

## ***Students' demographic factors and their academic achievement in Mathematics and Physics in Calabar Metropolis of Cross River State, Nigeria***

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### **Abstract**

*This study examined the influence of students' demographic factors on their academic achievements in Mathematics and Physics in Calabar Metropolis of Cross River State, Nigeria. Two hypotheses were formulated to direct the study. Ex-post facto research design was adopted for the study. A sample of 1000 SS 1 students, out of 10,016 students, was selected from 24 secondary schools for the study using stratified and proportionate simple random sampling procedures. One instrument constructed by the researchers was used for data collection namely: Students Mathematics and Physics Achievement Test. One way Analysis of Variance (ANOVA) and independent t-test were the statistical techniques adopted to test the hypotheses at .05 level of significance. The result of the analysis revealed that students' age does not significantly influence their academic achievement in Mathematics and Physics, and there was a significant difference between male and female students' academic achievement in Mathematics and Physics. Based on these findings, it was recommended, among others, that Mathematics and Physics teaching and evaluation strategies should be free from gender bias. This will make males and females to see themselves as equal, capable of competing and collaborating in school activities.*

**Keywords:** academic, achievement, demographic, gender, Mathematics, Physics

### **Introduction**

Mathematics and Physics are core and compulsory Science subjects in Senior Secondary School Curriculum which reflects the recognition of the vital role it plays in contemporary society (Federal Republic of Nigeria, 2014). The broad goals of secondary education as captured in the National Policy on Education is the preparation for higher education, and specifically, to equip the learner to live effectively in the modern age of science and technology. It is clear that the knowledge of Mathematics

and Physics is very necessary for the attainment of these goals. The inability of students to acquire this required knowledge in Mathematics and Physics is one of the major challenges in secondary education. This has resulted to students showing negative attitude, loss of interest and lack of attention in class during Mathematics and Physics instructions. Only few students pass the subjects, even those who passed the subjects are usually with low grades. Practically, all students believe that Mathematics and Physics are important for life, yet they demonstrate some negative attitude towards the subjects (Pestanaa, Duarteb & Coutinhob, 2016). They perceived that the subjects are abstract, difficult and uninteresting; thus are biased in the selections they make, and often not considering the subjects/requirements needed for future careers, which lead to poor performance in both Mathematics and Physics. The ugly situation continues yearly as students no longer take study of Mathematics and Physics serious and they are not encouraged to do so. It is a source of worry to many stakeholders especially parents, whose wards find themselves in this situation, and the government of Nigeria that spends a large proportion of the nation's resource on education. One of the most significant factors responsible for students' poor academic performance is their demographic factors (Awodun, Oni & Aladejana, 2014).

Demographic factors are the characteristics of a person or a population such as age, gender, ethnicity, socioeconomic measures, and group membership. Students' demographic factors are the sum total of the characteristics that differentiates students, or the stability of a student's behaviour across different situations. These attributes may help the individual accomplish tasks that are beneficial to him or the society. Reviewed research suggests that academic achievement has a relationship with some demographic characteristics (Pestanaa, Duarteb & Coutinhob, 2016; Awodun, Oni & Aladejana, 2014; Alhajraf & Alasfour, 2014). Kaighobadi and Allen (2008) attempted to determine the academic success factors of students, focusing on factors potentially influencing their performance. They targeted gender, age, ethnicity, and other demographic and academic variables. They found that students' performance is strongly correlated with demographics. The demographic factors examined in this study are gender and age.

One of the demographic factors that can likely influence students' academic performance is age. Age is the length of time that a person or thing has existed. The influence of age on academic performance has been investigated in a number of studies. According to Ebebuwa-Okoh (2010), "age of the individual student, as it increases, usually affects the various development changes". Rhodd, Schrouder and Allen (2000) examined the factors that can affect the academic success of students and found that the age of the student has no influence on overall academic success. The study of Abdullah (2011) finds that younger students perform better

than mature students. On the other hand, Grissom (2004) concluded that the negative relationship between age and achievement remains constant over time. According to Keith, Byerly, Floerchinger, Pence & Thornberg (2006), they assert that there exists a positive relationship between age and academic performance. However, Kaur, Chung and Lee (2010) in their study found that age does not significantly contribute to academic performance of students.

