SCIENCE EDUCATION IN SOUTH-WEST NIGERIA: IMPLICATION FOR EDUCATIONAL POLICY

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ABSTRACT

The demand for quality science education requires periodic assessment for its improvement especially in areas with previous challenges. This study was conducted to assess the current status of science education in Ekiti State, Southwest Nigeria. A cross-sectional design, combining a mixed method of quantitative and qualitative data collection approach, was used following a records review. Schools were selected using a cluster sampling technique. Science education status was ascertained by three parameters: students' pass rates in science subjects in the Senior Secondary School Certificate Examination, science teachers' profile (assessed with a 14-item self-administered questionnaire) and availability and functionality of infrastructure for science education using an observational checklist. In-depth interviews were conducted among relevant stakeholders using an in-depth interview guide. Quantitative and qualitative data were analyzed with descriptive statistics and a thematic approach respectively. Students' pass rates were below 50% in Mathematics and Biology but above in Physics, Chemistry and Agricultural Science. The science teacher: student ratio was 1:8 and 37.5% of the teachers were members of the Nigerian Science Teachers Association. One school (8.3%) had a computer library that was adequately equipped. Laboratory facilities were mostly multipurpose in nature. A quarter of the schools had no library while 33.3% had grossly inadequate library facilities. Opinions about science education status among the respondents was widely divergent with some feeling that it was good while others felt otherwise. This study revealed poor status of science education as evidenced by a low science teacher-student ratio and lack of basic infrastructure for science education. Interventions to improve these findings are recommended.

Keywords: Science Literacy, Secondary Education, Quality Learning, Science Teachers' Profile

INTRODUCTION

Science is an area of learning that is absolutely necessary for development because of its linkage to technology and industry (Batomalaque, 2015). Scientific development is essential for better quality of life, the sustainable development of the planet, and peaceful coexistence amongst peoples. From the immediate basic essentials of life such as access to water, food and shelter, to other issues such as management of agricultural production, water resources, health, energy resources, biodiversity, conservation, the environment, transport, communication, science provides the basis for action at local, regional, national and transnational levels (UNESCO, 2015). Science and technology have been identified as the key drivers for growth and sustainable social development and transformation of nations, which could lead to industrialisation (Uza, 2013).

The knowledge of science and its associated skills cannot be achieved without science education. The Declaration of Budapest argues that what distinguishes poor people or countries from rich ones is that not only do they have fewer possessions but also that the large majority remain excluded from the creation and the benefits of scientific knowledge (Budapest 1999). Science education aims at helping individual learner to gain a functional understanding of scientific concepts and principles linked with real life situations and acquire scientific skills, attitudes and values necessary to analyze and solve day-to-day problems (Batomalaque, 2015). This portends the reason why basic sciences are core subjects in the elementary and secondary schools world over. It emphasizes the fact that all citizens should achieve some degree of scientific literacy to enable them participate effectively as citizens in the modern societies. Lederman (2008) in his article about "Science Education and the Future of Humankind" argues that:

"We have arrived at a point in history where there must be a major increase in the capability of ordinary people to cope with the scientific and technological culture that is shaping their lives and the lives of their children."

Worthy of note is the fact that only quality science education can bring about effective learning among students which will eventually produce palpable development for any country. Quality science education is effective science teaching which occurs when students learn and achieve many scientific goals and not just being able to repeat scientific knowledge (Omoifo, 2012). During effective learning, student learn how to develop conceptual understanding and thinking skills in order to change their intuitive, everyday ways of explaining the world around them to incorporate scientific concepts and ways of thinking into their personal frameworks so as to enhance their ability to solve problems (Omorogbe and Ewansiha 2013). According to the Budapest Declaration (1999):

"Relevant and quality science education can develop critical and creative thinking, help learners to understand and participate in public policy discussions, encourage behavioral changes that can put the world on a more sustainable path and stimulate socio-economic development."

Opateye (2012), in his study on awareness and preparation for the challenges of vison 20:2020 among secondary school science teachers, noted that properly planned educational input, in-

cluding scientific education, can lead to an increase in the gross national product and a general improvement to national development as a whole (Opateye 2012).

