

Trends in Academic Achievement of Basic Science Students in Junior Secondary Schools: Implication for Enhancing Science Education for Self-Reliance

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Abstract

The paper investigated the trends in academic achievement of basic science students in Junior Secondary Schools. The specific purpose of the study is to determine the level of academic achievement of basic science students from 2012 to 2016 and also to determine the influence of school type on the academic achievement of basic science students. It discussed its implication for enhancing science education for self-reliance in a recessed economy. Two research questions and one hypothesis guided the research. The design is a descriptive survey. The population consists of all the JSS III students that sat for Junior School Certificate Examination (JSCE) schools in Enugu East Local Government Area from 2012 to 2016. The researcher selected three secondary schools out of the ten secondary schools in Enugu East Local Government Area using simple random sampling technique and all the JSS3 students that sat for the JSCE in the three schools within the time range were in used as the sample. Data were analyzed using mean and standard deviation for answering the research questions while t-test was used for testing the hypothesis. The findings indicated that the level of academic achievement of basic science students is low and also that there is a significant difference in the academic achievement of basic science students from single sex and co-educational schools. Based on the findings, it was recommended among others that government should regularly organize conferences, seminars and workshops for the in-service basic science teachers to help them in updating their knowledge in the contents in basic science curriculum

Introduction

The major subjects that lead to the study of science courses are Physics, Chemistry, Mathematics and Biology. At the Junior Secondary level of secondary education in Nigeria, all the above named subject except mathematics are integrated into the subject integrated science now known as basic science at the junior secondary school level. Basic science is the bedrock of all sciences, engineering and technology courses. It can therefore be regarded as an undifferentiated course designed to show the unity, wholeness and inter-relationship of the disciplines that make up science. Basic science is a subject that present science as a unified entity and exposes learners to the fundamental principles of science. The number of students who will enroll for science subjects at the higher level depends on the number that are favorably disposed on academic achievement in basic science at the junior secondary school level.

Basic science is of great importance because early experiences in science help students to develop problem solving skills that will empower students to participate in an increasingly scientific and technological world (Guyama chronical, 2009). Basic science is the type of science which provides unique training of students in observation, reasoning and experiment in the different branches of science. It also helps students to develop a logical mind (Prekash, 2012) Basic

science if properly taught according to its philosophy, equips students with the introductory scientific and technological knowledge and skills necessary for one to be self-reliant and therefore help to improve on the recession that is ravaging Nigeria today

Science and Technology has a very unique role to play in economic recession. It is intrinsically hooked to most if not all sectors of an economy. Economic recession refers to a negative Gross Domestic Growth (GDP) rate for two consecutive quarters (say first and second quarters). The National Bureau of Economic Research NBER (2012) defined a recession as a significant decline in economic activity spread across the economy lasting more than a few months normally visible in a real Gross Domestic Product (GDP), real income, employment, industrial production and wholesales – Retail sales. Judging by this definition Nigeria is experiencing economic recession currently. This is true since her first and second quarters growth in 2016 are 0.36% and 1.5% respectively (Noko, 2016). Furthermore, Nigeria's fourth quarter for 2016 is 0.8% growth rate (Noko, 2016). Some of the causes of economic recession in Nigeria have been attributed to poor economic planning, high inflation, high taxation and policy conflict.

The economic crises in Nigeria has impacted heavily on the citizens as it has given rise to high inflation, collapse of oil price, shortage of electricity, humanitarian crises, laying off of workers and shutting down of many industries resulting to high unemployment rate. This poor state of the economy demands an urgent step by all and sundry to help in rescuing the situation.

