An Evaluation of Teachers Preparation for Science Teaching and Effect on Achievement in Science in Lagos State

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***Abstract*: Academic achievement is the extent to whicha learner is profiting from instructions in a given area of learning and turn is dependent upon the teachers' knowledge base for effective teaching. The quality of teachers is equally dependent on the nature of their preparation. Despite the emphasis on science education that is made compulsory and formed part of the requirement for admission especially in sciences, medical, agricultural, environmental, and engineering programs.The performance of students in sciences has consistently been poor and unimpressive. Therefore, the paper aims atevaluating teachers' preparation for science teaching and its effect on achievement in science in Lagos state. Using a descriptive survey research design and a sample of 173 science teachers. A validated and piloted questionnaire based on a 4-point rating scale used as the data collection instrument for the study. Data were analysed using descriptive and inferential statistics including means and standard deviation. Data analysis was facilitated using the Statistical Package for Social Sciences (SPSS). Findings revealed that science teachers perceived their training on content and education courses as adequate,pedagogical knowledge training received to prepare them to teach major subjects,workshops and seminarshelp inprofessional development. It was recommended that: Teachers should be sensitized through in-service and continuing education courses and revision of teacher training curriculum to improve teaching methodologies, building the capacity of teachers in the use of relevant teaching materials and the government should equip schools with relevant teaching materials such as ICTsand alternative power supply**

***Keywords*: Academic achievement, Science teaching, Evaluation, Teachers preparation.**

I. BACKGROUND OF THE STUDY

Science is a controlled body of knowledge in form of concepts, laws, theories, and generalizations. Science is definedas a study of nature and natural phenomena to discover their principles and laws (Urevbu, 2001). Science has three interrelated aspects: content, process, and attitude. Content can be grouped into physical, life and earth sciences, while process encompasses the fifteen inquiring skills proposed by the American Association for the Advancement of Science (AAAS) which include observing, classifying, experimenting, measuring, inferring, organizing data among others, and attitude is concerned with openness and objectivities (Omoifo, 2012)Science Education is a field of study concerned with producing a scientifically literate society. Science Education acquaints students with certain basic knowledge, skills, and attitudes needed for future work in science and science-related fields.

Although there are several issues in science education in Nigeria, some of these issues are related to students, teachers, parents, and other stakeholders' factors. Student factors may include poor interest in the subjects, poor study habits, indulgence in using new technologies, poor interaction of students with science education learning materials, high cost of science textbooks and other learning materials, and perceived difficulties of science subjects among others. Teacher factors include poor quality or competence of teachers in content, poor quality teaching skills, over-reliance on the use of lecture method, insufficient quantity of science teachers, poor remuneration and incentives for teachers, and/or inadequacy of capacity building for science teachers. The school factors may include poor learning environments without appropriate physical facilities, the inadequacy of instructional and curriculum materials, over-population in schools, dearth of guidance counselors in schools, and limited time for completing the syllabus for different public examinations. The government factors include inconsistencies in educational reforms and policies or policy somersaults, lack of political will to implement policies on science subjects, poor monitoring, and supervision of teaching and learning, and inadequate funding. Other factors related to parents and other stakeholders include parents' lack of interest in what is happening in schools and their children/wards academic pursuits, the inadequacy of home support, poverty in the entire society, and parents' poor attitude towards investing in education.The areas of emphasisin this study arefocused on students' achievement in science and science teachers' preparation.

Academic Achievement is the extent to which a learner is profiting from instructions in a given area of learning i.e., the achievement is reflected by the extent to which skill or knowledge has been imparted to him. Academic achievement also denotes the knowledge attained and skill

developed in the school subject, usually designated by test scores (Karthigeyan & Nirmala, 2012).

Students' achievement refers to performance in a school subject as designated by a score or mark obtained in an achievement test. According to Anene (2005) achievement is quantified by a measureof the student's academic standing concerning those of other students of his age. There has been much concern about the apparent drop in the standard of science education at the secondary school level in Nigeria.Stakeholders in science education have always been concerned about the academic achievement of students. Adeyemi (2010) emphasized that teachers play a significant role in determining the academic achievement of their students. Science teachers are very essential in the transformation of science educational objectives into practice.