Rapid, worldwide change has dramatically altered global educational needs, challenging societies to transform the structures and processes of education (Hamilton et al., 2010). In developing countries, educational change means providing a quality of education that better addresses the needs of ever-expanding technologies in information systems, communications, medicine and engineering ((Halminton et al. 2010). Therefore, improving scientific education has become of paramount importance in determining a country's scientific status and its socio-economic power in today's open economies (Kalolo, 2015). The desire to develop scientific education is clear and in many countries there is an opportunity to ensure that quality, relevant and sustainable scientific education is provided for every student (Hestenes, 2013). However, many of today's youth do not have an interest in the study of science (Munro & Elsom 2000; Malcolm 1999). The fall in the number of secondary school leavers seeking careers in science, and the resulting situation where it is becoming difficult to find notable professionals in scientific fields, has become a matter of concern for most developing countries (Kalolo 2015), including Nigeria. It appears that while the global demand for skills in a technology-based economy is increasing rapidly, little effort has been made towards improving scientific education in schools.

Studies have shown that efforts to improve science education in most African secondary schools since the 1980's have been impacted by a number of global challenges with grave consequences on the practices in schools (Ogunmade 2005; Ogunniyi 1986, Kalolo 2015). These challenges include: changes in science as a discipline itself, the evolution of societal needs, rapid changes in technology, changes in scientific innovations, changes in the purposes of science education, the intensification of globalization, changes in new theories of learning, changing labour force demands and the evolution of the market forces in science careers. Such challenges have also led to a mismatch between the knowledge and skills that the schools offer, and the competencies that school graduates need for them to face their futures confidently (Kalolo 2015). Many of these challenges are also peculiar the situation in Nigeria.

Science education in Nigeria concentrates on the teaching of science concepts, method of teaching and addressing misconceptions held by learners regarding science concepts (Kola, 2013) but over the years, the situation has always been of concern to all including government and the society at large. This is evidenced by the poor/declining performance of students in science subjects (Ogunmade 2005). A highlight of students performance in SSCE showed that less than 50% of students passed their science subjects from 1995-2002 (Omorogbe and Ewansiha 2013). The proportions of students who had credits in biology, chemistry and mathematics from 2000-2004 were less than 50% in each of the subjects expect in 2003 when 51% had credit in chemistry (Omorogbe and Ewansiha 2013). A survey on the SSCE performance level of secondary school students in Ondo and Ekiti State from 2005 to 2009 showed that in each of the years, less than 40% passed mathematics and physics in both states while it was only in chemistry (2009) and biology (2005) that at least 50% of students passed in Ondo State (Adeyemi

2011). Some of the factors identified for poor performances in science from the various studies conducted in Nigeria were lack of motivation for most teachers, poor infrastructural facilities, inadequate textual materials, attitude of students to learning, lack of teaching skills and competence by science teachers, and lack of opportunities for professional development for science teachers (Braimoh & Okedeyi 2001; Folaranmi 2002; Olaleye 2002; Olanrewaju 1994). Other research findings had indicated that many students found science to be difficult, boring and not interesting to them (Salau, 1995; 1996). Large class sizes, inadequate funding, insufficient curriculum resources, poor teaching skills and lack of supports for teachers among other factors further limit the quality of science teaching and learning in Nigerian schools (Okebukola 1997). Recent studies have reported that quality of teaching and teachers were dominant factors for student poor performance in science subjects. Most teachers emphasizes theory rather than practical aspects of science subjects and most of them lack adequate knowledge of subject matter and the competence to deliver (Abdulahi 2007; Omorogbe and Ewansiha 2013). The teacher's academic qualifications and knowledge of subject matter, competencies and skills, and the commitment of teacher have a great impact on the teaching-learning process. Similarly, a study among Filipino students reported low performance in science subjects and some of the reasons were lack of science culture, deficiencies in school curriculum, the teaching learning process, instructional materials and teachers' training. Others factors include lack of textbooks, science equipment and facilities and poorly equipped laboratory rooms (Batomalaque, 2015).

