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Full Length Research Paper

Relationships between primary school pupils' academic performance in basic science and technology with age and gender in Sokoto State, Nigeria

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The study was carried out to find out relationship between primary school pupils' academic performance in Basic Science and Technology with age and gender in Sokoto state, Nigeria. Studies have shown that age and gender affect pupils' academic performance in some areas of knowledge. Two research questions and two hypotheses were raised, answered and tested respectively at .05 level of significance. The researcher used Correlation Research Design because it measures relationship. The research was limited to twelve public primary schools sampled from the four educational zones of Sokoto state Universal Basic Education Board (SUBEB). A population of 2810 and a sample of 690 pupils were obtained by Hat-draw means through Stratified Proportionate Random Sampling. A 20-item Basic Science and Technology (BST) Performance Test for primary six pupils was employed as instrument for data collection by the researcher, which was validated by senior Science Education scholars. The instrument was found reliable at 0.86. t-Test was used in the analysis of data to find difference and this was inferred to find relationship between the variables. Hypothesis one (H_{O1}) was accepted thus; there was no significant difference between younger and older primary school pupils' academic performance in BST. Hypothesis two (H_{O2}) was rejected meaning there was significant difference between male and female primary school pupils' academic performance in BST and their gender in Sokoto state, Nigeria. The study implied that age has no effect on pupils academic performance, and gender has effect on, pupils performance in BST. The researcher recommend that the National Orientation Agency (NOA), parents and other relevant agencies shall put more effort on encouraging enrolment of wards to school at the stipulated age as recommended by the Federal Republic of Nigeria: National Policy on Education (FME:NPE), and that age shall not be stigma for enrolling in school. Curriculum planners and teachers should be gender sensitive in curriculum delivery so as to allow equal opportunity for all gender to pursue science and science related careers. As suggestion, further research shall reach private primary schools and even beyond, also gender performance in other subjects and in other states shall be researched.

Keywords: Academic Performance, Age, Gender, Relationship

INTRODUCTION

The effect of science and technology on industrial revolution cannot be over emphasized. Olorundare (1993) reported that Science is related directly or indirectly to both the quality of life of the average individual and the economic health and security of nations at large. The Nigerian Education Research and

Development Council (NERDC) have stressed the teaching of science in the primary school with a view to promote value orientation, eradicate poverty, create jobs, generate health and use education to empower the people. The subject listing in National Policy on Education (NPE) and NERDC include Basic Science and Technology (BST). Science can teach children important skills, it can also help them think in a clear and logical way, just as it can help children to solve simple practical problems, which in later life they may meet. Muhammad (2009) has put forward that science education provides all round development of basic skills in the development of the individual and the society, and these are referred to as science process skills. In view of the facts mentioned, the Federal Republic of Nigeria National Policy on Education (FRN, 2013) stipulates that science shall be taught to all primary school pupils, regardless of culture of the child, his physical health, male or female. This research studied the relationship between age of primary school pupils and their academic performance in BST; and also the relationship between gender of primary school pupils and their academic performance in BST in Sokoto state, Nigeria.

Jabor, Machtmes, Kungu, Buntat and Safarin (2011) reiterated that the action of delaying school entry to give certain advantage to some students or retaining students in certain grade to ensure students achieve certain level of performance could be a futile effort to enhance students' performance. Jabor *et,al* concluded that when students are older than their classmates, their average academic performance declines and continue to decline the older they get. On age and achievement, Simonton (2001) reiterated that Lehman found correlation between age and achievement in a series of studies conducted even in studies of sciences and mathematics. New Zealand Center for Educational Research and Development (NZCERD, 2009) reported that 'our students do better at the secondary level than at the primary level'. However, Coleman *et, al*., (1966) and White's (1982) studies showed that as students become older, the correlation between age and school performance diminishes. Grisson (2004) in his study concluded that the negative relationship between age and performance remains constant over time. On the other hand, Dennis (1955) Ph. D thesis reviewed Lehman's studies on Age and Achievement, he realized that much of the apparent decline in creative achievement revealed by Lehman's tables and graphs is due to factors other than age. Lehman's data maintain a spurious appearance of age decrement in creativity. However, it is not incorrect to say that Lehman has been interested primarily in determining the 5-10 year age period in which important creative works have most often been produced.

