic Achievement.

**Introduction**

Within the confine of the school classrooms, the extent of students’ academic engagement, being creative and exhibiting sense of social well-being in the classroom task are assumed to be heavily influenced by students’ motivational orientation to learn in the school. It could be presumed that social goal orientation, academic engagement and creativity are adaptive motivational behaviours that offer plausible explanations regarding students’ academic achievement. This is the cognitive representation of what the student is trying to achieve. It is partly in line with the study of King and Watkins (2001) which revealed that students have different reasons for studying. For example, some students work hard not only for academic achievement but for the positive social perception they have within the learning environment. It could be an indication that some students creatively engaged in learning process for social reasons, such as to be with friends, to gain the approval of parents and teachers, to increase social status or simply help friends with their school works and to maintain social obligations to others.

The dominant paradigm for examining academic achievement in school has a tendency to neglect social goal orientation, academic engagement and creativity as the constructs that could jointly predict academic achievement. The relative neglect of these constructs seems unwarranted given the importance of interpersonal relationship in school (Martin & Dowson, 2009). Suffice it to say that, social goal orientation, academic engagement and creativity have been beset by a lack of consensus with regard to predict students’ academic achievement in Nigeria and Anambra State in particular. Therefore, the rationale behind the present study is to understand the relationship of these motivational variables to the important students’ educational outcome at the secondary school level specifically in the mathematics domain.

Despite the social imperative of academic achievement in mathematics, students still perform abysmally in the subject. This was observed in students’ performance in the subject in Senior Secondary Certificate Examination (SSCE) conducted by both West African Examination Council (WAEC) and National Examination Council (NECO) over the years. The WAEC report according to the study of Oguguo and Uboh, (2020) indicated that in 2016, 2017, 2018, 2019, and 2020, only 35.15%, 35.9%, 25.7%, 35.99%, and 35.10% of the students recorded credit in mathematics. This raises the questions as to whom or what organization is to be blamed over this incident. Whether the poor performance be attributed to examination institutions such as; WAEC, and NECO, as well as education stakeholders like teachers, and government or the students themselves is an issue that has been left unresolved. Although the SSCE may not be the only yardstick for measuring students’ academic achievement level in mathematics, it helps to understand what is happening in the school system and whether students are learning or not.

Various factors have been adduced for poor performance of students in mathematics such as; feeling of inadequacy, lack of motivation and self-confidence, mathematics anxiety, negative attitude developed towards mathematics, lack of interest in mathematics, mathematics fright/phobia and so on (Matawal, 2009). In view of the negative factors and poor achievement in mathematics among secondary school students, it could be suggested that the failure to make good use of these variables like social goal orientation, academic engagement and creativity by the students could have negatively influenced their academic achievement in mathematics. The problem is could these variables jointly predict academic achievement in mathematics?

Examining how these constructs could enrich the understanding of students’ motivational propensity to engage, approach and respond to learning situation and achieve academically is the fundamental reason for the study. This study is warranted for several reasons. First, students’
social goal orientation, academic engagement and creativity have been shown to profoundly influence the quality and quantity of their engagement in learning. Second, the study of Covington (2000) has suggested that a range of achievement motivation goal orientation which social goal orientation is an integral part of, may also affect students’ engagement in, and outcomes from learning. Third, some of the researches on these variables were Western oriented and have attempted to examine various combinations of students’ social goal orientation, academic engagement and creativity in predicting academic achievement, none has link to the Nigerian academic literature. The paucity of research on this aspect had motivated the researchers to examine the predictive strength of these three variables in relation with students’ academic achievement in mathematics in Anambra State.

Though, social goal orientation has been defined as perceived social reasons or purposes students have for wanting to achieve in any academic task (Urdan & Maehr, 1995). Juvonen and Wentzel (2006) defined social goal orientation as motivational construct that deals with social/interpersonal reasons for trying to achieve or not to achieve in academic situation. This indicates that the motivation students have towards engaging in academic activities is directed by a complex set of social reasons. It shows that social goal orientation can be considered of being socially driven as the motivation to achieve came from various social forces. Five dimensions of social goal orientation as prescribed by five factor theory of Dowson and McInerney (2004) as cited in Shim, Wang, Makara, Xu, Xie, Zhong (2007) such as; social affiliation, social approval, social concern, social responsibility and social status goal orientation. In response to these explanations, the researchers operationally defined social goal orientation as the perceived purposes or reasons for trying to achieve more meaningfully in the classroom learning. Therefore, examining the nature of students’ dispositional beliefs of social orientation goal to have a link with academic engagement in learning context could have a significant impact in predicting academic achievement.