Improving scientific education has become of paramount importance in determining a country's socio-economic development. This may be difficult to achieve without the understanding of the current status of science education. Anecdotal evidences showed that the tertiary institution graduates are not meeting up the challenges posed by our rapidly changing world. This may be explained from the poor quality of science education and the lack of interest of secondary school students in science. Science education especially at secondary level is very important for students of the 21st century. According to Iftekhar (2013), secondary education is the cornerstone of education system as it is the gateway to the opportunities and benefits of economic and social development. A situation whereby necessary functional scientific knowledge and skills are not achieved at the secondary school levels can adversely impact the youth application of scientific knowledge in the future especially the health sciences. A previous 5-year review (2005 – 2009) of the performance level of Ekiti State secondary school students in the core sciences including mathematics, using JSC (grade 9) and SSC (grade 12) examination revealed an abysmally low expectation (Adeyemi, 2011), especially as it is a state popularly tagged "the fountain of knowledge." Assessing the status of science education in Ekiti State in the current decade when Nigeria is far from achieving its education and health related goals may inform timely intervention to improve the current poor performance of students in the sciences because no nation can develop beyond her level of her scientific education. The rapidly demanding quest for quality science education in the secondary schools in today's world of ever-expanding technologies and health challenges requires periodic assessment for further improvement. This study was conducted to assess the status of science education in Ekiti State Nigeria by gauging the current level of students' performance (2009-2013) in the science subjects using Senior Sec-

ondary School Certificate Examination (SSCE), profile of science teachers and the availability, functionality of, and access to laboratory, library services and information, communication and technology (ICT) facilities.

METHODS

This study was carried out in Ekiti State. Ekiti State is located in the South-western geo-political zone of Nigeria. Administratively, the State is divided into three senatorial districts, 16 local government areas (LGAs) and 177 wards. With the population growth rate of 3.2%, the projected population as at 2013 was 3,025,427 while the population of youths (aged 10 – 24 years) was 1,088,704 comprising 557,509 male (51.2%) and 531,195 female (48.8%) (National Population Commission/Ekiti State Bureau of Statistics 2013). Ekiti State has a total of 330 secondary schools comprising 184 (55.8%) public and 146 (44.2%) private schools (Department of Planning, Research and Statistics 2013).

STUDY DESIGN

A review of records and cross sectional design were utilized to assess the quality of science education for this study. The descriptive method utilized a combination of quantitative and qualitative approach. The use of multiple instruments allowed triangulation of data as they provided opportunity to elicit information and have in-depth understanding of the situation of science education in Ekiti State, Nigeria.

Sampling Procedure

Quantitative approach

A cluster sampling technique was used to select schools. There are three senatorial districts in Ekiti State. The list of all the rural and urban secondary schools in each senatorial district, stratified into private and public sectors, was drawn. Two schools each (1 private and 1 public) were selected randomly by balloting from the list of rural and urban secondary schools in each senatorial district. Thus, a total of 12 secondary schools (4 per Senatorial District) were selected. All the selected secondary school and their science teachers were assessed.

Qualitative approach

A purposive sampling method was used to select relevant stakeholders. Those interviewed include the Honourable Commissioner for Education, Science and Technology and the Honourable Chairman, House Committee on Health and Social Services in the Ekiti State House of Assembly. Others were the Permanent Secretary, the Director of Science, Technology & Mathematics and the Director of e-Schools, all from the Ekiti State Ministry of Education, Science and Technology. The Director of Public Health, the principals of each of the selected schools or individuals nominated by the school authorities (school focal persons) were also interviewed.

Data Collection Procedure

Review of Records

Relevant records were reviewed and collated with respect to students' performance in science

subjects in the preceding five years (2009-2013).

Quantitative Data: The quantitative information was collected using semi-structured questionnaire and observational checklist.

Questionnaire

A 14-item self-administered questionnaire was developed to take inventory of science teachers and collect their bio-data, which included socio-demographic characteristics, basic and post-basic qualifications, subject(s) taught and affiliation with relevant professional bodies. All the science teachers who were met in the selected public and private secondary schools at the time of research team's visit were requested to complete a questionnaire for science teachers. Repeat visits were made to administer the questionnaire to those who were not met at the first visit.

Observational Checklist

The observational checklist was used to collect information on schools' statistics with regards to number of students and their distributions by gender, class and subject, number of science teachers and subjects taught, and students' performance in science subjects. It also documented availability and functionality of laboratory, library and ICT facilities. The principal or the focal person nominated by the school authority in each of the schools with the research team jointly carried out the school inventory and documentation as they both went through and observed school facilities. The checklist was completed for each of the schools visited.

Qualitative Data

In-depth interviews were conducted among the specified stakeholders using an in-depth interview guide. The interviewers and interviewees were allowed to deviate from the prepared in-depth interview guide as new themes emerged from the conversations. The interview guide was used to elicit information on participants' perception of the quality of science education in the state.