New Zealand Center for Educational Research and Development (NZCERD, 2009) reported that there does tend to be a proportion of boys who did not reach the lower bench mark or lower levels of proficiency. NZCERD, maintained that girls perform better than boys in terms of knowledge about science, which is the aspect of scientific literacy that measures students' knowledge about how scientists obtain evidence (scientific inquiry) and how scientists use data (scientific explanations). Gorard, Rees and Salisbury (2001) found few significant relationship between the attainment of boys and girls in mathematics and Sciences. In a Meta Analysis of 77 studies conducted between 1980 and 1991, Debaz (2011) found a significant gender effect favoring males in overall science performance. In a similar study, Lee and Burkam (1996) found large advantage for males on the physical science subtest. National Assessment of Educational progress (NAEP, 2007), Blosser (1990) found gender effect on performance in science, this is so in Hedges and Newell (1995), Beaten, Mullis, Martin and Gonzales (1996). On the other hand, Meece and Jones (1996) studies revealed that that there is no gender relationship in students standardized test scores.

Statement of the Problem

Nigeria is one of such economies that need to promote science and technology education in order to meet up with Millennium Development Goals (MDG) objective. The foundation of science and technology is laid at the primary school level. Researches by Jabor et,al. (2011), NZCERD (2009) proved that age affect pupils academic performance. NCCA (2009) and Grisson (2004) proved that age has no effect on academic performance. This is a part of the problems of interest in this research. Kathryn and Ellen (2005) and Jessica (2010) have shown that there is higher proportion of boys who did not reach the lower bench mark or lower levels of proficiency in Science Achievement Test (SAT). While in some researches (Jabor *et,al*., 2011 and NZCERD, 2009) proved that girls perform better than boys in terms of knowledge about science. It has been put forward by Muhammad (2009) that there has been poor female gender enrolment in the primary schools and even beyond, in Sokoto state, this calls for intervention by Non-Governmental Organizations (NGOs) and Donor Agencies through the MDGs, and research interventions of this type.

OBJECTIVES OF THE STUDY

The objectives of this research was to find out the:

i. relationship between primary school pupils academic performance in Basic Science and Technology (BST) with their age in Sokoto state, Nigeria.

ii. relationship between primary school pupils academic performance in Basic Science and Technology (BST) with their gender in Sokoto state, Nigeria.

Research Questions

To achieve the objectives stated, research questions were raised thus;

i. Is there any difference between primary school pupils academic performance in BST with their age in Sokoto state, Nigeria?

ii. Is there any difference between primary school pupils academic performance in BST with their gender in Sokoto state, Nigeria?

Null Hypotheses

In answering the research questions, the following null hypotheses were raised and tested at 0.05 level of significance;

i. there is no significant difference between primary school pupils academic performance in Basic Science and Technology (BST) with their age in Sokoto state, Nigeria.

ii. there is no significant difference between primary school pupils academic performance in Basic Science and Technology (BST) with their gender in Sokoto state, Nigeria.

Significance of the study

The research would be useful to Educational Administrators and Planners, researchers, primary school teachers, primary school pupils, NGOs working on age and gender of students in science. The research would also be useful to researchers and science educators in issues that relate to age and gender of pupils.

Scope and Delimitation of the Study

The research is limited to twelve (12) public primary schools, three each, from the four (4) educational zones under the Sokoto State Universal Basic Education Board (SUBEB).