Naturally, economic development should be the result of advances in science and technology. In other words science and technology have become crucial factors for sustainable development worldwide. It is a well-known fact that no nation can achieve technological advancement without encouraging her citizens to engage in the study of science subjects at all levels of their education. According to Eze (2005) Nigeria's hope for economic prosperity and technological breakthrough depends to a large extent on her ability to build a citizenry that is scientifically and technologically literate. Advances in science and Technology can help to diversify the economy by improving productivity sectors as well as defining new ones. According to Okonjo-Iweala (2012), Science and Technology can help in improving the economy of Nigeria in diverse ways as follows:-

- It will help in improving the productivity in Nigeria's agricultural sector which contributes about 40% of our GDP and employs more than half our workforce.
- It plays vital role in improving the quality of life especially in the area of health care. Science and technology has helped in the prevention, diagnosis and treatment of various killer diseases.
- In the area of ICT sector the invention and usage of mobile phones is strongly associated with economic growth. Cell phone coverage and high speed internet connections increases the GDP by 0.8% and 13% on average respectively.
- Science and technology has given rise to the development of hybrid batteries (for cars and ship). If this type of technology is adopted in Nigeria, it will substantially lower our fuel subsidy bill since there will be lower PMS consumption.

In these and other ways, the knowledge of science and its application will go a long way to diversify and improve the recessed economy of Nigeria.

. This study is therefore geared towards investigating the trends in academic achievement of basic science students in Junior Secondary Schools. The result will help us to be able to determine the level of academic achievement of these future scientists with a view to making amends where necessary.

Purpose of the study

The main purpose of this study is to investigate the level of academic achievement of basic science students in Junior Secondary school. Specifically the study intends to:

1. Determine the level of academic achievement of basic science students from 2012 to 2016.
2. Determine the influence of school type on the academic achievement of basic science students.

Research Questions

This study is guided of the following research questions

- 1) What is the level of academic achievement of students in basic science?
- 2) How does school type influence the academic achievement of basic science students?

Hypothesis

Ho₁ There is no significant difference ($P < 0.05$) in the mean achievement scores of basic science students from single sex and co-educational schools.

Methodology

This study adopted a descriptive survey research design. This is because the academic achievement of the students in basic science were already in existence at the time of the study. The target population comprised of 3,000 Junior Secondary School students in all the government owned secondary schools in Enugu East Local Government Area of Enugu State. The researcher used simple random sampling technique to select three secondary schools out of the ten government owned secondary schools in Enugu East Local Government Area. The three schools comprises of one all boys, one all girls and one co-educational school. The instrument for the data collection was past Junior Secondary School Certificate Examination (JSSCE) results of JS III students in basic science from 2012 to 2016 academic session. Based on the data collected, frequency, mean and standard deviation was used in answering the research questions while t – test was used in testing the hypothesis.

Results

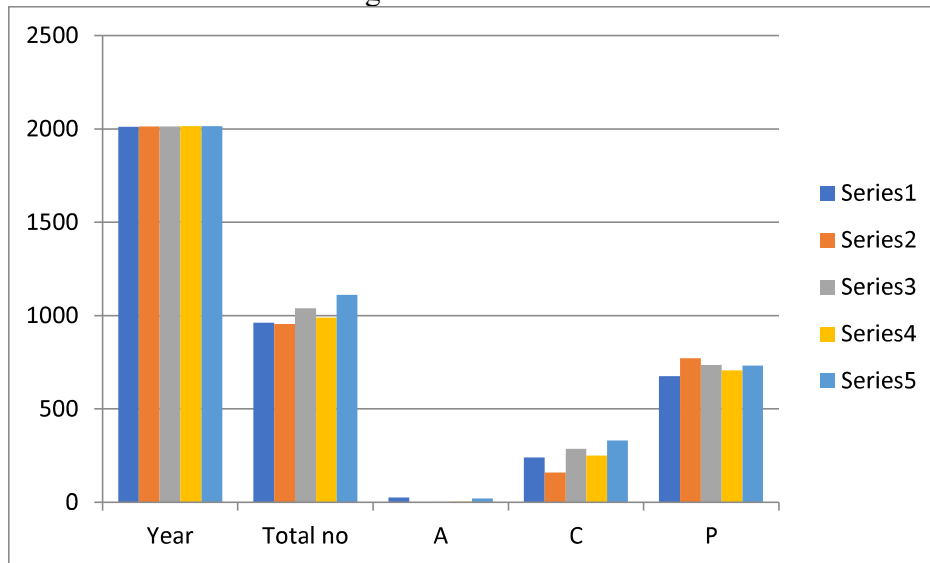
The presentation of the results and interpretation of the statistical data analysis was done as follows.

