PREDICTION OF SENIOR SECONDARY SCHOOL STUDENTS' MATHEMATICS PERFORMANCE BY FAMILY BACKGROUND VARIABLES

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Abstract
This study examined family background variables as predictors of students' achievement in mathematics. The study adopted a correlational research design. 1227 Senior Secondary School two (SS II) students from 32 government owned senior secondary schools in Ankpa local government area constituted the population. A total of 324 SS II students were used as a sample for the study. Pro-forma, which contained students' three consecutive end of term examination results of the sampled students, were used as a measure of their academic achievement in Mathematics. The scores from these results were standardized to create room for comparison. The hypotheses were analysed using the regression test of ANOVA. Results of the study revealed that there was a significant positive relationship between parents' level of education, parents' level of occupation, parents' level of income and students' academic 6government should therefore provide adequate reading materials and a conducive learning environment for the less privileged, so they can also compete favourably with their counterparts from homes with high socio-economic status.

Keywords: Prediction, students' performance, mathematics & socio-economic status.

Introduction

Science and technology are important tools for development and productivity in any nation. At the moment, countries all over the world, especially the developing ones like Nigeria, are striving hard to develop technologically and scientifically, since the world is turning scientific and all proper functioning of lives depend greatly on science. The British Science Council (2009) defined science as the pursuit and application of knowledge and understanding of the natural and social world, following a systematic methodology based on evidence. According to Ogunleye (2002), science is a dynamic human activity concerned with understanding the workings of our world. This understanding helps man to know more about the universe. Without the applications of science, it would have been difficult for man to explore the other planets of the universe.

In Nigeria, the study of science is of such great importance, that a lot of emphasis has been laid on the teaching and learning of science with the major aim of science education (as contained in the National Policy on Education), being to equip the students

to live effectively in this modern age (FGN, 2014). This can be achieved by the inculcation in the learners the necessary scientific skills and attitudes. The inculcation of scientific skills and attitudes in students can only be achieved through the proper teaching of the various science subjects like mathematics.

Mathematics plays a fundamental role in the scientific and technological progress of any nation and as such, is taught at all levels of education in Nigeria. Mathematics is an interdisciplinary language which explains the relationships, structures, quantities, properties and forms of objects, constructs time and space (Richard & Robbins, 2013). Similarly, Asikhia (2014) maintains that mathematics is a broad domain addressing the measurement, properties and relations of quantities, as expressed in numbers or symbols. The knowledge of mathematics is applicable to all areas of human activities and, consequently, determines the level and rate of national development (Iji, 2008). Mathematics, therefore, plays a major role for proper understanding of other science subjects. This may be the reason why Anastacio (2007) described mathematics as the supporting knowledge of modern sciences and a legitimacy label for all scientific knowledge.

The usefulness of mathematics is a means of sharpening man's reasoning ability and developing man's personality. In today's technology-driven society, greater demands have been placed on individuals to interpret and use mathematics to make sense of information and complex situations. The study of mathematics is generally considered as basic for preparation of every informed citizen, and serves as a gateway into numerous career choices in life (Ogbole & Uka, 2014). Mathematics plays an indispensable role in realizing a nation's dream of rapid scientific and technological development. Indeed, no nation that wants to develop scientifically and technologically neglects the mathematical component of her school curriculum. The importance of mathematics is laudable in the objectives of mathematics, as highlighted in the curriculum.

The main objectives of studying mathematics at senior secondary school level according to Nigerian Educational Research and Development Council (NERDC) (2008) are to: generate interest in mathematics and provide solid foundation for everyday living; develop computational skills and foster the desire/ability to be accurate to a degree relevant to the problem at hand; develop precise, logical and abstract thinking; develop the ability to recognize problems and to solve them with related mathematical knowledge; and provide necessary mathematical background for further education and encourage creativity.

Despite the importance and relevance of mathematics to individuals and the nation in general, it is very disappointing to note that students' achievement in the subject has been fluctuating and appears to be consistently low, both at internal and external examinations. The annual reports of the West African Examination Council show a discouraging picture of students' achievement in mathematics at the Senior Secondary School level. For instance, students' achievement in mathematics at the SSCE for the past six years has been fluctuating. Chief examiners' report revealed that the percentages

pass in mathematics were 23.36%, 30.9%, 38.81%, 36.57%, 31.28%, 38.68% and 53% for 2010, 2011, 2012, 2013, 2014, 2015 and 2016 respectively; this is an indication of poor achievement in mathematics.