Skinner, Connell and Wellborn (2005) defined academic engagement as the extent to which a student participated in academic and non-academic-related activities as well as identified with and values for the goal of studying. The scholars further described academic engagement as the quality of students’ participation or conception with the schooling endeavor. This has been classified into six dimensions such as; cognitive, behavioural, emotional, psychological, agentic and social engagement. On this note, the researchers operationally defined academic engagement as the simultaneous experience of concentration, interest and willingness to enjoy academic task within and outside the classroom.

Interestingly, examining how academic engagement could have influenced students’ creativity to engage, respond and adjust in the learning task is critical to the present study. This shows that creative students could be persistence and cope with challenges in the face of academic difficulty in the learning process. For example, Torrance (2007) defined creativity as the process of perceiving problems or gaps in knowledge, developing hypothesis or propositions testing and validating hypotheses and finally sharing the results. Amabile 1983 as cited by Horn and Salvend (2006) identified the most four outstanding dimensions of creativity such as; personal traits, process, press, and product which the author termed the 4Ps in the componential theory of creativity. On this note, the researchers operationally defined creativity as the capacity of a person to invent innovative ideas that is essentially novel and previously unknown to others. This means that students’ creativity could have a link with social goal orientation and academic engagement to predict academic achievement.

Academic achievement has been defined as scores obtained from examination that measure the extent to which a person has acquired certain information or master certain skills, usually as a result of specific instruction (Mehern & Lehman, 2008). These scores characterized the academic outcome obtained from achievement
test assigned to assess a person’s performance in a course of study which he/she has undergone. On this note, the researcher defined academic achievement as students’ cumulative scores in academic context. Suffice to say that studies on social goal orientation, academic engagement and creativity have awakened growing interest in psychological research in an attempt to examine the assumption that the variables could potentially predict academic achievement.

Several studies have unveiled some level of relationship and predictive nature that exist among students’ social goal orientation, academic engagement, creativity and academic achievement in the learning context. For example, that study of Emesi and Anyanwu (2022) revealed that the regression model of creativity scores significantly predicted academic achievement in mathematics. Emesi and Anyanwu (2022) noted that some components of creativity such as process and press have negative contributions to the predicting model. While product and personal trait have contributed positively to the predicting model. Their findings also noted that the proportion of variance in academic achievement scores in mathematics explained by creativity scores is not statistically significant. In Emesi and Anyanwu’s study, it was also recorded that the seven assumptions that were tested in the study were statistically suitable for the study. Also, the study of Unachukwu, Emesi, and Anyanwu (2022) revealed that the regression model of academic engagement scores significantly predicted academic achievement in mathematics. Their findings also noted that the proportion of variance in academic achievement scores in mathematics explained by academic engagement scores is not statistically significant. In the study of Unachukwu, et al (2022), it was also recorded that the seven assumptions that were tested in the study were also potentially fit to measure students’ motivation to study. It was also noted in their study that among the six clusters of academic engagement five clusters such as; behavioural-engagement, psychological-engagement, cognitive-engagement, emotional-engagement and agentic-engagement have negative contributions to the predicting model.

While only the social-engagement has positive contribution to the predicting model. However, Emesi, Anyanwu and Unachukwu (2023) examined social goal orientation as predictor of secondary school students’ academic achievement in mathematics. In this study, it was noted that the seven assumptions of the regression model were met and were considered accurate for the analysis. It was also revealed that among the five components of social goal orientation, social affiliation, social approval, social concern and social responsibility contributed negatively to the predicting model. Then only social status contributed positively to the predicting model.

Despite these findings from the reviewed studies none of the study has clearly identify the direction and the link that joined these independent variables to predict academic achievement in any subject domain at the secondary school level in Anambra State. Against this backdrop, the researcher sought to examine social goal orientation, academic engagement and creativity as predictors of secondary school students’ academic achievement in mathematics in Anambra State.

**Research Questions**

The following research questions guided the study

1. To what extent are the assumptions of multiple regression equation for predicting students’ academic achievement scores in mathematics using social goal orientation, academic engagement and creativity scores were met?

2. What is the nature of the regression equation for predicting students’ academic achievement scores in mathematics using social goal orientation, academic engagement and creativity scores?

3. Which of the independent variable such as social goal orientation, academic engagement and creativity scores better predicts students’ academic achievement scores in mathematics?