Research Question 1: what is the level of academic achievement of students in basic science?

Table 1: The level of academic achievement of students in basic science from the year 2012 to 2016:

Year	Number that took the exam	Number that passed with distinction(70% and above)	Number that passed with (55 -69%)	Number that got ordinary pass (40 – 54%)	Number that failed (o – 39%)
2012	963	26(2.7%)	240 (24.9%)	676 (70.2%)	21(2.2%)
2013	956	Nil	160 (16.7%)	773 (80.9%)	23 (2.4%)
2014	1039	2(0.2%)	287 (27.6%)	736 (70.8%)	14 (1.4%)
2015	989	3 (0.3%)	250 (25.3)	706 (71.4)	30 (3.0%)
2016	1112	20(18%)	331(29.8%)	733(65.9%)	28(2.5%)

This table can further be illustrated using the bar chart bellow



From Table 1 above, out of the 963 students that sat for basic science in JSSCE in 2012 only 26 students representing 2.7% got distinction (A), 240 students representing 24.9% got credit (C) 676 students representing 70.2% got ordinary pass (P) while 21 students representing 2.2% failed.

In 2013 a total of 956 students wrote the exam 160 students (16.79%) got credit (c) 733 students (30.9%) got Pass while 23(2.4%) students failed. No student got distinction.

In 2014 a total of 1039 students wrote basic science in JSSC examination and only 2(0.2%) got distinction. 287 (27.6%) got credit, 736 (70.8%) got ordinary pass while 14 (1.4%) students failed.

In 2015 989 students sat for the exam. Only 3(0.3%) got distinction 250 (25.3%) got credit, 706 (71.4%) got ordinary pass while 30 students (3.0%) failed.

In 2016, out a total of 1112 students that took the exam, 20 students representing 18% got distinction, 331 students representing 29.8% got credit, 733 students representing 65.9% got ordinary pass while 28 students (2.5%) failed.

From Table 1, it could be seen that the level of students' academic achievement in basic science is low. This is because the percentage credit passes which includes both distinction and credit in basic science from 2012-2014 is below 30% (27.6% in 2012, 16.7% in 2013, and 27.8% in 2014, 25.6% in 2015). The slight improvement in 2016 (47.8) was not even up to 50% credit pass.

Research Question 2

What is the influence of school type on student's academic achievement in basic science?

Table 2: The mean score and the standard deviation of the academic achievement of students in JSCE based on school type.

YEAR	SINGL SEX (MALE)						SINGL SEX (FEMALE)						CO-EDUCATION							
	SCORE			N	- x	SD	SCORE			N	- x	SD	SCORE			N	- x	SD		
	A	C	P				F	A	C				P	F	A				C	P
	3	2	1	0			3	2	1	0										
2012	6	53	337	1	397	1.16	0.41	20	-	206	6	232	1.15	0.50	187	133	13	333	1.54	0.58
2013	-	28	361	5	394	1.06	0.29	-	3	270	4	277	1.09	0.24	129	142	14	285	1.40	0.58
2014	-	23	372	6	401	1.05	0.28	-	47	242	-	289	1.16	0.38	217	122	8	348	1.61	0.53
2015	1	26	255	16	298	1.04	0.51	1	45	24	5	292	1.14	0.31	170	219	9	399	1.40	0.50
2016	7	68	288	8	371	1.20	0.70	9	52	262	0.7	330	1.14	0.32	211	182	13	410	1.48	0.51

From Table 3 above, from the years 2012 to 2016, the mean scores in basic science for single sex males are 1.16, 1.06, 1.05, 1.04 & 1.20 respectively and that of single sex females are 1.15, 1.09, 1.16, 1.14 and 1.14 respectively while the mean scores for co-educational schools are 1.54, 1.40, 1.61, 1.40 and 1.48 respectively. Considering the expected average achievement score which is 1.5 it reveals that the co-educational schools perform better than the single sex schools. Moreover, the mean scores of the co-educational schools are all above those of the single sex males and females respectively.