Design of the Study

The researcher used the Correlational Research Design, which describes an existing relationship between variables. The purpose of Correlational research is to either help explain important human behaviors or to predict likely outcomes and it does this by the use of correlation coefficient. Jack and Norman (2000) mentioned that a correlational study describes the degree to which two or more quantitative variables are related. The variables studied in this research are Academic Performance of Pupils in BST, Age and Gender.

Population of the Study

There was 2810 population of pupils enrolled in class six for the 2011/2012 academic session in the study schools of the four educational zones under the Sokoto SUBEB. The ages of the pupils range between 9 to 18 years, male and female in a class, who's parents are mostly economically challenged, Hausa-Fulani with some fraction of other Nigerian tribes.

Sample and Sampling Techniques

Twelve primary schools with class six pupils enrolment were selected by stratified, proportionate randomly sampling out of 1698. Three schools were selected to represent each zone, and the selected sample is by gender type ratio due to characteristic distribution of the gender type in the schools enrolment, 690 (460 male and 230 female) pupils were selected by Hat-draw method for the study.

INSTRUMENTATION

A 20 item Basic Science and Technology Performance Test for Primary Six Pupils was used to collect data for the study. The instrument was developed by the researcher using National Board for Educational Measurement (NBEM), National Examinations Council (NECO) 1994, 2000 and 2003 National Common Entrance Examination for secondary schools. The instrument was validated by senior science educators. The instrument reliability was established after pilot study. Index of reliability was obtained at 0.86 by the use of Pearson Product Moment Correlation (PPMC) in split-half and spearman Brown prophecy formula for full instrument.

Method of Data Collection

The instrument for data collection was administered to the pupils with the help of research assistants and school based teachers, while the researcher supervised. The test was then collected after the administration, marked by the researcher, computed and processed via the Statistical Package for Social Sciences (SPSS).

Method of Data Analysis

Mean, Standard Deviation and t-Test were employed in data analysis, which were adopted from the work of Jack and Norman (2000). The difference was then inferred to find relationship. Statistical Package for Social Science (Version 20) was used in processing and analysis of the

Table 1 Relationship between age of pupils and their academic performance in Basic Science and Technology in Sokoto state, Nigeria t–Test Table

Variable	N	$\bar{X}$	SD	DF	Cal-t	Crit-t	Decision
*OAPS	277	42.80	18.24	688	.97	1.96	Ho_1 accepted
**YAPS	413	41.39	18.96				

*OAPS= Older Age Pupils in Science & **YAPS= Younger Age Pupils in Science

Table 2 Relationship between gender and academic performance in Basic Science and Technology in Sokoto State, Nigeria t-Test Table

Variable	N	$\bar{X}$	SD	DF	Cal-t	Crit-t	Decision
*MPPS	461	43.17	19.16	688	2.42	1.96	Ho_2 rejected
**FPPS	229	39.52	17.45				

*MPPS= Male Pupils Performance in Science & **FPPS= Female Pupils Performance in Science

data obtained.

Presentation and Analysis of Data

The scores of pupils in the BST performance test were obtained after careful marking and insertion of the computed mean scores in tables. The tables explain the testing of the hypotheses stated earlier.

Table 1 showed that with 41.39 and 18.96 mean and standard deviation of the younger pupils, and 42.80, 18.24 mean and standard deviation of the older age pupils; with a calculated t value of .97 and critical t value of .196 at .05 level of significance, 689 degree of freedom (calculated t .97 < critical t 1.96), hypothesis was accepted, meaning that there was slight difference between BST scores of the older pupils and younger pupils performance in primary schools of Sokoto state. But the difference was not statistically significant. This translates that age was not a determinant factor of pupils academic performance in BST. There was no relationship between age and academic performance in BST. In line with the finding of this research, Grisson (2004) in his study concluded that age does not affect academic performance. Coleman et, al., (1966) and White's (1982) studies showed that as students become older, the correlation between age and school performance diminishes. It was against the finding of this research where Jabor, Machtmes, Kungu, Buntut and Safarin (2011) reiterated that empirical studies have conclusively indicated that when students are older than their classmates, their average academic performance declines and continue to decline the older they get.

