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Psycho-Academic Variables and Mathematics Achievement of 9th Grade Students in Nigeria

Eme U. Joseph[1*]

[1]Dept. of Educational Foundations, Guidance and Counselling, University of Uyo, Nigeria.

Author's Contribution

As the first and sole author, EUJ was entirely responsible for the identification and design of the study. He did the literature searches, data capture and statistical analysis, the writing and proof reading of the final manuscript.

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ABSTRACT

The aim of this study was to examine the role of students' five psycho-academic variables in predicting their academic achievement in mathematics. Participants included a total of 853 9th grade students (407 males and 446 females) randomly sampled from 20 secondary schools in Akwa Ibom State, Nigeria, who answered a 40-item Mathematics Standardised Test and a Psycho-academic Questionnaire constructed with five variables. The results from multiple regression analyses indicated that only students' study habits and attitude toward school were significant in contributing to mathematics achievement. The other three variables, test anxiety, test wiseness and attitude towards mathematics were not statistically significant at the individual level. The results highlighted the importance of certain psycho-academic variables on predicting mathematics achievement, and suggest the replication of these results across all areas of the curriculum.

Keywords: Psycho-academic variables; study habit; attitude to schooling; attitude towards mathematics; mathematics achievement.

**Corresponding author: Email: emeujoseph@yahoo.com;*

1. INTRODUCTION

The recently introduced Universal Basic Education Programme in Nigeria emphasizes the need for every Nigerian youth to avail him/herself of the first nine years of compulsory formal education. With the adoption and implementation of this programme, the Nigerian child takes his first major certificate examination at the end of this nine years of education, more so, a good performance in Mathematics which is the dependent variable in this research is requisite of all students. Unfortunately, Mathematics has been one subject in which students consistently perform poorly. In order to stem the tide of poor performance in this all-important subject, successive governments, education related agencies in both the public and private sectors have variously made relevant contributions toward the improvement of the teaching and learning of Mathematics.

Despite these concerted efforts, students' performance is still taking a downward train. It is perhaps due to the persistent nature of this problem that educational researchers, university dons and even government agencies have tried to uncover the underlying reasons for students' poor performance in this subject. Various research endeavours have been under taken; some of which include the effects of school variables such as class size, school location, school proprietorship (Ansa, 1990) and effects of socio-economic background on academic achievement (Okebukola, 1992). Studies of effects of psychological factors such as attitudes and interest on academic achievement have also been undertaken by Akubiro and Joshua (2004).

The aforementioned research works have been conducted to understudy the lone effects of these variables on students' academic achievement. But on considering the interactive nature of various personal, social, psychological and school variables this research intends to investigate the individualistic and collective effects of some psycho-academic variables on students' academic achievement with regard to their performance in Mathematics at the 9^{th} grade; 9^{th} grade as used in this study refers to the Junior Secondary Three (JS 3) class in the Nigerian Secondary Schools System.

1.1 Statement of the Problem

Despite the myriad research endeavours at uncovering the factors that affect students' performance, gaps still exist in the area of the possible effect of some psycho-academic factors such as test anxiety, test wiseness, study habits and attitudes toward the subject areas as they affect students' performance in Mathematics at the Junior Secondary School level. This research is therefore to statistically ascertain the individual and collective effects of aforementioned psycho-academic variables at predicting JS 3 students' performance in Mathematics.

1.2 Purpose of Study

The purpose of this research therefore is to:

1) Examine the individual contributions of psycho-academic variables (study habits, test anxiety, attitude towards schooling, attitude towards Mathematics and test wiseness), predicts JS 3 students' performances in Mathematics.

2) Examine the collective contributions of the listed psycho-academic variables to the prediction of JS 3 students' performances in Mathematics.

1.3 Hypotheses

The study will be guided by the following hypotheses:

Ho 1. The individual contributions of the listed psycho-academic variables (study habits, test anxiety, attitude towards schooling, attitude towards Mathematics and test wiseness), do not significantly predict JS 3 students' performance in Mathematics.

Ho 2. The collective contributions of the listed Psycho-academic variables (study habits, test anxiety, attitude towards schooling, attitude towards mathematics and test wiseness), do not significantly predict JS 3 students' performance in Mathematics.