A Science teacher is an individual who teaches science. Science teachers in Nigeria are prepared mostly from colleges of Education, institutes of Education, and faculties of Education from different universities. Achieving the goals and objectives of science education requires experienced and highly scientifically literate teachers.It is believed that an effective science teacher should be a master of his subject, as well as grounded in methods of teaching, and be able to relate the science concepts to real-life experience. Omorogbeand Ewanisha (2013) regard such teachers as those who understand the concepts, principles, theories, and processes of science and are aware of the complex relationship between science, technology, and society.Such teachers more importantly must develop an understanding of the nature of science. This is important because the aspect of scientific knowledge science teachers selected to teach and how the instruction was carried out presents a particular view of the nature of science to their students (Omorogbe & Ewanisha)

The teacher's knowledge base for effective science teaching is very important in that they are to help the students completely understand the content and underlying philosophy of science. This has long been stressed and culminated in recent emphasis on teacher preparation programs that will produce sound and effective scientifically literate teachers. The quality of teachers is dependent on the nature of their preparation and training. In-service education and training is a continuous on-going process for teachers throughout their professional life. As noted by Okhiku (2005), teachers are not finished products even after the completion of the preparation or pre-service program. Science teachers are faced with the challenge of meeting with innovations in science. It was in recognition of this fact, that it was stated in section 7 of the National Policy of Education (FRN, 2013) that teachers shall be regularly exposed to innovations in their profession, also in-service training shall be developed as an integral part of continuing teacher education and also take care of all inadequacies.

Science education provides more effective preparation for citizenship and to achieve this, qualified and experienced science teachers who are well aware of global demands of science teaching to engender scientific and technological values in learners are required. Sciences occupy a special position in the senior secondary school curriculum in Nigeria. Federal Republic of Nigeria (NPE, 2013), explains that each student at senior secondary school irrespective of his/her stream is expected to study at least a science subject (Biology, Chemistry, or Physics). The Federal Republic of Nigeria to equip students to live effectively in the modern age of science and technology emphasises science education which is taught at all levels of education and made compulsory at both primary and secondary schools. At the tertiary level, science is a compulsory subject and formed part of the requirement for admission especially in Natural sciences, Medical Sciences, Agricultural Sciences, Environmental Sciences, and Engineering programs. Science is part of general studies for students in all fields of studies in Nigerian tertiary institutions. Similarly, for admission purposes into the Nigerian institutions of higher learning; the ratio of sciences to liberal arts is 60 to 40 percent with functionality and integration of theory and practical as paramount aims (Adegun & Adegun, 2013).

Teacher's preparation is related to the subject matter knowledge a teacher acquires while in school. Several studies showed a positive relationship between teachers' preparation in the subject matter they later teach and students' achievement. Shamim, Rashid,and Rashid, (2013)revealed that there is a positive correlation between content knowledge and students' achievement. Research shows that teachers' knowledge of the specific subject matter, particularly at the secondary school level is a good predictor of students' achievement (Aliyu, Yashe, & Adeyeye, 2013). Teachers with content knowledge achieve a higher percentage of students' outcomes than teachers without such experience (Akinfe,Olofinniyi, & Fashiku, 2012). Assigning students to a teacher with deeper content knowledge has a positive correlation with greater academic growth (Neild, Farley-Ripple, & Byrnes, 2009). According to Ademulegun(2001) students taught by more qualified and experienced teachers in terms of knowledge of subject matter performed better than those taught by less qualified but experienced teachers. A well-prepared teacher of a subject should also have a strong command of the subject matter, knowledge of the difficulties it presents to students (McDermott, 1990)