Hypothesis 1: There is no significant difference in the mean achievement scores ($p < 0.05$) of basic science students from single sex and co-educational schools.

Table 4

T – test analysis on the difference in the mean achievement scores of students in single sex and co-educational schools.

Schools	N	\bar{x}	SD	tCAL	t – CRIT
Co-educational	1775	1.49	0.54	2.52	1.96
Single sex	3281	1.112	0.39	17.97	

Table 4 revealed that the mean score of students in single sex schools is 1.12 with a standard deviation of 0.39 while the mean score of students in co-educational schools is 1.49 and a standard deviation of 0.54. The t – calculated is 17.97 which is greater than a t – critical of 1.96 and therefore significant at 0.05. The alternative hypothesis is therefore accepted. It shows that the students in co-educational schools perform better than those in single sex schools.

Summary of Findings

- (1) The academic achievement of basic science students in JSSCE is low. Majority of the students got ordinary pass which is not even up to 50%.
- (2) There is a significant difference in the academic achievement of students in co-educational schools and their counterparts in single sex schools in basic science in junior secondary schools.

Discussion

The first finding from the study indicates that the level of academic achievement of basic science students in JSSCE is low. This is true because considering the five years that were studied, only very few students (27.6% in 2012, 16.7% in 2013, 27.8% in 2014, 25.6% in 2015 and 47.8% in 2016) were able to make credit passes (i.e A & C) in the subject. This means that majority of the students did not score up to 50% which made them to get ordinary pass. This finding conform with that of Ochu and Haruna (2014) who found that though basic science has been of great value both to individuals and the society, the students perform poorly in the subject. The finding is also supported by the finding of Eya (2011) who also found that basic science students show low level of acquisition of integrated process skills. The poor performance of the students may be traceable to the methodology used by basic science teachers in teaching the subject as Achimugu (2014) rightly pointed out that the major challenge of basic science education in Nigeria over the years is that the basic science that is taught in schools fall below expectations both in content and in methodology. This situation should be a matter of concern to every citizen of this nation since the poor level of academic achievement cannot lead to the production of students with the necessary scientific and technological knowledge and skills needed to build a progressive society.

The second finding from this study also revealed that there is a significant difference in the academic achievement of basic science students based on school type. The male and female students in co-educational schools performed significantly better than their counterparts in single sex schools. This finding is supported by that of Ogunlenye (1996) who also found that mixed sex groups performed better than students from single sex schools.

Conclusion

The position of basic science as the bedrock of all sciences in secondary schools cannot be over emphasized. This study revealed that the performances of students in basic science in Junior Secondary Schools have been low over the years. The situation demands urgent attention by every citizen of this country since the poor level of academic achievement in basic science means the production of students who do not have the necessary scientific and technological knowledge and skills to build a progressive society in the future. Moreover, these students are our hope for future scientists and technologists who will manage the economy of this country and take it to the highest developmental peak we are aspiring for.

Recommendations

Based on the findings, it is recommended that

- The government should regularly organize conferences, workshops and seminar for the in-service basic science teacher to help them update their knowledge .
- The government should help in maintaining timely supply of teachers guide and handbook to help the teachers in understanding most of the major concepts.
- Provision of well-equipped laboratories for basic science in Junior Secondary schools should be ensured by the government.
- The government should help in the motivation of teachers through regular payment of salaries and science allowances.
- Government should ensure the recruitment of well qualified teachers for the teaching of basic science in J.S.S.
- Basic science teachers should help the students to improve on their attitude towards basic science by encouraging their little efforts through motivation
- In order to develop and maintain the interest of students in basic science, it is essential to promote the organization of science clubs, lectures, symposia, science quiz and field trips to industrial establishments by the government, schools and agencies.
- Philanthropic organizations or individuals can also float scholarship opportunities for students to arouse their interest in basic science and other science subjects.

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