2. REVIEW OF RELATED LITERATURE

Psycho-academic variable though the coinage of the researcher is focused on some academic attributes with strong psychological leaning. For this research, attention will be given to variables like study habit, test anxiety, attitude to schooling, attitude towards mathematics and test wiseness and their effect on students' academic performance.

Hambree (1999) portrays test anxiety as a performance anxiety which generates from self-consciousness and self-doubt; this reduces the likelihood of success and increases the possibility on failure on the test or tests (Mitchell, 2002). A study conducted by Woodward (2004) on the relationship between mathematics test anxiety scores and mathematics achievement scores showed that there was a significantly low negative relationship between mathematics test anxiety scores and mathematics achievement scores. The researcher further investigated the differences that exist among male of female students using the independent t-test. Results from the analysis showed that female students were significantly more anxious than their male counterparts. These findings confirmed result of researches independently conducted by Tobias (2001) and Tapasak (2002), which indicated that female students exhibited higher levels of mathematics test anxiety thus having lower confidence in their mathematical ability than the male students.

In another study by Becker (1990) on the effect of test wiseness coaching on standardized Aptitude Test (SAT), mathematics and SAT verbal, Becker (1990) found out that coaching effects were higher for the mathematics than the verbal aspects of SAT. From a study conducted by Ijeoma (2002) on 500 senior secondary school students in Imo State, Nigeria, the result from a 2-way ANOVA used showed that test wise students in the research performed significantly better than the non-test wise students.

From a study conducted in 1994 by the United States National Center for Education Statistics to determine if there is a relationship between study habits and academic performance. The data obtained showed a positive trend linking high performance on the assessment and good study habits. It was observed that students near the 90^{th} percentile than those near the 50^{th} percentile and those near the 50th reported the use of good study habits than those near the 25^{th} percentile.

According to Amoo (2002), attitude play major role in the comprehensibility of mathematical concepts. A study conducted by Bassey, Ubi and Joshua (2005) using 600 senior secondary students to ascertain sex differences in student's attitude towards mathematics instruction in southern Cross River State, Nigeria, the result of a t-test analysis from the data gathered showed that male students exhibited a favourable attitude towards Mathematics than their female colleagues. In another study carried out by Akubiro and Joshua (2002), students' attitude towards science subject was found to be a significant predictor of student's performance in the subject. The analysis of variance showed an F-ratio of 94.381 which was significant at 0.05 alpha levels using a sample of 300 students. Despite this array of researches this particular research is needful because of its investigation into the collective influence of these psycho-academic variables of students' performance in mathematics.

3. METHODOLOGY

3.1 Population, Sample and Sampling Technique

The population of this study comprised all the 9th grade students from both public and private secondary schools in Akwa Ibom State. There were a total of four hundred and thirty eight secondary schools in Akwa Ibom State; comprising 240 public and 198 private schools with an approximate JS 3 student population of 29,000 at the time of this study. A total of 20 schools were randomly sampled. From each of these schools, 50 students were randomly sampled to make up a study sample of 1000 respondents. Out of the 1000 students complete and correct data were obtained from 853 respondents of which 407 were males whereas 446 were females representing a percentage of 47.7% and 52.3% respectively.

3.2 Research Design

In the course of conducting this research, the researcher had no direct control over the changes in the variables under study, thus the research was basically of a causal comparative design. In this kind of research, the inferences from the dependent variable are only based on the natural variations in the independent variables as they affect or influence the dependent variables (Kerlinger, 1986)**.**

3.3 Instrumentation and Method of Data Analysis

Two instruments were employed by the researcher to gather relevant information for this study namely;

(i) Mathematics Achievement Test and
(ii) The Students' Psycho-academic Information Questionnaire (SPAIQ)

3.3.1 Mathematics achievement test

To ascertain the respondents' academic performance in Mathematics, a 60-item test for were constructed and used. The instrument developed by the researcher was based on the JSS 3 syllabus for the subject. Considering the cognitive level of the students, items included in the instrument were based on knowledge, comprehension and application levels of Blooms taxonomy of educational objectives. The content areas tested on were: number systems; factors and multiples; fractions and percentages and geometry. Others include

algebra; measureation; proportion and ratio; variation and probability; everyday arithmetic; and statistics.