Evaluation according to Okoro (2000) is the appraisal of the worth or value of a thing or action and making of appropriate decisions based on such appraisal. If provided as feedback and integrated into education, will help students to stimulate growth and form new habits. Through evaluation, all relevant information about teachers' preparation would be obtained and it will help to describe how science teacher's preparationis required at a point in time, also evaluation provides an objective means of monitoring the progress of individuals over time. It will further help to capitalise on the strength of teacher preparation and minimise the impact of

his/her weakness to produce expected academic achievement. Also, evaluation of students learning is an important part of the teaching and learning process, because it is through evaluation that the objectives of the schools' curriculum could be assessed. The quality of learning and evaluation systems used are conceptually related, science teachers, need to understand the relationship between standardized tests and curriculum. For teachers who are directly involved in the curriculum implementation, more guidance may be needed as teachers work with new standards and content. The researchers agreed that the objectives of science education in secondary school can only be realized if there is an effective evaluation of the science teacher's preparation. Thus, gaining an appreciation of their performance in science may provide useful insight into their area of weakness and future performance as well as their suitability to be sponsored by the relevant agencies.

There is, therefore, an urgent need to evaluate teachers' preparation for teaching and effect on achievement in science subjects as it will assist to determine the extent to which the objectives and goals of science education have been attained and to also establish better kinds of teachers' preparation, skills, and how these could be improved to meet the academic achievement of students. This also will facilitate their conceptual understanding and meaningful learning of new concepts will be integrated into the cognitive structure of learners to form a network of concepts. To this end, this study is designed to evaluateteachers' preparation for science teaching and its effect on achievement in science in Lagos state.

Statement of the Problem

The persistently low level of senior secondary school students' achievement in science subjects at the various public examinations in Nigeria has continued to attract the attention of major stakeholders in science education. The performance of students in sciences has consistently been poor and unimpressive. Despite all the considerable efforts made by stakeholders at various levels, very little improvement in students' achievement has been recorded. Available reports from chief examiners of two public examination bodies' in Nigeria,which is, West African Examination Council (WAEC) and National Examination Council (NECO) in their appraisal report together with the analysis of post senior secondary school certificate examination (SSCE)attest to the poor performance and high failure in Nigeria. Available records show that from 2005 to 2013, there was a negative trend in the performances of students in the three sciences subjects with the average performances of 56.01% in Physics, 46.30% in Chemistry and 37.27% in Biology, this is in addition to an increasing failure rate in Biology and Chemistry (Sakiyo & Badau, 2015). It was generally observed that the performance of candidates in the West African Senior Secondary School Certificate Examination (WASSCE) in Nigeria in the subjects and for the period reviewed was not quite impressive.

The underlying problems have been traced to many factors including poor teacher preparation, inadequate teacher training, and lack of in-service training and refresher courses, resulting in poor teaching skills among science teachers, and inability to determine a realistic and well-articulated purpose and goals for secondary science education. Ogunmade (2005) equally added that lack of opportunities for professional development for science teachers' preparationled to the poor performance of students in science subjects in Nigeria, this certainly has sounded the alarm of crisis, and therefore calls for concern as these are core subjects for admission into tertiary institutions (Bello & Oke, 2012). However, if the academic achievement of science education students in both internal and external examination will be improved, then proper evaluation should be carried out to determine the extent to which teachers' preparation will affect the objectives and achievement of student's science education.

Purpose of the Study

The purpose of the study is to evaluateteachers' preparation for science teaching and its effect on achievement in science in Lagos state. Specifically, the study determines the extent to which:

1. Content knowledge of science courses offeredin tertiary institutions equip science teacher to teach major teaching subjects
2. Pedagogical knowledge received by science teachers prepares them for science subjects.
3. Training received by science teachers prepares them to observe and enforce work habits and safety.
4. Forms of professional development science teachers benefited from educational districts in Lagos State.

Research Questions

The following are the research questions formulated to guide the study:

1. What is the extent to which content knowledge of science courses offered in tertiary institutions equip science teacher to teach major teaching subjects?
2. To what extent did thepedagogical knowledge training received by science teachers prepare them to teach major subjects?
3. To extent did the training received by science teachers prepare them to observe and enforce work habit and safety?
4. What are the Forms of professional development science teachers benefited from educational districts in Lagos state?