4. What is the unique contributions of social goal orientation, academic engagement
and creativity scores to predict students’ academic achievement in mathematics?

**Hypotheses**

The following null hypotheses will be tested at .05 level of significance.

1. The regression equation does not significantly predict students’ academic achievement scores in mathematics using social goal orientation, academic engagement and creativity scores.

2. Social goal orientation, academic engagement and creativity scores do not significantly predict students’ academic achievement scores in mathematics.

3. The unique contributions of social goal orientation, academic engagement and creativity scores to students’ academic achievement scores in mathematics is not significant.

**Research Method**

The researchers adopted a predictive correlational design and used questionnaires to collect data for the study. The population of this study consisted of 21,204 which represented all the Senior Secondary School Students II in Anambra State. A sample of 1560 SS2 students was drawn from the senior secondary schools in the six education zones in Anambra State. Probability 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 60 schools. Then, from each of the schools, 26 SSII students were selected for the study using a table of simple random sampling. This gave a total number of 1500 students used in the study.

The study adapted a standardized research questionnaire namely, Social Goal Orientation Questionnaire designed by Dowson and Melnerney (SGOQ, 2004), Students’ Academic Engagement Questionnaire designed by Lam and Jimerson (SAEQ, 2018) and Creativity Competencies Inventory designed by Epstein (CCI, 2008). The students’ achievement scores were obtained from that state wide Senior Secondary One (SS1) promotion examination from the schools before the administration of the instruments. 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 for the instrument. A reliability indices were found to be .88, .82, .92 for SGOQ, SAEQ and CCI respectively. 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.

**Presentation of Results**

The data were first screened for missing values, and 60 respondents had missing representing 3.8%. Hence likewise deletion approach was adopted. After deleting the 60 respondents, the sample size was reduced to 1500. Thereafter, analysis of the study was carried out using standard multiple regression analysis with SPSS 26.

**Research Question 1**

To what extent are the assumptions of the regression equation for predicting students’ academic achievement scores in mathematics using social goal orientation, academic engagement and creativity scores met?
Table 1. Descriptive Statistics of Independent and Dependent Variables in the Regression Model for the Study (N = 1500)

<table>
<thead>
<tr>
<th>Variables</th>
<th>SGO</th>
<th>AE</th>
<th>CR</th>
<th>AA</th>
<th>X</th>
<th>SD</th>
<th>Var</th>
<th>Skew</th>
<th>Kurt</th>
<th>VIF</th>
<th>TF</th>
</tr>
</thead>
<tbody>
<tr>
<td>SGO</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AE</td>
<td>.240</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR</td>
<td>.356</td>
<td>.338</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AA</td>
<td>- .085</td>
<td>.015</td>
<td>-.018</td>
<td>1</td>
<td>57.3913</td>
<td>8.36402</td>
<td>69.957</td>
<td>.186</td>
<td>-.661</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SD</td>
<td>110.3093</td>
<td>126.3580</td>
<td>87.1580</td>
<td>57.3913</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Var</td>
<td>11.44539</td>
<td>12.00552</td>
<td>10.41217</td>
<td>8.36402</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skew</td>
<td>.101</td>
<td>-.522</td>
<td>.162</td>
<td>.186</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kurt</td>
<td>2.005</td>
<td>2.592</td>
<td>2.262</td>
<td>-.661</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIF</td>
<td>1.157</td>
<td>1.151</td>
<td>1.242</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TF</td>
<td>.857</td>
<td>.869</td>
<td>.805</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Std. Residual Min = -2.877, Std. residual Max = 3.000, Durbin Waston statistics = 1.881, SGO = Social Goal Orientation, AE = Academic Engagement, CR = Creativity, AA = Academic Achievement, X = Mean, SD = Standard Deviation, Var = Variance, Skew = Skewness, Kurt = Kurtosis, VIF = Variance Inflated Factor, and TF = Tolerance Factor.

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’s distance statistics (1977). Result of standardized residual values indicated that the (Std. Residual Min = -2.877, Std. Residual Max = 3.000). It lies between -3 to 3 as recommended by (Tabachnick and Fidell, 2018). While the result of the Cook’s 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 (social goal orientation, TF = .857, VIF = 1.167; Academic engagement, TF = .869, VIF = 1.151; Creativity, TF = .805, VIF = 1.242; 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 1.881 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 (social goal orientation, Variance = 130.997; Academic engagement, Variance = 144.133; Creativity, Variance = 103.413; Academic achievement, Variance = 69.957) 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 social goal orientation, academic engagement and creativity scores?

