Predictors of Mathematics Anxiety Rating Scale for Nigerian Secondary School

Adebule, S. O. And Kolawole, E. B.

Faculty of Education,
University of Ado-Ekiti, Nigeria.

Corresponding Author: Adebule, S. O.

Abstract
The study examined the predictors of Mathematics Anxiety Rating Scale for Nigerian secondary schools. It investigated the predictive validity of such factors as age, gender, location, class, subject interest, religion and type of schools. The descriptive research design of the survey type was used for the study. The population was the universality of Senior Secondary School students in Nigeria. A sample of 1,243 subjects selected by stratified random sampling technique from Ekiti, Imo and Kaduna States was used in the study. A 50-item Mathematics Anxiety Rating Scale (MARS) was used as instrument to collect data. Multiple regression analysis was used to determine the predictive strength of each variable of MARS. The multiple R=0.256 indicates that there was a significant but low multiple relationship among the variables identified in the study. The results showed that religion has the strongest and most powerful strength of predicting MARS. However some variables not studied could cause unparalleled hatred, negative attitude and total neglect of Mathematics which could result into abysmal failure and woeful performance. Consequently, it was recommended that the teaching of moral education and religious studies be intensified in the secondary schools at both rural and urban settings.

Keywords: prediction, validity, anxiety, rating scale, attitude, multiple regression, dependent and independent variables.

INTRODUCTION
Mathematics has been described by Alonge (1988) and Bloom (1971) as a dynamic and elegant field of human creation and a strong binding force among various branches of sciences, without which knowledge of science often remain superficial. It is a subject which deals with numbers and figures. According to Ogunmoyela (1988), Mathematics plays a fundamental role in economic and social development of a nation.

In Nigeria, Mathematics is a core subject in the curriculum, which occupies a strong and central position and as such, everybody in the society needs it to a certain level in order to make such a person acceptable in the society. Mathematics is often referred to as ‘Queen of the sciences’. But Adelodun (1988) noted that there is a wave of utter indifference and unparalleled hatred bordering on total neglect of Mathematics among students in our educational institutions right from the foundation level to the pinnacle of education. This unfortunate situation leads to the negative attitudes and anxiety towards Mathematics and consequently, the abysmal failure and woeful performances of students in most internal and external examinations (Adebule, 2003).

Anxiety as a global construct has been operationally defined in various ways by notable scholars. Adelodun (1988) looked at anxiety as a state of stress and tension, bordering on uneasiness and instability of the mind. Stone (1976) asserted that emotional difficulties caused by school generated anxiety are detrimental to pupils’ learning. Also Okebukola (1987) indicated that anxiety level in science classes is high and that this leads to depression in achievement. Adebule (2002) described anxiety simply as a summary description of a series of overt and covert actions.

Taylor (1954) constructed the Manifest Anxiety Scale because of the need to measure individual differences in emotional responsiveness in laboratory conditioning experiments. Also, Dregger & Aiken (1957) as quoted in Gire (1988) identified in the research work evidence of ‘Mathemaphobia’ or anxiety in presence of Mathematics and found out that anxiety of students to Mathematics correlates negatively with performance.

Omirin (1999) constructed and validated a science-oriented attitudinal scale for Nigerian schools. The findings showed that scores of students on variables like course of study, class of students differ significantly while gender issue and location of students did not influence their rating of the scale. Also Idu (1988) in his study found out that attitude profile of secondary school students towards Mathematics were contingent upon the type of residence, gender differences and study interest.
This study therefore investigates the predictive validity of such factors as age, gender, location, class, subject interest, religion and type of school on Mathematics Anxiety Rating Scale. The findings would determine the predictability of each variable of the scale.

**IMPORTANCE OF THE STUDY**

Scholars, readers and consumers of research findings could identify the variables that are predictors of Mathematics Anxiety Rating Scale among those variables that were studied. Also, the magnitude and direction of prediction of these variables would be highlighted. Some possible solutions to reduce anxiety towards mathematics and related situations are preferred.