Cohn (1972), Simpson and Sumrall (1979) and Guney (2009) conducted studies about the link between the students' age and students' academic performance. They found that mature students achieve higher grades than youthful students do. This result demonstrates a positive relationship between students' age and their academic achievement. However, this is inconsistent with some other studies which reveal that grades earned by younger students are higher than mature students (Lane & Porch, 2002; Diaz, 2003; Roos, 2009; Al-Mutairi, 2011). The fact is that mature students have other responsibilities than study, and that may lead to poor performance if compared with young students who are more concerned with their studies only. Luguterah and Apam (2013) in a related study in Ghana, used the Generalised Linear Model (GLM) to study and find the performance of students to improve with decreasing age. Alhajraf and Alasfour (2014) carried out a study to explore students' demographic and academic characteristics that are associated with students' academic performance and found students' age and gender to significantly relate to students' academic performance. Nasir (2012), in his study, found a combined effect of age and sex on academic performance in school.

Gender is the physical and/or social condition of being male or female. Abosede (2015) opines that gender is a range of characteristics distinguishing between male/masculinity and female/femininity, particularly in the cases of men and women. Several studies have been conducted to ascertain the influence of gender on students' performance (Cole & Espinoza, 2008; Jaeger & Eagan, 2007). Gammie, Paver, Gammie and Duncan (2003), Kaighobadi and Allen (2008) and Al-Khader (1996) studied and found that female students performed better than male students. Also Cullen, Hardison and Sackett (2004) confirmed that females outperform males in Mathematics, Physics and English courses. Nguyen, Allen and Fraccastoro (2005) and Sheard (2009) investigated the relationship between the gender (male and female) and students' achievements. Both studies found that performance is associated with students' gender.

Rampacher and Peterson (1999) examined the effect of gender on students' performance in adjustive technique classes and found that no statistically significant differences exists between the adjustive performance of male and

female students. Mondoh (2001) argues that males and females have unique cognitive styles that may influence the level of understanding and academic performance of students. However, Al-Tamimi and Al-Shayeb (2002) investigate the factors affecting students' performance and found that significant gender differences exist, with males outperforming females. Sarwar and Sarwar (2012) investigated the students' performance in University of Punjab, Pakistan by testing students' gender as a parameter to determine the relationship between gender and students' achievement and reported a significant correlation between gender and academic performance of students. Also, Laband and Piette (1995) stated that there is strong evidence that gender is a statistically insignificant factor that is affected negatively on the students' success.

### **Research Questions**

The following research questions were raised to guide the study:

1. How does students' age influence their academic achievement in Mathematics and Physics?
2. To what extent does gender influence students' academic achievement in Mathematics and Physics?

### **Hypotheses**

The following null hypotheses were put forth to guide the study:

**Ho1:** Students' age does not significantly influence their academic achievement in Mathematics and Physics.

**Ho2:** There is no significant influence of gender on students' achievement in Mathematics and Physics.

### **Methodology**

The study area was Calabar Metropolis of Cross River State, Nigeria. The research design used for this study was the ex-post facto design. The population for the study consisted of all the senior secondary school I (SS 1) students in Calabar Metropolis which comprises of Calabar South and Calabar Municipality Local Government Areas (LGAs). There are twenty-four (24) public secondary schools and ten thousand and sixteen (10,016) SS 1 students which comprises of 4598 male and 5418 female students. A multi-stage sampling technique involving stratified, proportionate and simple random technique was adopted in selecting 1000 SS 1 students which made up of 459 males and 541 females for the study. The students were stratified based on schools, gender and Local Government Areas. Out of a total of 24 public secondary schools, 12 (50%) of schools were randomly selected for the study; from the selected schools in each local government, 10% of the total number of students were selected using

proportionate sampling technique giving a total sample of 1000 SS 1students for the study.

One instrument was used for data collection titled Students' Mathematics and Physics achievement test. The instrument constructed by the researchers consisted of two sections: A and B. Section A described the bio data of the respondents which include gender and age, while section B consisted of 50 items constructed by the researchers based on SS-1 syllabus; 25 questions were from Mathematics and 25 questions were from Physics. This was used to test students' ability in Mathematics and Physics tasks. Correct answer was scored 1-mark while incorrect answer was scored 0-mark. The instrument was face-validated by two experts in Measurement and Evaluation and two Mathematics and Physics Educators, both from the University of Calabar. Corrections were pointed out by the experts and adjusted by the researchers and the document was considered valid. The reliability estimate of the Students' Mathematics and Physics achievement test was established through Kuder Richardson formula K-R20 which gave .75. These estimates having met the criterion for reliability, thus warranted the use of the instrument for the study. The statistical package for social sciences (SPSS) computer programme was used to analyze the data collected. The hypotheses were tested using One Way Analysis of Variance (ANOVA) for hypothesis one while independent t- test was used for hypothesis two.