#### Table 2. Regression Coefficient for Social Goal Orientation, Academic Engagement, and Creativity Scores (N = 1500)

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized βeta</th>
<th>Std. Error</th>
<th>Standardized βeta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>61.558</td>
<td>2.846</td>
<td></td>
</tr>
<tr>
<td>Social goal orientation</td>
<td>-.069</td>
<td>.020</td>
<td>-.095</td>
</tr>
<tr>
<td>Academic engagement</td>
<td>.026</td>
<td>.019</td>
<td>.037</td>
</tr>
<tr>
<td>Creativity</td>
<td>.002</td>
<td>.023</td>
<td>.003</td>
</tr>
</tbody>
</table>

Using the information in table 2, the nature of the regression equation for predicting students’ academic achievement in mathematics using social goal orientation, academic engagement and creativity scores follows:

$$Y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3$$

$$Y = 61.558 + -.069 x_1 + .026 x_2 + .002 x_3$$

$$Ach = 61.558 – 0.069 + 0.052 + 0.006$$

$$Achievement = 61.558 – 0.069 SGO + 0.052 AE + 0.006 CR$$

SGO = Social Goal Orientation, AE = Academic Engagement, CR = Creativity.

The equation shows that for every unit decrease in social goal orientation, achievement decreased by -0.069. For every unit increase in academic engagement, achievement increased by 0.052. For every unit increase in creativity, achievement increased by 0.006.

### Research Question 3

Which of the independent variables best predict Students’ academic Achievement scores in Mathematics?
Table 3. Regression Coefficient for Students' Academic Achievement Scores in Mathematics Using Social Goal Orientation, Academic Engagement and Creativity Scores (N = 1500)

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized βeta</th>
<th>Std. Error</th>
<th>Standardized βeta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>61.558</td>
<td>2.846</td>
<td></td>
</tr>
<tr>
<td>Social goal orientation</td>
<td>-0.069</td>
<td>0.020</td>
<td>-0.095</td>
</tr>
<tr>
<td>Academic engagement</td>
<td>0.026</td>
<td>0.019</td>
<td>0.037</td>
</tr>
<tr>
<td>Creativity</td>
<td>0.002</td>
<td>0.023</td>
<td>0.003</td>
</tr>
</tbody>
</table>

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) social goal orientation scores are -.069 and -.095. For academic engagement scores are .026 and .037. For creativity scores are .002 and .003 respectively. Using the standardized beta for comparison, academic engagement is mostly predicted students’ academic achievement in mathematics as shown by the β of .037. Creativity is the second most predicted students’ academic achievement in mathematics as shown by the β of .003. While social goal orientation is the third most predicted students’ academic achievement in mathematics as shown by the β of -.095.

**Research Question 4**

What are the unique contributions of social goal orientation, academic engagement and creativity scores to predict students’ academic achievement scores in mathematics?

Table 4. Regression Model Summary of Social Goal Orientation, Academic Engagement, and Creativity Scores to Predict Students' Academic Achievement Scores in Mathematics (N = 1500)

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R-Square</th>
<th>Adjusted R-Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.092a</td>
<td>.009</td>
<td>.007</td>
<td>8.33657</td>
</tr>
</tbody>
</table>

To answer research question 4 the adjusted multiple regression R square in 3 was used. The result of study shows that using social goal orientation, academic engagement and creativity scores yielded an adjusted R squared of .007. This implies that predictors accounted for about 0.7% 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 Social Goal Orientation, Academic Engagement and Creativity Scores on Students’ Academic Achievement in Mathematics Scores (N= 1500)**

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>895.671</td>
<td>3</td>
<td>298.557</td>
<td>4.296</td>
<td>.005b</td>
</tr>
<tr>
<td>Residual</td>
<td>103969.616</td>
<td>1496</td>
<td>69.498</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>104865.287</td>
<td>1499</td>
<td>4.296</td>
<td>.005b</td>
<td></td>
</tr>
</tbody>
</table>

The analysis of variance in the table shows that the regression equation was significant (3, 1496) = 4.296, p < .05. This implies that at least one of the independent variables significantly predicted the academic achievement in mathematics.