Several factors have been adduced for students' poor achievement in mathematics. Some of these factors include: students' poor study habit (Okeke, 2006); lack of instructional resources (Yara & Otieno, 2010); and instructional techniques (Olulonye, 2010) among others. Despite these factors that may make it impossible to achieve the objectives of Mathematics, Osuafor and Okonkwo (2013) reported that family has the potential to influence a child's academic achievement. This, according to the authors, is because family is the first environment of the child.

Family background refers to all the conditions and circumstances in the family which influence the child physically, intellectually and emotionally. According to Osuafor and Okonkwo (2013), family background is a collective terminology comprising of social class/status, economic status, family size, family structure, socio-economic status (parents' level of education, occupation and income) and other factors pertaining to family life. Family background in this study focused on socio-economic status. The choice of socio-economic status over other components of family background is because the major components of family background influencing pupils' academic achievement are parents' level of education, occupation and income (Jacob & Harvey (2005). Socio-economic status is a sociological classification indicating the close relationship between someone's relative wealth and that person's social status. It is also regarded as an economic and sociological combined total measure of a person's work experience and of an individual's or family's income and social position in relation to others, based on income, education and occupation, (Kraus, 2008). It is also a categorization of people according to their economic, education and occupational characteristics (Santrock, 2004). In support of the above statement, Keltner (2008) stated that when analysing a family's socio-economic status, the household income, earner's education and occupation are examined, as well as the combined effect.

The level of educational attainment of parents could influence the academic achievement of their children. There is evidence that parents' level of education will affect students' academic achievement in mathematics. According to Grissmer (2003), parents' level of education is the most important factor affecting students' academic achievement. According to European Union Monitoring Report (2013), those students whose parents have a tertiary level of education perform, on average, significantly better in tests of science, reading and mathematical ability than those whose parents have only basic schooling. Akinsanya, Ajayi and Salomi (2014), conclude that a child from a well-educated family with high socio-economic status is more likely to perform better than a child from an illiterate family. In addition to parents' level of education, parents' level of income and occupation may also influence students' achievement in mathematics.

Family income, according to Simiyu (2001) refers to wages, salaries, profit, rents and any flow of earnings received which can come in form of unemployment or workers' compensation, social security, pensions, interests or dividends, royalties, trusts, alimony,

or other governmental, public, or family financial assistance. Income is a commonly used measure of socio-economic status because it is relatively easy to figure for most individuals (Kraus, 2008).

There is evidence that students who come from homes of low-income and occupation have significantly less school success than students from homes of high socio-economic status (Adeyemo, 2010). This may be as a result of low monitoring of children's school work and less overall supervision of social activities compared to students from homes of high socio-economic status (Jacob & Harvey, 2005). In line with the above assertion, Hill et al. (2004) had also argued that socio–economic status of parents does not only affect the academic performance, but also makes it possible for children from low background to compete well their counterparts from high socio – economic background under the same academic environment. In a previous local finding in Nigeria, Oni (2007) and Omoegun (2007) had averred that there is significant difference in the rates of deviant behaviour between students from high and low socio–economic statuses.

The foregoing discussion had established family background variables which focused on socio – economic status of the parents and host of other factors relating to home environment of students. It is therefore, important to examine whether there is any significant relationship between family background variables (socio-economic status) and students' academic performance in mathematics.

It has been observed that families with good socio-economic status (well-educated parents, high income and occupation) would always have good attitudes towards education and provide learning materials such as televisions, instructional video tapes, novels, books and journals that could facilitate the learning process. The motivation of any intelligent child towards learning is accelerated by the positive influence of his/her environment while others are negatively affected in terms of their non-stimulating home environment. It is a general belief that parental socio-economic status has much to contribute to the students' academic achievement. However, the assumption that "the higher the socio-economic status of parents, the higher the students' academic achievement" is questionable, debatable and arguable, because students whose parents did not attend any level of education, have no reasonable income and have no good occupation equally have high academic achievement. This contradicts the findings of the numerous researchers, which reveal that socio-economic status and education environment of the home have high positive correlation with the students' academic achievement.