Validity of Data Instruments

Content validity of the quantitative instruments was carried out by experts and more than 50% of each item was agreed to by them. All the instruments was pre-tested in a school which was not selected for the study. Findings of the pre-test exercise were used to assess the internal consistency for the instrument and Cronbach Alpha estimate was 0.77. The pre-test findings were useful in making appropriate adjustments to the questionnaire, where necessary.

Data Management

For the quantitative data, the teachers' questionnaire and observational checklist were manually sorted out, checked and carefully arranged according to school and community. Thereafter, the questionnaires were numbered serially for the purpose of data entry. Data was entered into the computer and analyzed using Statistical Packages for Social Science (SPSS) version 16.0.

Descriptive statistics were used to summarize the data, which were presented in frequency tables as means and standard deviation. Science education status was measured by students pass rates in the core science subjects (physics, chemistry, biology, agriculture and mathematics) using SSC (grade 12) examination for 2009-2013; profile of science teachers; and availability and functionality of infrastructure for science education.

Qualitative data was analyzed using thematic approach. The transcription of the audio-taped qualitative data was done verbatim. Firstly, necessary steps were taken in transcribing the content such as verbal and non-verbal sounds, inaudible information, overlapping speech, pauses, questionable text and sensitive information as required. Secondly, all transcriptions were reviewed for accuracy by proofreading against the audiotape and revising the transcript file accordingly. Thirdly, all transcripts were saved in a computer as a rich text file with adequate labelling. Guided by the project objectives, data were thematically analyzed with similar patterns of responses identified and described as themes. Furthermore, some of the transcriptions were reported verbatim to highlight some responses of the stakeholders.

Ethical Issues

Approval to conduct this project was obtained from the Research and Ethics Committee of the Oyo State Ministry of Health (as there was no functional review committee at that time in the Ekiti State Ministry of Health. Approval of the Ekiti State Government has been previously sought and obtained to carry out the project. Permission to collect relevant information was sought from the appropriate Commissioners and Directors such as the Commissioner for Education, Science & Technology; Director of Science, Technology and Mathematics and Director of e-Schools. Permission to collect relevant information from schools and science teachers was obtained from the Principals of selected schools in Ekiti State.

Results

In the 12 surveyed schools, there were 6,198 students: 3,168 males (51%) and 3,030 females (49%). The students in JSS class (7th – 9th grade) were 3,296 (53%) and those in SSS class (10th – 12th grade) were 2,902 (47%).

Status of Science Education

Pass Rate of Students in Science Subjects (Table 1):

Students' pass rate in Mathematics was generally low (average 46.3%) in both male and female students except in 2009 when slightly over 50% was recorded in both sexes. Male students also recorded 52.6% in 2013. Pass rate in Biology was low (average 39.5%) in both sexes except in 2010 which recorded slightly over 50%. Pass rate in Physics was consistently high (average 61.8%) from 2009 to 2013. Pass rate in Chemistry was generally fair (average 53.8%) except in 2012 when male students recorded 35.4% and female students recorded 30.8%. Similar to Chemistry, pass rate in Agricultural Science was generally fair (average 57.7%) except in 2012 when male students recorded 40.3% and female students recorded 37.1% (Ekiti State Ministry of Education, 2013).

Science Teacher/Science Students' Ratio

Out of 2,902 students in SSS category, 1,097 (38%) were science students, 919 (32%) were undertaking arts subjects and 886 (30%) were undertaking commercial subjects. The total number of teachers in the 12 surveyed schools was 459; out of these, 131 were science teachers. This gave a gross Science Teachers: Science Students ratio of 1:8. The ratios for individual subjects were however much lower than this. For Physics, the ratio of science teachers to students was 1:84. The ratios for Chemistry and Biology were 1:61 and 1:44 respectively.

Number of Teachers by Subject in the Selected Schools

The number of teachers available to teach science subjects in the selected 12 schools were as follows: Physics has 13 teachers (average of 1 per school), Chemistry - 18 teachers (1.5 per school), Biology - 25 teachers (2 per school), Agricultural Science - 26 teachers (2 per school), Mathematics - 36 teachers (3 per school) and Integrated Science - 21 teachers (1.5 per school).