Dennis (1955) in his Ph.D thesis realized that factors other than age, affect performance of pupils. Simonton (2001) also reiterated that Lehman found correlation between age and achievement in a series of studies conducted even in studies of sciences and mathematics.

NZCERD (2009) reported that 'our students do better at the secondary level than at the primary level'. Table 2 showed that with 43.17, 19.16 mean and standard deviation of male pupils; 39.52, 17.45 mean and standard deviation of female pupils, male pupils perform better than the female pupils. At .05 level of significance, 688 degree of freedom, and a calculated t-value of 2.42 (t-cal > t-crit 1.96), null hypothesis 2 was rejected. This showed that there was significant difference between male and female pupils academic performance. By inference there was relationship between gender of pupils and their academic performance in BST in primary schools of Sokoto state, Nigeria. This translates that gender affects performance of pupils in BST in primary schools of Sokoto state, Nigeria.

In line with the finding of this research, National Assessment of Educational Progress (NAEP, 2007) in United States, Hedges and Newel (1995) in his book 'Sociology of Education', NZCERD (2009) in New Zealand and Jabor et, al (2011) in an international conference presentation, found significant gender effect on performance of pupils in science. However, Gorgard, Rees and Salisbury (2001) found few significant relationship between the attainment of boys and girls in mathematics and science.

On the other hand the finding of this research is against the finding of Blosser (1990), Meece and Jones (1996) who found no significant gender effect on performance of pupils in science.

MAJOR FINDINGS

The major findings of this research revealed that there was no significant relationship between the academic performance of primary school pupils in Basic Science and Technology (BST) and their age in Sokoto state, Nigeria. It was also discovered in this research that there was significant relationship between the academic performance pupils and their gender in Basic Science and Technology (BST) in Sokoto state, Nigeria, even though the male gender out-performed the female

gender, with reference to mean and standard deviation. This translates that age is not a factor of academic performance in Sokoto State, and gender significantly affect academic performance of pupils in Basic Science and Technology in primary schools of Sokoto State.

CONCLUSION

In conclusion, the researcher studied the relationship between age of primary school pupils and their performance in Basic Science and Technology (BST) in Sokoto state, Nigeria and found although there was slight difference between younger and older age pupils performance (older age pupils performance is slightly higher than the younger pupils performance), the difference was not statistically significant, which mean that age is not a determinant factor of academic performance of pupils in BST and by inference age is not related to academic performance of pupils in BST in primary schools of Sokoto State.

Male and female primary school pupils academic performance in BST in Sokoto state were correlated and it was found that male gender out-performed the female gender in BST performance test, there was significant difference between their performances, and so there was significant relationship between age of pupils and their academic performance in BST, meaning that gender is determinant of academic performance of pupils in Sokoto State.

Implication of the Study

The study implied that age of pupils does not determine their academic performance in Basic Science and Technology in Sokoto state, Nigeria. The research also implied that gender of pupils affect their performance in Basic Science and Technology in Sokoto state, Nigeria.

Suggestions for Further Studies

The researcher suggests that further research should be carried out:

i. on age and academic performance of primary school pupils in private schools, other levels and other subjects in other states of the federation, and also,

ii. on male and female academic performance in Basic Science and Technology in private primary schools, other levels and other subjects in other states of the federation.

RECOMMENDATIONS

By the conduct of this research, the researcher recommends that stake holders in basic education should feed the National Orientation Agency (NOA) with evidences why:

i. parents should send their children to school at the stipulated age as prescribed by the National Policy on Education, and why age should not be a stigma in sending wards to school,

ii. Teachers and curriculum planners should be gender sensitive in curriculum planning and delivery, assist and sensitize parents of primary school pupils and beyond to encourage them pursue science and science related careers.

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