3.3.2 The students' psycho-academic information questionnaire (SPAIQ)

The students' psycho-academic information questionnaire (SPAIQ) consisted of two parts. Part A was to enable the researcher elicit demographic information on the respondents, while Part B consisted of 10 items for each of the five (5) psycho-academic variables under study, The respondents expressed their level of agreement or otherwise to each statement based on a 4 point Likert type scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD).

The researcher personally constructed the items for each variable in the study. The items on the questionnaire were vetted and reviewed by Measurement and Evaluation experts, while Secondary school teachers who are currently teaching mathematics vetted the achievement tests items. This exercise was needful to ensure face validity of the items.

The original 60-item Mathematics achievement test was pre-tested using 100 JS3 students in four secondary schools within the study area. The result of the item analysis conducted guided the researcher on the selection of the final 40-item instrument, items with negative discrimination indices were discarded while those with low difficulty/low discrimination indices were restructured. The reliability coefficient of 0.92 for the mathematics achievement test was established using the split-half method. The reliability of the Students' Psycho-academic Information Questionnaire was calculated on the basis of the subsets in the instrument using the Cronbach alpha statistical procedure. The reliability coefficient for each subset is shown on Table 1.

Table 1. Reliability results of the instruments

Variables	No. of items	Mean	sd	Cronbach alpha
Test Anxiety	10	17.15	5.03	0.72
Test Wiseness	10	29.92	2.74	0.59
Study Habits	10	33.46	0.68	0.87
Attitude to Schooling	10	32.61	5.08	0.91
Attitude towards Mathematics	10	32.14	4.60	0.82

The researcher with the assistance of the mathematics teacher in the sampled schools administered the instruments. These teachers were enlisted by the researcher as research assistance for the proper collection and collation of the relevant data from the respondents. Each instrument was administered within a day in each school so, data collection in each school lasted two days.

4. PRESENTATION OF RESULTS

The hypotheses that guided the study sort to establish if the psycho-academic variables of study habits, test anxiety, attitude towards schooling, attitude towards Mathematics and test wiseness, do significantly contribute either individually and/or collectively to the prediction of JS 3 students' performance in Mathematics. To test these hypotheses, the data gathered

from the respondents were analyzed using multiple regression. The result of the analysis is given in Table 2.

Results of the regressional analysis show that only study habit with the regressional coefficient (b) of 0.580, and a beta weight of 0.118 and attitude to schooling with the regressional coefficient (b) of 0.516 and a beta weight of 0.116 significantly determine JS 3 students' performance in Mathematics. But the contributions of test anxiety, attitude towards Mathematics and test wiseness was not significant in predicting students' performance in Mathematics. The prediction equation is therefore as follows:

MATHEMATICS= -13.096 + 0.580SH – 0.00106TA + 0.516AS + 0.245AM + 0.363TW.

On the basis of the results in Table 2, the null hypothesis which proposed a no significant contribution of the individual variables to the prediction of JS 3 students' performance in Mathematics is rejected for study habit and attitude to schooling but retained for test anxiety, attitude towards Mathematics and test wiseness.

Table 2. Summary of multiple regression analysis of the individual and collective effects of students' psycho-academic variables in the prediction of students' performance in mathematics

Regression statistics				
Multiple R	0.245			
R Square	0.060			
Adjusted R Square	0.054			
Standard Error	20.77			
Sources of variation	**Sum of squares**	**Degree of freedom**	**Mean square**	**F-ratio**
Due to regression	23226.147	5	4645.229	10.772*
Due to residual	365256.52	847	431.236	
Total	388482.67	852		
Variables	**Unstandardized regression weight (b)**	**Standard error of regression wt**	**Beta weight**	**t**
Constant	-13.096	9.956		-1.315
Study Habits	0.580	0.186	0.118	3.127*
Test Anxiety	-0.00106	0.162	-0.002	-0.066
Attitude to Schooling	0.516	0.172	0.116	2.999*
Attitude towards Mathematics	0.245	0.166	0.055	1.478
Test Wiseness	0.363	0.206	0.060	1.759

*P < 0.05; critical $F_{(5, 847)}$ = 2.23; critical t = 1.96.

To ascertain the collective effect of the five psycho-academic variables (study habit, test anxiety, attitude to schooling, attitude towards Mathematics and test wiseness) in predicting JS 3 students' performance in Mathematics the multiple regression analysis yielded a coefficient of R = 0.245 and a multiple R-square (R^2) of 0.060 which means that only 6% of the total variance of students' performance in Mathematics can be explained by the five variables. The result of analysis of variance (ANOVA) for the prediction produced an F-ratio

of 10.772 which is significant at 0.05 alpha level. This means that the collective effect of these five variables can be used to predict or explain students' performance in mathematics.