Thus, there is need to investigate family background variables (with a focus on parents' level of education, income and occupation) on students' achievement in mathematics. This study therefore, sought to investigate the relationship between family background variables and students' academic achievement in mathematics. The general purpose of the study was to examine family background variables as correlates of

students' academic achievement in mathematics. The following hypotheses were formulated for the study:

1. There will be no significant relationship between parents' level of education and students' achievement in mathematics.
2. There will be significant relationship between parents' level of occupation and students' achievement in mathematics.
3. There will be no significant relationship between parents' level of income and students' achievement in mathematics.

Methodology

This study employed a correlational research design. Correlational research design, according to Nworgu (2015), establishes the relationship that exists between two or more variables. Ali (2006) defines correlational research design as a general approach to research that focuses on assessing the co-variation among naturally occurring dependent and independent variables. This design was considered appropriate because it enabled the researchers to obtain responses concerning the relationships between the predictor variables (family background variable, that is, socio-economic status of parents which include; parents' education, occupation and income) and the criterion variable (students' achievement in mathematics).

The population of the study comprised all the one thousand two hundred and twenty-seven (1227) SS II mathematics students in all the 32-government owned senior secondary schools in Ankpa local government area. The sample size of this study was 324 (Senior Secondary School two) SS II mathematics students. Simple random sampling technique was used to sample twelve SS II students offering mathematics in Ankpa local government area. The number of SS II mathematics students in the twelve sampled schools constituted the sample size.

A data collection format of students' academic achievements in mathematics (pro-forma) was used by the researchers to collect the existing three consecutive end of term examination results from the students in the sampled schools. The scores were transformed using T-score, and the average performances of the students in the three consecutive end of term examination results were used to measure the academic achievements of the students in mathematics. The pro-forma consisted of two sections, section A and B. Section A contained demographic data of the respondents which focused on students' class, name of school, parents' highest qualification, parents' occupation and parents' highest income per month, while section 'B' was on the pro-forma where students' performance were written.

The pro-forma was subjected to face validity by giving the instrument to three experts in Measurement and Evaluation Unit, University of Nigeria, Nsukka to ascertain if the elements are capable of providing the needed information. The experts' comments and suggestions helped in modifying the pro-forma to suit the problem under investigation. One of the major comments of the experts was to include the average scores of the students in the pro-forma.

To collect the pertinent data for the study, the average scores of students in mathematics in the three consecutive end of term examination results were collected from the sampled schools using students' academic data format (pro-forma) designed by the researchers. The average performance of the students in the three consecutive end of term examinations results was used to measure the academic achievements of the students in mathematics. The data collected were analysed using regression test of ANOVA at 0.05 level of significance.

Results

Table 1: Regression ANOVA of parents' education and students' academic achievement in mathematics

	Sum of Squares	df	Mean Square	F	Sig.
Regression	14.226	1	14.226	77.876	.000[a]
Residual	247.530	322	.183		
Total	261.757	323			

$R = 0.45; R^2 = 0.20$

The result in Table 1 shows that an F-ratio of 77.876 with associated exact probability value of 0.00 was obtained. This exact probability value of 0.00 was less than 0.05 level of significance set as bench mark, and it was found to be significant. The null hypothesis was therefore rejected and the inference drawn was that there was a significant relationship between parents' education and students' academic achievement mathematics.

Table 2: Regression ANOVA of parents' occupation and students' academic achievement in mathematics

	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.167	1	6.167	93.697	.000
Residual	255.589	322	.189		
Total	261.757	323			

$R = 0.52; R^2 = 0.27$

The result in Table 2 shows that an F-ratio of 93.697 with associated exact probability value of 0.00 was obtained. This exact probability value of 0.00 was less than 0.05 level of significance set as bench mark, and it was found to be significant. The null hypothesis

was therefore rejected and the inference drawn was that there was a significant relationship between parents' occupation and students' academic achievement in mathematics.

Table 3: Regression ANOVA of parents' income and students' academic achievement in mathematics

	Sum of Squares	df	Mean Square	F	Sig.
Regression	51.553	1	51.553	232.316	.000[a]
Residual	210.204	322	.155		
Total	261.757	323			

$R = 0.62$; $R^2 = 0.38$

The result in Table 3 shows that an F-ratio of 232.316 with associated exact probability value of 0.00 was obtained. This exact probability value of 0.00 was less than 0.05 level of significance set as bench mark for testing the hypothesis, and it was found to be significant. The null hypothesis was therefore rejected and the inference drawn was that there was a significant relationship between parents' income and students' academic achievement in mathematics.