Availability of Science Teachers

A total of 64 Science Teachers were interviewed. A majority (70.4%) of the science teachers were aged 40 years or less. Twenty-five (39.1%) were in the 21 to 30 years age-group and 20 (31.3%) were aged 31 to 40 years old. Most of the science teachers were male (51.6%). Majority of them had a degree qualification (76.6%) which had mainly been acquired in the previous five years (40.6%) (Table 11). Biology was the most common subject studied by the teachers (21.9%) followed by Chemistry (14.1%) and then Physics (12.5%). Most of the teachers also taught Biology (21.9%) followed by Chemistry (18.8%) and then Physics (17.2%) (Table 2).

Table I: Five (5) Years Students' Pass Rate in Science Subjects (2009 – 2013

Subject	2009		2010		2011		2012		2013	
	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)
Mathematics	3,624 (56.4) N= 6,422	2,952 (51.6) N= 5,725	3,435 (44.4) N= 7,738	3,198 (46.6) N= 6,856	3,648 (43.0) N= 8,488	3,593 (43.4) N= 8,273	2,349 (38.8) N= 6,056	2,214 (40.0) N= 5,548	2,894 (52.6) N= 5,503	2,501 (46.4) N= 5,389
Biology	1,994 (30.7) N= 6,490	1,887 (32.2) N= 5,855	3,959 (51.2) N= 7,726	3,733 (54.4) N= 6,862	3,472 (39.1) N= 8,883	3,981 (48.3) N= 8,249	1,212 (20.1) N= 6,036	1,249 (22.8) N= 5,491	2,670 (48.7) N= 5,488	2,573 (48.0) N= 5,357
Physics	1,329 (54.5) N= 2,439	1,167 (52.5) N= 2,223	1,446 (49.0) N= 2,949	1,423 (50.1) N= 2,816	3,041 (79.7) N= 3,815	3,049 (87.1) N= 3,502	1,763 (69.5) N= 2,538	1,751 (67.0) N= 2,617	1,366 (55.9) N= 2,443	1,422 (52.5) N= 2,707
Chemistry	1,385 (56.6) N= 2,447	1,180 (53.0) N= 2,227	1,527 (52.0) N= 2,934	1,396 (50.8) N= 2,749	2,004 (55.5) N= 3,612	2,021 (57.2) N= 3,532	907 (35.4) N= 2,560	826 (30.8) N= 2,679	1,746 (71.7) N= 2,435	2,010 (74.8) N= 2,689
Agricultural Science	2,983 (54.7) N= 5,450	2,607 (56.8) N=4,589	3,807 (53.9) N= 7,061	3,329 (56.0) N= 5,944	4,982 (66.4) N= 7,507	5,015 (69.6) N= 7,205	2,184 (40.3) N= 5,422	1,791 (37.1) N= 4,832	3,673 (73.2) N= 5,016	3,364 (69.4) N= 4,844

N = Total number of students who took the examination in Ekiti State
Source: Ekiti State Ministry of Education (2013)

Table 2: Science Teachers' Socio-Demographic Characteristics, Course of Study and Subjects Taught

Membership of a Science Association

Only 24 (37.5%) of the science teachers were members of the Science Teachers Association of Nigeria (STAN), while the remaining 40 teachers (62.5%) were not.

Infrastructure for Science Studies

a. Laboratories

Age (in years)	
21-30	25 (39.1)
31-40	20 (31.3)
41-50	12 (18.8)
≥ 51	7 (10.9)
Gender	
Male	33 (51.6)
Female	31 (48.4)
Qualification	
NCE	10 (15.6)
HND	5 (7.8)
BSc/B Ed	49 (76.6)
Number of years since basic qualification was obtained	
0- 5 years	26 (40.6)
6-10 years	17 (26.6)
>10 years	21(32.8)
Possession of higher degree	
Yes	19 (29.7)
No	45 (70.3)
Course of study for basic qualification	
Physics	8 (12.5)
Chemistry	9 (14.1)
Biology	14 (21.9)
Mathematics	5 (7.8)
Integrated Science	7 (10.9)
Agriculture	7 (10.9)
Others	14 (21.9)
Courses taught in school	
Physics	11 (17.2)
Chemistry	12 (18.8)
Biology	14 (21.9)
Mathematics	9 (14.0)
Integrated Science	10 (15.6)
Agriculture	8 (12.5)
Years of teaching experience*	
0 - 5 years	21 (32.8)
6 -10 years	17 (26.6)
11-15 years	11 (17.2)
>15 years	8 (12.5)

7 respondents did not provide information on the number of years of teaching experience.

