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EFFECT OF GENDER, AGE AND MATHEMATICS ANXIETY ON COLLEGE STUDENTS' ACHIEVEMENT IN ALGEBRA

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ABSTRACT :Mathematics is a very important subject. It is the language of science and technology and so it is a force to reckon with in the development of any nation. Several studies on factors that affect mathematics achievement have been conducted. However, studies on factors that affect mathematics achievement among College students in Nigeria seems to be rare. This study therefore sought to investigate the effects of gender, age and mathematics anxiety of College students on their achievement in Algebra. The study adopted an expost-facto design since no variable was manipulated. The participants of the study are mathematics teacher trainees in the Federal Colleges of Education in Lagos and Ogun states of Nigeria. The data for the study was from a questionnaire which elicited information on gender and age of respondents, a mathematics anxiety scale (r=0.82) and participants' achievement score in an Algebra course coded MAT 111. The achievement score in Algebra is the dependent variable while gender, age and mathematics anxiety formed the independent variables of the study. The data collected were analysed using mean, standard deviation, independent t-test and One-way ANOVA. The results of the analyses showwed average performance in the Algebra course. Besides, the differences in achievement across gender,age and mathematics anxiety groupings (low, medium and high) were all non-significant. Since the participants are on their first semester in the college and their performance is generally on the average, it is recommended that proper orientation be given to new students on how to be high achievers on the programme. Besides, their lecturers should be as simple as possible in their instructions.

Keywords: Gender, age, anxiety, mathematics, achievement.

INTRODUCTION

Several studies have been conducted over the years to determine the predictors of mathematics achievement among various groups of individuals. Some of the predictors discovered are: socio- economic status (Ajayi & Muraina 2011), students' employment status (Wantanabe, 2005), teaching methods (Eniayeju, 2010), gender and continuous assessment (Owolabi & Etuk –Iren, 2009). Other factors found to affect achievement in mathematics are: self-concept and learning style (Rech & Stevens,1996), reading abilities, mathematics self efficacy and teacher evaluation (Larwin, 2010) and students' previous knowledge (Siegler, Duncan,Davis-Kean, Duckworth, Claessens, Engel, Susperregury and Chen, 2012).

One variable that has, over the years, received considerable attention in many studies on science achievement in general and mathematics achievement in particular is gender. In a meta –analysis of 77 studies conducted between 1980 and 1991 among middle and high school students, DeBaz (1994) found a significant gender effect favouring males in overall science achievement. Hedges and Newell (1999) discovered that boys outperform girls in science but in reading and writing girls have the advantage. Researchers have indicated that gender affects mathematics achievement. For example, Trends in International Mathematics and Science Study (TIMSS), found significant differences between male and female students in mathematics achievement, with male students significantly outperforming their female counterparts. Epstein, Elwood, Hey, Maw (1998) reported that females outperform males in mathematics. In their study, Hedges and Newell(1999) reported that girls

perform better than boys in reading and writing. However, a Nigerian study by Abiam and Odok(2006) shows no significant gender-achievement relationship in number and numeration, algebraic process and statistics. Similar results showing no significant gender difference in mathematics achievement were found by Habibollah, Abdullahi, Arizan, Sharir, and Kurma (2009) and Abubakar(2010).

Another variable which is of great interest to this study is age. Many studies have been conducted to investigate the effect of age on students' achievement. White (1982) found that the correlation between age and school achievement diminishes as students become older. According to White (1982), schools provide equalizing experiences, and thus the longer the students study in the schooling process, the more the impact of the age on students' achievement is diminished. In addition, as the students move up the age, more students drop out of school, thus reducing the magnitude of the correlation. On the contrary, results from longitudinal studies have contradicted White's results by demonstrating that there is a gap in students achievements as students get older (Walker, Greenwood, Hart & Carta, 1994). La Paro & Pianta (2000) presented evidence that older children fared better academically than the younger ones.

Akman-Yesilel (2012) submits that anxiety is a term used for several disorders that cause nervousness, fear, apprehension and worrying. According to him, these disorders affect the way we feel and behave. Zhang (2004) see it as a cognitive behaviour rising from self doubt and self depreciation. Many students with mathematics anxiety possess little or no confidence in their ability to solve mathematics problems. The pertinent question is what is the level of anxiety which is acceptable and beyond which performance is seriously affected? According to Ashcraft and Kirk (2001), the correlation between mathematics anxiety and academic performance is negatively significant. The findings of Hembree (1990) shows that a students with high level of mathematics anxiety have lower levels of mathematics achievement.

Different studies have been conducted to investigate the kind of relationship displayed across several age population. For example, mathematics anxiety is negatively correlated with mathematics performance among adults among college students in particular (Frary & Ling, 1983). Hembree (1990) reported an average correlation between anxiety and achievement for college students. In their study, Eccless and Jacobs (1986) after introducing gender as a mediating variable found that gender difference in mathematics anxiety are attributable to gender differences in mathematics achievement. Wood (1988) reviewed research on mathematics anxiety manifested among elementary teachers and suggested that mathematics teachers anxiety towards mathematics was likely to be transmitted to their students.