Discussions

The result in Table 1 showed that the correlation coefficient between parents' education and students' academic achievement was 0.450 and the coefficient of determination associated with it was 0.52, indicating that 53% of students' achievement in mathematics is accounted for by parents' education. This is an indication that parents' education is a predictor of students' academic achievement in mathematics (P>0.05). This finding is in agreement with Chikwelu (2005), who found out that parents' education to some extent predicts students' achievement in school. Also, the finding of this study agrees with the findings of Ugwuja (2010) and Muruwei (2011), that students from educated parents achieve more than those from uneducated parents in academics. However, the findings of this study are in disagreement with the findings of Orji (n.d), whose results revealed no significant difference in performance between students with high parental academic qualifications and those with low parental academic qualifications. The implication of this study is that, to some extent, the education of parents contributes to the achievement of students academically in mathematics, since the correlation between them was positive and moderate.

The correlation coefficient between parents' occupation and students' academic achievement (which provided answer to research question two) was 0.52 and the coefficient of determination associated with the coefficient was 0.57. This indicates that

parents' occupation positively influences students' academic achievement. The result in Table 2 also showed that there is a significant relationship between parents' occupation and students' academic achievement, and led to the rejection of hypothesis two, which stated that there was no significant relationship between parents' occupation and students' academic achievement. The findings of the study are consistent with findings of Chikwelu (2005), who found that, parents, irrespective of their occupational background give affordable support to their adolescent wards in school and guide them toward attaining higher educational standards which they see as a sure means of improving the socio-economic status of the family. Also, the findings of this study are in agreement with the findings of Udida, Ukwayi and Ogodo (2012) and Osuafor and Okonkwo (2013), whose separate studies reported that students whose parents had better jobs and higher levels of educational attainment, and who were exposed to more educational and cultural resources at home tended to perform better than their counterparts without such opportunities. This finding also implies that the type of parents' job, to some extent, influences their children's academic outcome. This is because the correlation coefficient has direct and positive effect on students' academic achievement in mathematics.

The finding of this study, as presented in Table 3, also showed that the correlation between parents' income and students' academic achievement was positive and moderate. The coefficient of determination indicated that 62% of students' academic achievement is accounted for by parents' income. This showed that parental income has direct and significant positive effect ($p<0.00$) on students' academic achievement. This finding is in agreement with the earlier findings by Bryman and Crammer (1990), who found that parents' income, to a greater extent, determines students' academic achievement. This accounts for the reason why majority of poor children are educationally disadvantaged because of the poor condition of their parents. This also shows why most children from poor homes are not able to attend good schools because of the financial condition of their parents. No doubt, most children do not attend school at all and some dropout because of financial difficulty.

Conclusion

Results of the study revealed that: there was a significant relationship between parents' education and students' academic achievement in mathematics; there was a significant relationship between parents' occupation and students' academic achievement in mathematics; and there was a significant relationship between parents' income and students' academic achievement in mathematics. The implications of the above findings were examined and it was recommended among other things that parents should provide adequate funds for their children while in school. This will help in providing the necessary reading materials that may enhance students' academic achievement in mathematics. It was also recommended that the government should provide adequate reading materials and conducive learning environment for the less

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privileged so they can also compete favourably with their counterparts from high socio-economic status. The limitations of this study were highlighted, and suggestions were made for further studies.

Recommendations

The following recommendations are made based on the findings of the study.

1. Results of the study showed that there was a positive correlation between parents' income and students' academic achievement. Parents should therefore provide adequate funds for their children while in school. This will help in providing the necessary reading materials that may enhance students' academic achievement.

2. The findings of the study also revealed that students from high socio-economic status performed better than students' from low socio-economic status. The government should therefore provide adequate reading materials and conducive learning environment for the less privileged so they can also compete favourably with their counterparts from high socio-economic status.

3. Government and non-governmental organizations (NGOs) should provide pupils from poor homes with scholarships and necessary learning materials needed for schooling for enhancement of academic achievement.

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