All the surveyed schools had a structure referred to as a Laboratory. In all schools, the laboratory was multipurpose in nature i.e. the same laboratory was used for the main Science subjects - Physics, Chemistry and Biology. All schools' laboratories had their equipment stored away in an adjoining room, but only 16.7 % of schools had an adequate structure, space and satisfactory equipment. About two thirds of the schools (66.7%) had a structure with space but had inadequate equipment while 16.7 % of schools had a structure but had limited or no space.

a. Library Facilities

Twenty five percent of the schools had no structure that could be referred to as a library while 33.3% of the surveyed schools had a structure referred to as a Library but these were grossly inadequate. The inadequacies observed include lack or limited tables and chairs with empty and poorly maintained shelves, where available. In two (2) schools where science books were sighted, the books were piled on top of each other and locked up in a cupboard. About forty

two percent (41.6%) had a structure that was adequate in space and facility.

a. ICT Facilities

Only one school (8.3%) had a computer library that was adequate in structure, space and equipment. About two thirds of the schools surveyed (66.7%) did not have any structure called a computer library while 8.3% had a structure but this was limited in space and 16.7% had a structure with adequate space but inadequate equipment. There was no internet access in any of the schools

Students' Performances in Examinations (2009-2013)

Number of Students with at least 5 credits, including English and Mathematics:

Annual students' performance with respect to those having at least 5 credits and above including English and Mathematics during the period under review was poor as it ranged from 23% in 2012 to 33% in 2011 (Table 3).

Table 3: Number of Students Obtaining at Least 5 Credits, Including English and Mathematics (2009 – 2013)

Sex Distribution	2009	2010	2011	2012	2013
	N=12,358	N=14,613	N=17,149	N=11,956	N=10,896
Males	1,779	1,851	2,895	1,365	1,576
Females	1,580	1,616	2,792	1,375	1,473
Total	3,359 (27%)	3,467 (24%)	5,687 (33%)	2,740 (23%)	3,049 (28%)

N = Total number of students who took the examination in Ekiti State for the year
Source: Ekiti State Ministry of Education (2013)

Perception of Relevant Stakeholders as to the Status of Science Education in Ekiti State

Some of the stakeholders felt there was an improvement in science education in the State as they believed the government had a good intention to improve its current status through provision of necessary facilities. However, a divergent view is obtained from the FGD/IDI groups of the school population as they felt that science education was still suboptimal in the State.

> *"it is o.k, but there is a lot of improvement that is coming up now, like when I was in secondary school in Ekiti here, majority of us are on the science line, then along the line there was a decline in terms of laxity interms of government and governance but since the assumption to office of the current governor, there has been a lot of improvement even more than a thousand percent improvement because when you look at the time when you compare the result of the 2010 with that of 2013 then you will know what I am talking about. There is close to 80% pass mark and people are getting more interested in science again. the reason most of the students run away then was because of mathematics because if they*

don't have maths they may not be allow to enter school. With the investment the government had done in the education sector, provision of computer, i.e laptops to the student, provision of reading materials and other things that they have almost 100% free education that is going on, students are getting more interested now especially with the investment in science laboratory in secondary school. Science education is improving and you know we still have enough room to improve on it. All of them cannot do science and we cannot force them but with the present intervention, things have change" **IDI, a Legislature leader**

"It is one of the priorities of government to do next. Government has already yielded to their demands. This year budget should include that. Most of the buildings are being expanded. There renovating laboratories and the libraries. They have just concluded the infrastructure. If you go to all secondary schools you will see they are renovated". **IDI, Senior Officer, Ministry of Health**

".....yes, I think the government has done much in that area, some schools have been renovated. I know some laboratories have been renovated too. the government is doing much interm of renovating the school, I think it is part of their plan to cover all the schools and make sure they have enough materials for their science courses." **IDI, NGO FEMALE YOUTH**