II. METHODOLOGY

The research employed a descriptive survey research design. The choice of the design was based on the kind of data solicited from the teachers. The study was carried out in Lagos State, southwest Nigeria. The Population for the Study consistsof all the 173 Science teachers in the six Educational

Districts that formed the population for the study.A proportionate stratified random sampling technique was used to select 15% of the number of schools in each District. Subsequently, a total of 48 schools were selected. The schools selected are large co-educational schools offering science subjects: Physics, Chemistry, and Biology. All science teachers were used in each of the selected schools. The instrument for data collection was a structured questionnaire. The instrument had five sections A to E.Section A sought information on personal data of the respondents such as educational district, name of the school, sex, educational qualification, teaching experience, and major teaching subject. Section B contains items that were used to answer the extent to which content of science subjects equip teachers to teach major teaching subjects. Section C contains items that were used to provide an answer on the extent to whichpedagogical knowledge received by science teachers prepares them for science subjects. Section D contains items that were used to provide an answer on the extent at which training received by science teachers prepare them to observe and enforce work habit and safety. Section E was used to provide an answer to research question four on the extent to which the forms of professional development science teachers benefited from educational districts in Lagos State. There are four response alternatives of very great extent (VGE), great extent (GE), moderate extent (ME), and low extent (LE). The questionnaire was subjected to face and content validation by three experts. The internal consistency of the instruments was determined using Cronbach Alpha. The reliability coefficient was α = .79.The instrument was administered to the respondents through research assistants and personal contact. The WAEC results of the participating schools were collected from 2006 – 2014. The collected data were analyse using both descriptive and inferential statistics, graphs, and figures were used to supplement the information obtained.

III. RESULTS AND DISCUSSION OF FINDINGS

Research Question 1: What is the extent to which content knowledge of science courses offered in tertiary institutions equip science teacher to teach major teaching subjects?

Data obtained from the study with regards to how the science teachers in the sample perceived their preparation in their subject area was presented in table 1 as illustrated below.

Table 1: Science Content Preparation for Science Teaching

	Teacher Preparation	Mean	Remarks
1	To what extent did the content of the science courses you took in the tertiary institution equip you to teach your major teaching subject?	3.41	GE
2	To what extent did the science practical classes you were exposed to prepare you for handling secondary school, practical classes?	3.23	GE
	Overall	3.32	

It was observed from the table that the science teachers perceived their content knowledge as adequate to a great extent (GE) in both content of science courses $\bar{x}$ 3.41, and for science practical $\bar{x}$ 3.23 on a 4-point rating scale.

Science teachers were also required to provide information on how they perceived the extent to which the education courses they offered prepared them for science teaching. Table 2presents the relevant data for answering the question.

Table 2: Extent at Which Content of Education Courses Prepared Teachers to Teach their Major Subject.

S/No	Item statements	Mean	Remarks
1	Curriculum theory	3.12	GE
2	Educational Administration	2.78	GE
3	Adult Education	3.05	GE
4	Guidance and Counselling	3.15	GE
5	Educational Psychology	3.16	GE
6	Educational Technology	3.35	GE
7	Measurement and Evaluation	3.39	GE
8	Methodology Courses	3.43	GE
	Overall mean	3.18	GE

Low Extent =1, Moderate Extent =2, Great Extent =3, Very Great Extent =4

From Table 2 the teachers perceived that the education courses they offered prepared them to a Great Extent for teaching science. This was because most of the items range within the means of 2.78 and 3.43 with an overall mean of 3.18. Highest means was recorded for Methodology Courses ($\bar{x}$ = 3.43); Measurement and Evaluation ($\bar{x}$ = 3.39) and Educational Technology ($\bar{x}$ = 3.35) and Adult Education ($\bar{x}$ = 3.05). The lowest was Educational Administration ($\bar{x}$ = 2.78).

Research Question 2: To what extent did the pedagogical knowledge training received by science teachers prepare them to teach major subjects?

To answer research question 2, respondents were required to respond to ten items dealing with the extent to which pedagogical knowledge training received by science teachers prepares them to teach major subjects. The data for answering this research question are presented in Table 3.