On the basis of the results on Table 2 the null hypothesis of no significant collective contributions of the five psycho-academic variables of (study habit, test anxiety, attitude to schooling, attitude towards mathematics and test wiseness) on predicting the JS 3 students' performance in Mathematics has been rejected.

5. DISCUSSION

The result of testing hypothesis one shown on Table 2 reveals that the five students' psycho-academic variables (study habit, test anxiety, attitude to schooling, attitude to mathematics and test wiseness) when taken collectively are effective in predicting students performance in Mathematics. The observed F-ratio of 10.772 was significant at $p<0.05$ alpha level indicating that the effectiveness of the collective contribution of the psycho academic variables in predicting that students' performance in Mathematic could not have occurred by chance. The level of contribution of these independent variables with the students' performance in Mathematics is reflected by 0.245 value of the coefficient.

A further study of Table 2 revealed the individual contributions made by each of the psycho-academic variables to the prediction. The readings of the t-values of each independent variable showed that study habit and attitude to schooling contributed significantly to performance in Mathematics at $p<0.05$ level of significance with t – values of 3.127 and 2.999 respectively. The significant contribution of study habit to academic performance is a result supported by previous research studies by Christenson (1992) and Idika (2004).

Studies on the effect of attitude has also buttressed the result of this research endeavor, for instance attitude has been found to positively affect students' performance from studies conducted by Maduabum (1993), Freedman (1997) and Thompson (2001). Attitude toward mathematics has not significantly contributed to students' performance in mathematics but a more encompassing factor – attitude to schooling has been found to significantly contribute to students' performance in mathematics. This tends to support Amoo's (2002) stance that attitude plays a major role in the comprehensibility of mathematical concepts. This is further confirmed by Ukpong (2000) who opines that attitudes influence students' choices, response, values participation and commitment to educational activities, therefore a positive and significant attitude to schooling will permeate the different facet of the child's school career.

The third variable on the series is test wiseness. Results gathered from the study indicate that test wiseness yielded a t-value of 1.759 which was statistically insignificant at 0.05 level. This result is naturally obvious as it is more difficult to get mathematics item correct by guessing or by some other test-wise method other than actual knowledge of the subject matter. For success in mathematics the student is often expected to actually know and apply the mathematical formula to get the mathematics test item correct.

The psycho-academic variable that has least effect on students' performance in Mathematics is test anxiety. This outcome could be consolidated by the fact that interest in mathematics directly affects anxiety, which also influences performance. Studies abound that showed a negative effect of test anxiety on performance in Mathematics such researches by Petz (1999), Woodward (2004) and Amadioha (2006). These findings have

implications for students' interest in school subjects as it usually will bear upon their performance in those subjects.

Summarily, it is observed that study habit and attitude to schooling are the two variables that have individually contributed to the students' performances in Mathematics. The strength of contribution to each of the two predictor variables has been indicated by the beta weight of 0.118 for study habit and 0.116 for attitude to schooling. These results emphasize the need for good study habit and a positive attitude to schooling for an all round good academic performance in our students. It is worthy of note that the major contribution of this study is particularly on the collective effect of the five psycho-academic variables on the students' performance in Mathematics. Although only the effects from study habits and attitude towards schooling where significant, the contributions of test wiseness, attitudes towards Mathematics and the negative influence of test anxiety should not be trivialized as their collectively force has a significant influence on performance.

6. CONCLUSIONS

This study sought to establish the role of selected psycho-academic variables in predicting students' academic achievement in mathematics. Based on the outcome of data analyses, the following conclusions are reached:

- The five psycho-academic variables namely study habit, test anxiety, attitude toward schooling, attitude towards mathematics and test wiseness, collectively and significantly predicted students' performances in Mathematics.

- When considered separately two out of the five psycho academic variables—study habits and attitude towards schooling—contribute significantly contributed to the prediction of students' performance in Mathematics.

- Test wiseness cannot predict mathematics achievement due to the fact that mathematical achievement is primarily enhance by knowledge and mastery of the rules of mathematics and not mere guesswork or some other test-wise methods that students could employ.