### **Presentation of results**

The result of the analysis is presented in the tables 1 and 2. The hypotheses were tested at .05 level of significance.

**Ho1:** Students' age does not significantly influence their academic achievement in Mathematics and Physics.

The independent variable in this hypothesis is students' age (categorized as 13years and below, 14-15 years and 16years and above), while the dependent variable is students' academic achievement in Mathematics and physics. Based on this categorization, One-Way Analysis of Variance (ANOVA) test statistics was employed in testing the hypothesis based on their academic achievement in Mathematics and Physics. The result of the analysis is presented in Table 1.

**Table 1:** One-Way Analysis of Variance on influence of students' age on their academic achievement in Mathematics and Physics

Students' age	N	$\bar{x}$	SD		
13years & below	281	15.78	3.92		
14-15 years	399	16.53	4.38		
16 years & above	320	15.95	4.16		
Total	1000	16.13	4.62		
Sources of variation	SS	Df	MS	F-value	P-value
Between group	142.023	2	71.012	1.558	.132
Within group	45432.234	997	45.569		
Total	45574.257	999			

The result of analysis in Table 1 ( $F=1.558$ ;  $p=.132$ ) indicates that the null hypothesis was accepted at 0.05 level of significance while the alternative was rejected. This implies that there is no significant influence of students' age on their academic achievement in Mathematics and Physics.

**Ho2:** There is no significant difference in achievement in Mathematics and Physics on the basis of gender among secondary school students.

The independent variable in this hypothesis is gender while the dependent variable is students' academic achievement in Mathematics and Physics. To test this hypothesis, respondents were classified into two groups (Male and female). based on the classification, their mean scores were compared using the independent t-test analysis and the result is presented in Table 2.

**Table 2:** Independent t-test analysis on the influence of gender on students' academic achievement in Mathematics and Physics

Variable	N	$\bar{x}$	SD	t-value	p-value
Male	459	14.23	4.53	8.707	.000
Female	541	16.99	4.28		
Total	1000	15.72	4.69		

The result of the analysis ( $t=8.707$ ;  $p=.000$ ) as presented in Table 2 indicates that there is a significant influence of gender on students' academic achievement in Mathematics and Physics. With this result, the null hypothesis was rejected at 0.05 level of significance and alternative hypothesis was accepted. The result also shows that the mean score of female students (16.99) is higher than their male counterpart (14.23).

This implies that female students performed better than their male counterpart in Mathematics and Physics.

### **Discussion of the findings**

The result of the first hypothesis reveals that there is no significant influence of students' age on their academic achievement in Mathematics and Physics. The finding is in line with the finding of Rhodd, Schrouder and Allen (2000) who examined the factors that can affect the academic success of students and found the age of students to have no influence on overall academic success. Similarly, the finding is in agreement with findings of Kaur et al. (2010) who found that age does not significantly contribute to academic performance of students. The finding contradicts the finding of Keith et al. (2006), who found a positive relationship between age and academic performance.

The result of the second hypothesis reveals that there is a significant difference in achievement in Mathematics and Physics on the basis of gender among secondary school students. The finding agreed with the study of Cole and Espinoza (2008); Jaeger and Eagan (2007) who conducted studies to ascertain the influence of gender on students' performance. The finding is in line with the finding of Gammie et al. (2003), Kaighobadi and Allen (2008) and Al-Khader (1996) who found that female students performed better than male students in their studies. Also, Cullen et al. (2004) confirmed that females outperform males in Mathematics, Physics and English courses. Nguyen et al. (2005) and Sheard (2009) investigated the relationship between the gender (male and female) and students' achievements. Both of the studies found out that performance is associated with students' gender.

### **Conclusion**

Based on the findings of this study, it could be concluded that students' demographic factors are very necessary and essential in teaching and learning, especially in Mathematics and Physics. Therefore, gender and age are very important factors and should be considered in teaching and learning Mathematics and Physics to enhance students' academic achievement in schools.

### **Recommendations**

On the basis of findings of the study, the following recommendations were made:

1. Since no difference exists in achievement of students based on their age, it is therefore recommended that educators should continue to encourage the students irrespective of age to take their studies serious in order to maintain and improve their academic achievement.

2. Since gender differences exist in achievement in Mathematics and Physics, Mathematics and Physics teaching and evaluation strategies should be free of gender bias. This will make males and females to see themselves as equal, capable of competing and collaborating in school activities.

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