"though the state government has a good idea of giving laptops to Senior Secondary Students (SSS), the implementation was not encouraging because it was not well implemented. The problem was that they should not have given it to them to take home, when the project started, I was one of the people that said that this project will fail because of the model. There is way it is done and we need to learn from other countries. Countries have schools that have ICT in their classes. if you say we want laptops on every students table it is good, let us have an ICT center in every school, build a hall, equipped it with laptops, one it will be controlled and when you give them a server, there is a way you control what they can download. It is not something you give them to take home, I can have a big brother that is into yahoo yahoo and will use it. These laptops can even be configured in a way that no program will enter it. It depends on the applications you put there. This thing was not properly done and I know that the government had good intentions but they did not develop a good model and it was a huge investment. They should have just gone throughout the process, see it is not about doing things it is about doing it right. Even when they allow them to have an email, it should have been an intra net within the school, you have your friends email, you have your teachers and that of the principal and you can be monitored on the server. All those things should have been put in place and if you want to have a laptop on every desk let them have an ICT center. let us say they have 200 students in their SS1, build that hall and let us have the capacity and 200 laptops there, it is not compulsory to do it all at once. It is step by step". **IDI, NGO FEMALE YOUTH**

"2R: the status of science education in Ekiti state is very low, because in our school now we don't have functioning laboratories. the one we have is not even functioning again.

2R: they are chemistry and biology lab but it is only the chemistry lab that is functioning, eveb the chemistry lab is not well equipped because there are some equipment that we need that are not in the lab

3R: we don't have biology, we don't have physic, even the chemistry we have is not well okay." **Male FGD, SSS Rural Public School**

"I: o.k, fine you as a counselor in this school, I believe the school have laboratories, would tyou say they have adequate science teachers

R: no

I: the science teachers are not enough in comparison to the number of students here, what about the laboratories. you have laboratories in this school

R: yes, but we don't have enough, we need more, we don't have a standard one

I: the ones you have are they functioning

R: there is need for improvement " **IDI, Female School Staff, Urban Public School**

DISCUSSION

This study was conducted to assess the status of science education in Ekiti State using students' performance in science subjects, profile of science teachers and availability of functional science laboratories, libraries and ICT facilities.

On the average, students' pass rate in selected science subjects for most of the years under review (2009-2013) was below 50% for both sexes, but pass rates above 50% were reported for Chemistry, Physics and Agricultural Science. These findings demonstrate that students' performance in these science subjects has improved compared to what was obtained in the 5-year review from 2005-2009 by Akinyemi (2011) where students performance in all the core sciences was below 40% in each of the years reviewed. This supports the perception of some of the key informants who reported perceived improvement in science education in the State. The findings of Omorogbe and Ewansiha (2013) of pass rates less than 50% for 1995-2002 and 2000-2004 were for a much wider area that includes Ekiti State, but these also support the views that the status of science education had improved in the State. However, all the reports are still in keeping with low quality of science education. The level of poor student performance observed in this and previous studies are indicators of the poor quality of science education available in schools in the State.

Majority of the science teachers in this survey had a basic degree qualification. This is quite commendable as evidence has shown that the learning experience of students in enhanced where the teachers have degree qualifications and higher degrees as compared to the possession of lower qualifications such as the National Certificate of Education (NCE) (Darling- Hamond

2000; Akiri 2013). Quality of teachers has been linked to students' achievement and the criteria for determining such quality include their academic and professional qualifications, participation in in-service refresher courses and training, teachers' years of experience, teachers' remuneration and availability of quality teaching–learning resources. All these factors affect the way science is taught in schools (Omorogbe and Ewanisha 2013). In a bid to improve the quality of teaching, the Federal Ministry of Education had set a benchmark that the majority of teachers in Nigerian secondary schools should hold a degree qualification (FMOE 2005). There have also been calls for experienced teachers to be retained within the educational system as students achieve more from such category of teachers (Darling-Hammond 2000). Teacher qualifications and the years of teaching experience have been found to contribute to the quality of education. Higher qualifications and a greater number of years of teaching experience are both positively correlated with students' academic performance (Akinsolu 2010). In this survey, most of the teachers had less than 10 years of teaching experience and only 8 of them had taught for more than 15 years. This may be a disadvantage to the students as the experience of teaching garnered over the years serves to make the teacher much more effective in helping the students to learn. Other factors that have been identified to be associated with poor students' performance in science subjects are the absence of science laboratories, inadequate science equipment and specimens (Ajileye 2006).