- The interplay of interest in mathematics naturally allays (aggravates) test anxiety thus reducing (increasing) the potency of text anxiety in predicting mathematics achievement in the study population.

7. RECOMMENDATIONS

The following recommendations are made on the basis of the findings of this study.

1. Teachers and guidance counsellors in particular should educate the students on how to cultivate good study habits in order improve on their gains from education.

2. Parents and teachers should consciously work on their students' attitude towards school and the different school subjects as this will directly impact their academic performance in various school subjects.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

Akubiro, I.M., Joshua, M.T. (2004). Self-concept attitude and achievement of secondary students in science in Southern Cross River State, Nigeria. The African Symposium 4(1). <http://www2.ncsu.edu/ncsu/aern/seksiens.html>.

Amadioha, A. (2006). Item placement, test anxiety, reliability and students' achievement in mathematics in secondary school in Rivers State, Nigeria. Unpublished Ph. D. Thesis, Faculty of Education. University of Calabar, Calabar, Nigeria.

Amoo, S.A. (2002). Analysis of problems encountered in teaching and learning of mathematics in secondary schools. ABACUS, 5, 56-61.

Ansa, E.E. (1990). Construction and validation of a chemistry achievement test for senior secondary schools, Akwa Ibom State, Nigeria. Unpublished M.Ed. Thesis. University of Benin, Benin City.

Bassey, B.A., Ubi, O.U., Joshua, M.T. (2003). Sex difference in students' attitude towards mathematics and their evaluation of mathematics instructions. Education for Today, 3(1), 109–115.

Becker, B.J. (1990). Coaching for the scholastic aptitude test: Further synthesis and appraisal. Review of Educational Research, 60, 373–417.

Betiku, O.F. (2001). On the low participation and poor performance of girls in school mathematics. Proceedings of 42nd Annual Conference of STAN, 314 – 320.

Christenson, S.L. (1992). Family factors and student achievement. An avenue to increase student success. School Psychology Quarterly, 7(3), 112-117.

Freedman, M.P. (1997). Relation among laboratory instruction, attitude towards science and achievement in science knowledge. Journal of Research in Science Teaching, 34(4), 343–357.

Hembree, R. (1999). Correlates, causes, effects and treatment of test anxiety. Review of Educational Research, 58, 47-77.

Idika, D.O. (2004). A causal model of some psycho-social variables as determinants of cheating tendency among senior secondary school students in southern education zone of CRS, Nigeria. Unpublished M. Ed. Thesis, Faculty of Education. University of Calabar, Calabar, Nigeria.

Ijeoma, G.M. (2002). Test - Wiseness, guessing tendency and performance in mathematics among secondary school students in Imo State. Unpublished Ph.D Thesis, Faculty of Education. University of Calabar, Calabar, Nigeria.

Maduabum, E.D. (1993). Sex differences in attitude towards science and achievements in science in Nigeria: An analysis of 12 years of research. Journal of Technical and Science Education, 2(1&2), 63-71.

Mitchel, l.S. (2002). Test anxiety: Counselling services. Available Online: <http://ubcounselling.buffalo.edu/stresstestanxiety.shtml>.

Okebukola, P.A. (1986). Co-operative learning and students' attitude toward laboratory works. School Science and Mathematics, 86, 582-590.

Petz, N. (1999). Prevalence, distribution and correlates of mathematics anxiety in college students. Journal of Counselling Psychology, 25, 441-443.

Tapasak, A.A. (2002). The relationship between anxiety toward mathematics and achievement in mathematics. Journal of Research in Mathematics Education, 30, 520–522.

Thompson, L. (2001). How to improve student performance with a focus on mathematics by fostering positive self esteem and creating awareness of gender issues. Ontario Action Researcher, 4, 23–27.

Tobias, S. (2001). Mathematics anxiety and update. Journal of Social Work Education, 29, 270–274

Ukpong, E.M. (2002). The psychology of adult learning**.** Port Harcourt: Double Diamond Publications.

United States National Center for Education Statistics. (1994). Good study habits and academic performance: findings from the NAEP 1994 U.S. History and Geography Assessments. Available Online: <http://nces.ed.gov/pubs97/web/97931.asp>.

Woodward, T. (2004). The effect of mathematics anxiety on post secondary development students as related to achievement gender and age. Journal of Contemporary Education, 67, 42–45.

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