Studies that investigated the collective and individual influence of age, gender and mathematics anxiety on mathematics in general and Algebra in particular seems to be very rare. On this note, this study seeks to find out the influence of gender, age and mathematics anxiety on achievement in Algebra among NCE mathematics students in south-western Nigeria.

Purpose of the Study
This study will determine:
1.   The influence of gender on students' achievement in Algebra
2.   The influence of age on students' achievement in Algebra
3.   The influence of mathematics anxiety on students' achievement in Algebra

Hypotheses
The following hypotheses were tested:
1.   There is no significant difference in the achievements of male and female students in Algebra.
2.   There is no significant difference in the achievements of students in Algebra across age groups.
3.   There is no significant difference in the achievements of students in Algebra across low medium and high anxiety groups.

METHOD

The study adopted a survey design with all undergraduate computer/mathematics students of the Federal colleges of education in Lagos and Ogun states of Nigeria as population for the study. The sampling procedure was purposive as students who had offered the Algebra course in their first semester year one were eligible to participate in the study. The mathematics anxiety rating scale was administered on one hundred and sixty computer/mathematics students of Federal College of Education (Technical), Akoka, Lagos state, Nigeria and Federal College of Education, Osiele, Abeokuta, Ogun state, Nigeria. To determine the mathematics ability of students, their first semester scores in a course titled "Algebra" (MAT 111) was used. The student background questionnaire was used to elicit information on age and gender of the respondents. The mathematics anxiety rating scale was originally designed and validated by Baloglu and Zelhart (2007). The scale has 14 items. The respondents were given instructions to rate their anxiety levels when faced with mathematical concepts. The

questionnaire was designed using a four-point Likert-scale using the following response format: strongly agree (SA), agree (A), disagree (D) and strongly disagreed (SD). The reliability coefficient using cronbach alpha was found to be 0.82. The resulting data were analysed with the aid of Statistical Package for Social Sciences (SPSS) version 17.0 software using correlation and multiple regression.

RESULTS

The results and the relevant discussions are presented below in accordance with the hypotheses stated.

Hypothesis One: There is no significant difference in the achievements of male and female students in Algebra.

Table 1: T-test comparison of male and female students in Algebra

Gender	No	Mean	S.D	Tcal	Df	P-value	Remark
Male	82	55.06	18.583	0.372	158	0.711	N.S
Female	78	53.94	19.721				

Table 1 presents the t-test comparison of the scores of male and female students in Algebra. The t-test comparison showed a statistical difference which is not significant between the mean scores of male and female students in Algebra (tcalculated = 0.372, df = 158, p > 0.05). We therefore accept the null hypothesis. The mean scores showed a higher mean for male students. It therefore follows that the mean score of male students in Algebra (mean = 55.06, Standard deviation = 18.583) is higher but not significantly higher than that of their female counterparts (mean = 53.94, Standard deviation = 19.721).

Hypothesis Two: There is no significant difference in the achievements of students in Algebra across age groups.

Table 2: The Influence of Age on Achievement in Algebra.

	Sum of Squares	df	Mean Square	F	P-value
Between Groups	982.075	3	327.358	0.896	0.445
Within Groups	56987.900	156	365.307		
Total	57969.975	159			

The F value of 0.896 in Table 2 is not significant at 0.05 level of significance, implying that achievement in Algebra do not vary across age groups. On the sample selected however, the post hoc analysis showed that those between age 15 to 20 years had the highest mean score, while those above 30 years had the least mean score.

Hypothesis Three: There is no significant difference in the achievements of students in Algebra across mathematics anxiety groups.

Table 3: The Influence of mathematics anxiety on Achievement in Algebra.

	Sum of Squares	df	Mean Square	F	P-value
Between Groups	707.160	2	353.580	0.964	0.384
Within Groups	57206.023	156	366.705		
Total	57913.182	158			

The F value of 0.964 in table 3 is not significant at 0.05 level of significance, implying that achievement in Algebra do not vary across mathematics anxiety groups. On the sample selected however, the post hoc analysis showed that those that are in the medium anxiety level had the highest mean score, while the highest anxiety level had the least mean score.

DISCUSSION

The findings of this study agrees with the findings of Abiam and Odok(2006) , Habibollah, Abdullahi, Arizan, Sharir, and Kurma (2009) and Abubakar(2010). It is however in contrast with the findings of Epstein, Elwood, Hey, Maw (1998) and Hedges and Newell(1999). On the whole, it is hoped that if both gender are given proper orientation, opportunities and training gender will no longer be an issue in mathematics achievement in general and achievement in Algebra in particular.

The insignificant differences in achievement in Algebra across age groups in this study agrees with Abubakar and Oguguo (2011), but disagrees with Walker, Greenwood, Hart & Carta, 1994), Crosses (1991) and La Paro & Pianta (2000). More influential factors might be active in determining variation in achievement in Algebra.

Level of anxiety was not seen to affect achievement in Algebra in this study. However among the participants of the study, those with medium level of anxiety performed best. This is in agreement with the assertion of Skemp

(1986), that a moderate amount of anxiety may actually facilitate performance. Beyond a certain degree, anxiety hinders performance particularly in the case of higher mental activities and conceptual process.

CONCLUSION and RECOMMENDATION

Gender, age and mathematics anxiety did not significantly affect achievement in Algebra. It is recommended that studies on the interaction effects of these variables should be carried out.

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