**Hypothesis 2**
Social goal orientation, academic engagement and creativity 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 Social Goal Orientation, Academic Engagement and Creativity Scores (N = 1500)

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Beta</th>
<th>Std. Error</th>
<th>Standardized B</th>
<th>T</th>
<th>p-value</th>
<th>remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>.61558</td>
<td>2.846</td>
<td>-21.630</td>
<td>21.630</td>
<td>.000</td>
<td>S</td>
</tr>
<tr>
<td>Social goal</td>
<td>-.069</td>
<td>.020</td>
<td>-.095</td>
<td>-3.405</td>
<td>.001</td>
<td>S</td>
</tr>
<tr>
<td>Academic engagement</td>
<td>.026</td>
<td>.019</td>
<td>.037</td>
<td>1.343</td>
<td>.180</td>
<td>NS</td>
</tr>
<tr>
<td>Creativity</td>
<td>.002</td>
<td>.023</td>
<td>.003</td>
<td>.101</td>
<td>.919</td>
<td>NS</td>
</tr>
</tbody>
</table>

Table 6 shows that social goal orientation scores significantly predict students’ academic achievement scores in mathematics since the p-value is less than .05. Then, academic engagement and creativity scores do not significantly predict academic achievement scores in mathematics since their p-values are greater than .05.

Hypothesis 3
The unique contributions of social goal orientation, academic engagement and creativity scores to students’ academic achievement in mathematics is not statistically significant.

Table 7. T-Test of Adjusted R Square of the Regression Model for This Study (N =1500)

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R-Square</th>
<th>Adjusted R-Square</th>
<th>Std. Error Estimate</th>
<th>t-call for adj. R²</th>
<th>DF</th>
<th>t-crt.</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.092+</td>
<td>.009</td>
<td>.007</td>
<td>8.33657</td>
<td>3.576900</td>
<td>1498</td>
<td>1.960</td>
<td>S</td>
</tr>
</tbody>
</table>

To test hypothesis 7, t-test for adjusted R square was conducted. Results of the study shown in table 6 indicates that t-critical for adjusted R square is 1.960 while that of the calculated is 3.576900. Since the t-calculated for adjusted R square 3.576900 is greater than t-critical 1.960, the null hypothesis which states that the unique contributions of social goal orientation, academic engagement and creativity scores to predict students’ academic achievement in mathematics is not statistically significant is rejected and the alternative hypothesis is accepted. In other words, the unique contributions of social goal orientation, academic engagement and creativity scores to predict students’ academic achievement in mathematics is statistically significant. Effect sizes were also evaluated using adjusted $R^2$ 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 .007 indicates a minimal effect.

Discussion of Findings
The findings of the result revealed that the seven assumptions tested in table 1 indicated that social goal orientation, academic engagement and creativity are potentially fit to examine students’ motivational propensity to engage and achieve academically. Meeting the assumptions of the regression model implies that the data are suitable and amenable to the analysis. This implies that results obtained from the multiple regression analysis are more precise, accurate and reliable to determine academic achievement. The present results supported the result from the study of Emesi and Anyanwu (2022) that examined creativity as predictor of secondary school students’ academic achievement in mathematics. In Emesi and Anyanwu’s result, the seven assumptions tested were suitable for the analysis The result also supported the result from the study of Unachukwu et al (2022) which
examined academic engagement as predictor of secondary school students’ academic achievement in mathematics. In their findings, results show that the seven assumption of the regression model were also accurately fit for the analysis. In another contribution, the present finding from the study supported the study of Emesi, et al (2023) which examined social goal orientation as predictor of secondary school students’ academic achievement in mathematics revealed that the seven assumptions were statically fit for the study.

The findings from the result in table 2 using unstandardized β revealed that the on the nature of regression equation, social goal orientation has negative contribution to the predicting model while academic engagement and creativity have positive contributions to the predicting model. This implies that both creativity and academic engagement have positive influence on students’ academic achievement while social goal orientation has negative influence on students’ academic achievement. This result supported the result from the study of Emesi and Anyanwu (2022) such that, some components of creativity such as process and press have negative contributions to the predicting model. While product and personal trait have contributed positively to the predicting model. However, this result did not support the result from the study of Unachukwu et al (2022) which recorded that among the six clusters of academic engagement five clusters such as; behavioural-engagement, psychological-engagement, cognitive-engagement, emotional-engagement and agentic-engagement have negative contributions to the predicting model. While only the social-engagement has positive contribution to the predicting model. The present findings from the result did not support the study of Emesi, et al (2023) which revealed that among the five components of social goal orientation, social affiliation, social approval, social concern and social responsibility contributed negatively to the predicting model. Then only social status contributed positively to the predicting model.