**RESEARCH HYPOTHESIS**

A null hypothesis was generated and tested at 0.05 level of significance:

1. There is no significant difference in the predictive validity of such factors as age, gender, location, class level, subject of interest, religion and type of school on Mathematics Anxiety Rating Scale.

**METHODOLOGY**

The research design for this study was descriptive survey type. The population for the study was the universality of senior secondary school students in Nigeria. The study used 1,243 students selected by stratified random sampling technique as sample from Ekiti, Imo and Kaduna States. The research instrument was a 50-item Mathematics Anxiety Rating Scale developed and validated for use in the Nigerian secondary schools based on the assumptions, procedures and principles of summated ratings developed by Likert (1932). Using the test-retest method, a coefficient of stability r=0.975 was got and the Cronbach coefficient alpha α =0.928. The retest method, a coefficient of stability r=0.928. The instrument was personally administered to the students with the assistance of their teachers.

**Data Analysis**

The data were analysed using multiple regression to determine the predictive strength of the various independent variables.

**Table 1: Summary of regression on sample data**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Beta</th>
<th>Standard error</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject interest</td>
<td>-8.686783</td>
<td>1.044553</td>
<td>-8.316*</td>
</tr>
<tr>
<td>Class</td>
<td>-0.806447</td>
<td>1.104725</td>
<td>-0.730</td>
</tr>
<tr>
<td>Location</td>
<td>4.288460</td>
<td>1.718481</td>
<td>2.495*</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.648847</td>
<td>2.429252</td>
<td>-0.268</td>
</tr>
<tr>
<td>Religion</td>
<td>7.064387</td>
<td>2.711948</td>
<td>2.605*</td>
</tr>
<tr>
<td>Age</td>
<td>-1.748339</td>
<td>1.358929</td>
<td>-1.287</td>
</tr>
<tr>
<td>Type of school</td>
<td>0.491790</td>
<td>1.697921</td>
<td>0.290</td>
</tr>
<tr>
<td>Intercept</td>
<td>174.256309</td>
<td>6.438315</td>
<td>26.066*</td>
</tr>
</tbody>
</table>

**Table 2: Regression analysis of overall performance of the variables and MARS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Beta</th>
<th>Standard error</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject interest</td>
<td>-8.686783</td>
<td>1.044553</td>
<td>-8.316*</td>
</tr>
<tr>
<td>Class</td>
<td>-0.806447</td>
<td>1.104725</td>
<td>-0.730</td>
</tr>
<tr>
<td>Location</td>
<td>4.288460</td>
<td>1.718481</td>
<td>2.495*</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.648847</td>
<td>2.429252</td>
<td>-0.268</td>
</tr>
<tr>
<td>Religion</td>
<td>7.064387</td>
<td>2.711948</td>
<td>2.605*</td>
</tr>
<tr>
<td>Age</td>
<td>-1.748339</td>
<td>1.358929</td>
<td>-1.287</td>
</tr>
<tr>
<td>Type of school</td>
<td>0.491790</td>
<td>1.697921</td>
<td>0.290</td>
</tr>
<tr>
<td>Intercept</td>
<td>174.256309</td>
<td>6.438315</td>
<td>26.066*</td>
</tr>
</tbody>
</table>

Table 2 shows the independent variables that can predict effectively and those that cannot predict the dependent variable. The prediction equation is MARS = 174.26 – 8.69 (Sub int) – 0.81 (class) + 4.29 (location) – 0.65 (Gender) + 7.06 (Rel) – 1.75 (Age) + 0.49 (Type of school) + e (the residual factor which represents the variance in MARS that is not accounted for by the independent variables analysed)

By setting aside all other studied variables, for every extra mark in other variables, there is a corresponding extra mark of 174.256 in MARS. Also putting other variables aside, for every extra mark in religion, there is a corresponding extra mark of 7.0648 in MARS. Setting other variables aside, for every extra unit increase in class, there is a corresponding 0.806447 decrease in MARS. Also, for putting all other variables aside, for every one extra year, there is a corresponding 1.748339 decrease in MARS. Setting aside all other variables, for every extra mark in subject of interest, there is a corresponding 8.686783 decrease in MARS.