Table 3: Extent to Which Education Courses Prepared Teachers in Pedagogical Content Knowledge

S/No	Items	Mean	Remarks
1	The laboratory	3.25	GE
2	The core curriculum in your subject area	3.26	GE
3	WAEC/NECO examination syllabus	3.26	GE

4	Recommended textbooks	3.18	GE
5	Carry out practical activities in the laboratory	3.19	GE
6	Evaluation methods	3.26	GE
7	Classroom disciplinary techniques	3.12	GE
8	Several teaching methods	3.17	GE
9	Laboratory manual	3.04	GE
10	Scientific Inquiry	3.14	GE
	Overall	3.18	

Low Extent =1, Moderate Extent =2, Great Extent =3, Very Great Extent =4

The analysis in Table 3 presents the mean responses of science teachers on the extent to which their pre-service training prepared them to use the listed curriculum resources using a 4 point rating scale. The analysis revealed that all the items were rated to a Great Extent ($\bar{x}$ = 3.18) with regards to science teacher preparation. The highest means were recorded for use of WAEC/NECO examination syllabus $\bar{x}$ = 3.26; Core curriculum in subject area $\bar{x}$ = 3.26; and use of the laboratory $\bar{x}$ = 3.25. The lowest mean of 3.04 was recorded for use ofthe laboratory manual.

The science teachers were further requested to rate their preparation for science teaching in the use of some effective pedagogical strategies. Their responses are presented in Table 4.

Table 4: Extent at Which Science Teacher Education Programme Prepared Them to use the Under listed Pedagogical Skills

S/No	Pedagogical Skills	Mean	Remarks
1	Use of inquiry instructional methods for science teaching	3.19	GE
2	Selection of instructional materials	3.23	GE
3	Using meta-cognitive instructional strategies	2.97	GE
4	Using the science-technology-society approach to science teaching	3.02	GE
5	Using ICT in the teaching and learning of science	2.78	GE
6	Using teaching skills and techniques in teaching science	3.18	GE
7	Exposure to microteaching during initial training	3.19	GE
8	Improvisation of modern equipment	3.17	GE
9	Breaking down of syllabus into schemes	3.30	GE
10	Planning of lesson notes	3.41	GE
11	Writing of lesson notes	3.38	GE
12	Classroom management	3.42	GE
13	Fostering a conducive learning environment	3.19	GE
14	Encouraging students' participation in the teaching and learning process.	3.36	GE
	Overall	3.20	

From Table 4 the science teachers rated their preparation to Great Extent in all the listed areas with an overall mean of 3.20. The highest means were recorded for classroom management 3.42 and planning of lesson notes 3.41 and using Meta – cognitive instructional strategies 2.97. The lowest means were recorded for using ICT in teaching and learning of science 2.78.

Research Question 3: To the extent did the training received by science teachers prepare them to observe and enforce work habits and safety?

To answer research question 3, respondents were required to respond to six items dealing with the extent to which the training received by science teachers prepare them to observe and enforce work habit and safety. Table 5 presents the result on how the science teachers perceive their preparation in terms of Work Habits and Safety.

Table 5: Preparation for Work Habit and Safety.

S/No	Work habit and safety	Mean	Remarks
1	Maintaining a safe environment for students in the laboratory.	3.48	GE
2	Checking and using equipment properly	3.34	GE
3	Avoiding risks from fire hazards	3.30	GE
4	Avoiding risks from biological/chemical contaminants	3.30	GE
5	Giving First Air when required	3.24	GE
6	Planning and preparing for laboratory activities	3.25	GE
	Overall	3.32	