In the present study, the result in the able 3 using multiple regression R square stands to prove a dynamic relationship link among students’ social goal orientation, academic engagement and creativity as they jointly predict achievement scores. The small percentage (0.7%) of these variables in predicting academic achievement scores indicated that the constructs are salient predictors of learning outcomes. This was supported by the study of Emesi and Anyanwu (2022) as the four components of creativity jointly predicted academic achievement scores and this accounted for small 0.4%. The present findings supported the study of Unachukwu et al (2022) where the six components of academic engagement had jointly predicted academic achievement with small 0.8%. Also, findings from this study supported the study of Emesi, et al (2023) which indicated that the five components of social goal orientation jointly predicted academic achievement scores with small 0.3%.

Findings in table 4 using standardized β indicate that the independent variables have roles to play on students’ academic achievement in mathematics. For example, when students’ level of academic engagement is high their level of willingness to adjust and engage in learning of mathematics will be high. Also, when students’ level of creativity is high, their level of constructive reasoning in solving mathematical problems will be high. However, when the level students’ social goal orientation is low, students’ direct and divert their attention to less social interest and classroom social interaction that could have influence their attention to respond, approach and adjust to learning activity. The findings did not support the result from the study of Emesi et al (2023) which recorded that among the clustered of social goal orientation, social-affiliation, social-approval, social-concern and social-responsibility showed a low negative influence to the students’ beliefs to engage in learning mathematics. The findings did not support the result from the study of Emesi and Anyanwu (2022) which revealed that among the clusters of creativity, process, press and product negatively influence students’ creative mind in the learning of mathematics. The findings did not support the result from the study of Unachukwu et al (2022) which indicated that among the students’ academic engagement,
behavioural-engagement, cognitive-engagement, emotional-engagement and agentic-engagement negatively influenced their motivational propensity to engage in the mathematic task.

Finding from table 5 revealed that the analysis of variance for regression equation was significant using social goal orientation, academic engagement and creativity 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 (2023) which recorded that the analysis of variance for regression equation was significant using clusters of students’ social goal orientation. This supported the study of Emesi and Anyanwu (2022) which also indicated that the analysis of variance for regression equation was significant using clusters of students’ creativity. The finding also supported the study of Unachukwu et al (2022) which indicated that the analysis of variance for regression equation was significant using clusters of students’ academic engagement.

Finding in table 6 revealed that the unique contributions of social goal orientation, academic engagement and creativity scores to students’ academic achievement scores in mathematics is statistically significant. Using effect sizes to evaluate its adjusted $R^2$ to compare it with Cohen’s $d$ statistics guideline, the value of $R$ adjusted square .007 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 Unachukwu et al (2022) which indicated that the value of $R$ adjusted square .008 indicates a minimal effect. It also supported the study of Emesi and Anyanwu (2022) which indicated that the value of $R$ adjusted square .004 indicates a minimal effect. Finally, the finding supported the study of Emesi et al (2023) which indicated that the value of $R$ adjusted square .004 indicates a minimal effect.

**Conclusion**

From the findings of the study, it was concluded that the relative and joint interaction of social goal orientation, academic engagement and creativity scores significantly predicted students’ academic achievement scores in mathematics.

**Recommendations**

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

1. It was recommended that students should consider social goal orientation, academic engagement and creativity as adaptive motivational variables that jointly predict academic achievement.

2. It was also recommended that parents should adopt a strategy that will enhance the development of their children’s social goal orientation, academic engagement and creativity so as to help their children develop more insight that will have a positive link with their academic achievement.

3. It was also recommended that the mathematics teachers should adopt a process measure in examining these exogenous variables as this would enable them to identify at risk students much earlier compared to using CGPA, which is a product measurement. This would enable the mathematics teachers to formulate more effective intervention and teaching strategies to reduce attrition rate which students experience in the process of learning.

4. It was also recommended that the guidance counselors should provide emotional support to students to enable them develop a high level of academic interest as well as critical thinking skills during the learning process. This will help the students in providing simple explanations, think deeply and thoroughly in making correct decision and make proportional assessments in the problem solving.

5. It was also recommended that the researchers in the field of educational psychology should adopt other research designs such as hierarchical regression research design to
examine the multiple dimensions of these variables in the subsequent studies.

**Authors Contributions**
The two authors are equally responsible for the following: study conception and design, data collection, analysis and interpretation of results and manuscript preparation.

**Conflict of Interest**
There is no conflict of interest in this research.

**Acknowledgement**
The authors express their profound gratitude to the director of ministry of education, for granting our request and directed the principals in all the selected schools to give us maximum cooperation during data collection for the study.

**References**