Evidence has shown that the teacher-student ratio has a bearing on the quality of science education provided and the recommended international standard is a maximum of 30 students to one science teacher (UNESCO 2000; Huebler 2008). In Nigeria, the National Policy on Education advocated for a science teacher-student ratio of 1:40 (NPE 2004); though this is lower than the international standard, it is not envisaged that this will adversely affect the quality of science education to a large extent. However, it has been found that teaching effectiveness is improved with low ratios (Huebler 2008). In the schools surveyed, teacher- student ratio for the individual core science subjects ranged from 1:44 to 1:84, which were lower than the 1:40 recommended by international and national educational organizations recommendations (UNESCO 2000: NPE 2004). More teachers are needed for these subjects. Less than 40% of teacher's interviewed were registered members of a Science Teachers' Association. This implies that many of the teachers do not avail themselves of the opportunity of continuing professional development that such associations provide. This also has negative implications for the quality of teaching they can offer the students. Science teachers particularly at the secondary school level are in a unique position to lay the foundation for the transfer of this scientific knowledge to the next generation.

The infrastructure for the teaching and studying of science was found to be inadequate in most of the schools. Research has shown that such inadequacies contribute to the poor performance of students in science subjects (Ajileye 2006). It was also noted that there was inadequate access to ICT by the in-school youth. This is of great disadvantage to the youth in Ekiti State as the need for the possession of ICT skills among young people cannot be over emphasized in this technology driven age. Such skills not only engage students and help them to relate school experiences to work practices but also prepare them for their future role as productive individuals in

the work force of the nation (Adomi and Anie 2006; Adomi and Kpangban 2010; Osakwe 2012). Furthermore, the lack of exposure to ICT threatens the ability of youths to compete in on-line national and international examinations such as the University Matriculation Examinations (UME) and post-UMEs conducted by universities.

Our survey found inadequately equipped laboratories in majority of the schools. This was in contrast to what Daluba and Mama (2012) observed in Kogi State, Nigeria, where almost two thirds of the schools surveyed had well equipped laboratories. In this study, three quarters of the schools surveyed had a structure referred to as a library but all of these were grossly inadequate. The availability of adequate infrastructure for science studies cannot be over emphasized if quality science education is to be achieved. The science laboratories serve to demonstrate reality to the abstraction of science subjects and hence foster a greater understanding of the concepts to students and by extension facilitate better students' performance. This has been documented by researchers as library materials and science laboratory equipment, and have been found to be positively related to students' performance (Orji 2006). Access to reference materials such as textbooks and e-books by students is very essential. It had been observed that students need to be proficient computer users for them to be able to function effectively and be productive in the technology driven world of today (Eisenberg and Johnson, 1996). Our survey discovered that only one school had adequate facilities to ensure such proficiency among the students. A similar situation has also been highlighted by other researchers who have observed the low level of computer usage in Nigerian secondary schools (Adomi and Kpangban 2010). This has implications for national development especially when considering the speed at which various new technologies are being developed worldwide to make the execution of tasks more effective and efficient. Inadequate supply of equipment and facilities for teaching science has been associated with poor performance (Ajileye 2006). The face of teaching and learning globally has been positively changed by the advent of information communication technology (ICT) and the need for the acquisition of ICT skills by students to facilitate their learning and contribute to the growth and development of the nation has been identified (Osakwe 2012). Challenges facing ICT development presently in Nigerian secondary schools range from inadequate curriculum content, lack of basic infrastructure and inadequate funding to lack of qualified personnel (Osakwe 2012). To ensure that young people are able to develop properly and compete favourably with their contemporaries in other countries requires a concerted effort of the government and other stakeholders to address these concerns.

This study is descriptive in nature, so no causal relationship could be drawn. Further studies to explore the effect of teachers' profile on the performance of students in science education is thereby advocated. Although this study involved rural-urban, public-private schools, this report was not stratified to include results based on the different locations because of limitations of sample size. Since the influence of location and types of school is important to the quality of science literacy, a future study is hereby recommended that would have a large enough sample to permit such stratification. School enrolment was not reported because it was not specific for science subjects.

This study demonstrated that the status of science education in Ekiti State as assessed by average pass rates in science subjects, science teacher-student ratio and availability of basic infrastructure for science education shows a lot of areas where intervention can lead to a marked improvement. The State Government and other stakeholders need to increase the amount of resources made available for the support of science education. There is a need to enhance teachers' professional training and development, and to institute retention programmes for experienced teachers. There is a need to renovate the laboratory and library facilities in the schools.

ACKNOWLEDGEMENTS:

The authors acknowledge the funding provided by the Ford Foundation, through the Nigerian Academy of Science.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest

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