Table 2 also indicates that some of the variables studied can predict effectively the performance of students on MARS. A cursory look at the predictability of all these variables shows that

**Analysis of Variance**

<table>
<thead>
<tr>
<th>Multiple Regression</th>
<th>df</th>
<th>Sum of squares</th>
<th>Mean square</th>
<th>F-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>7</td>
<td>78969.018</td>
<td>11281.29</td>
<td></td>
</tr>
<tr>
<td>Residual</td>
<td>1235</td>
<td>1126014.625</td>
<td>911.752</td>
<td>12.3732</td>
</tr>
</tbody>
</table>

P<0.05 (Significant result)
religion has the highest Beta weight of 7.064871 hence has the strongest and powerful strength of predicting MARS. This was followed by location of school (4.2885), type of school (0.49179), gender (-0.64885), class (-0.806447) and age (-1.74834). However, subject interest had the least strength and thus the worst predictor of MARS. It has a Beta weight of -8.686783. Subject interest, class, age and gender all contributed negatively to the prediction of Mathematics Anxiety Rating Scale while location, religion and type of school all had positive contribution. On a final analysis, apart from all the above mentioned variables, there were other factors not studied that contributed significantly to the prediction of MARS.

DISCUSSION AND CONCLUSION
The findings of this study indicated that there was a significant difference in the predictive validity of such factors as age, gender, location, class, subject interest, religion and type of school on Mathematics Anxiety Rating Scale. It also revealed that there was a significant relationship between each of the variables and MARS. The findings also showed that each of the variables made a significant contribution to MARS. It showed that there existed a stronger linear dependence among MARS and each of the independent variables.

Kolawole (1998) stated that $Y$, $X_1$, $X_2$, $X_3$, $X_n$ are said to be linearly dependent if each of them can be expressed as a linear combination of the others. Thus, since it was possible to obtain a prediction equation and also there was a significant regression then, there existed a strong linear dependence among MARS and the independent variables.

This finding is in line with Alonge (1988) and Gire (1988). Kolawole (1998) also used multiple regression analysis to analyse and predict achievement in Mathematics via the APD test items and found a significant linear relationship between them. The study also discovered a strong linear dependence among achievement scores and the APD variables used in the study.

Obemeata (1974) in his analysis of the factors which affect the performance of Nigerian child on Intelligence Test, found that the problem of languages was the most important factor which influenced scores and affect the predictive validity of tests of intelligence which were used for the purpose of selection for secondary education.

RECOMMENDATIONS
Since religion has the highest Beta weight, then it has the strongest and most powerful strength of predicting Mathematics Anxiety Rating Scale. Consequently, it was recommended that the teaching of moral education and religious studies be intensified in the various secondary schools. Also, mission schools should be reintroduced at both urban and rural settings.

LIMITATIONS
Initially some of the principals and teachers of schools where students that served as sample were selected did not cooperate. However, when the researcher explained the purpose of the study to them they cooperated. Also, time and financial constraints limited the size and coverage of the sample.

REFERENCES


Likert R (1932); A technique for the measurement of attitudes. Archive of Psychology; USA; Holt, Rinehart and Winston.

Ogunmoyela K. (1988); Mathematics in the study of nature. Journal of Ondo State Mathematics Association 1(1) 87-93

Okebukola P.A (1987); Remedying students weaknesses in sciences. A test of the efficacy of a psychosical learning model. Journal of the school of Pure Sciences (1) 4


Stone E, (1976); An introduction to Educational psychology; Methue Publishers