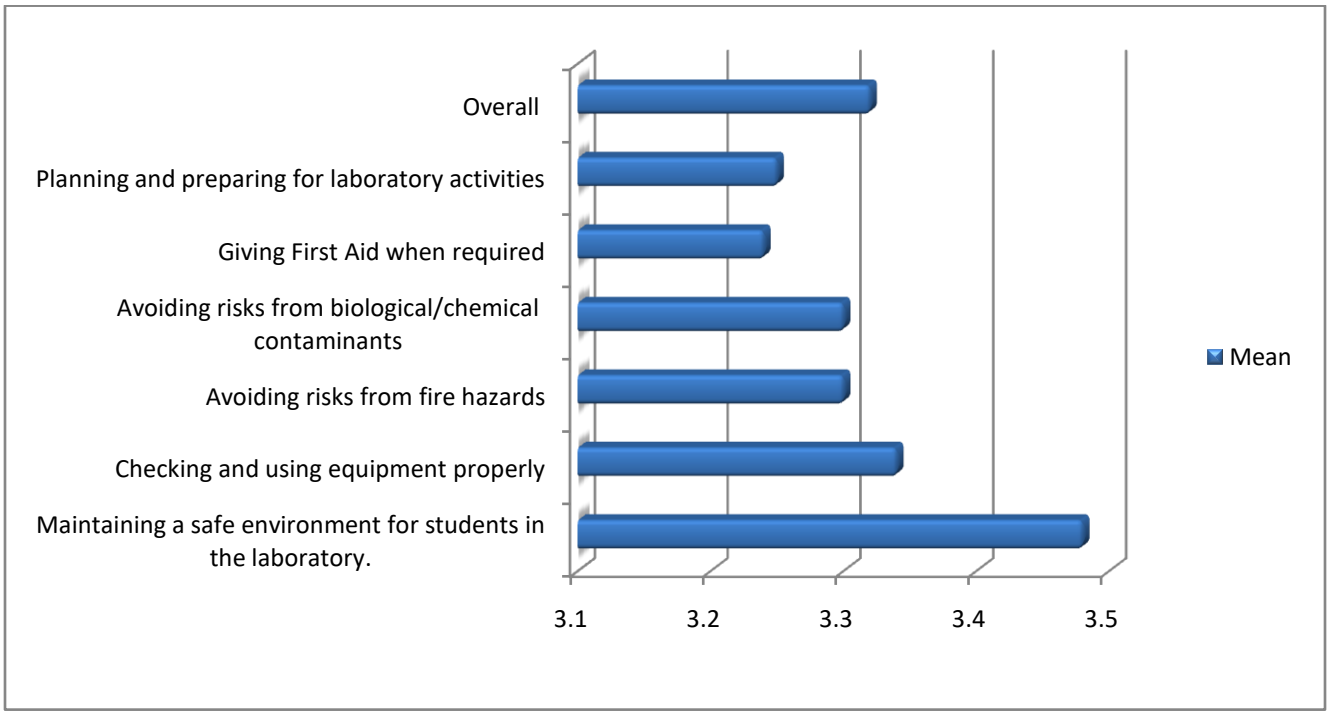

Figure 1:Preparation for Work Habit and Safety.

From the results, it could be inferred that the teachers perceived their training in the areas of Work Habits and Safety to be adequate to a Great Extent with an overall mean of $\bar{x}$ =3.32. This is further illustrated in Figure 1. The lowest mean of 3.24 was recorded for giving First Aid when required and the highest mean of 3.48 was for maintaining a safe environment for students in the laboratory.

Research Question 4: What are the Forms of professional development science teachers benefited from educational districts in Lagos state?

To provide an answer to research question four. The science teachers in the sample were required to indicate on a 4 point scale the type of in-service training they have benefitted from their school or educational district. Table 5 presented the data obtained.

Table 5: Form of in-service training science teachers benefitted from school/ educational districts

S/No	Items Statements	Never	Rarely	Sometimes	Always	Mean
1	Workshops	15 (10.2)	15 (10.2)	79 (53.7)	38 (25.9)	2.95
2	Seminars	13 (8.3)	22 (14.1)	86 (55.1)	35 (22.4)	2.92
3	Conferences	41 (29.3)	31 (22.1)	49 (35.0)	19 (13.6)	2.33
4	Short-term courses	40 (29.2)	37 (27.0)	45 (32.8)	15 (10.9)	2.26
5	School-based teacher professional support	30 (21.3)	35 (24.8)	59 (41.8)	17 (12.1)	2.45

Never (1), Rarely (2), Sometimes (3), Always (4).

From table 5it was observed that workshops and seminars have the highest mean with 2.95 and 2.92 respectively. The least in-service training is the short-term course and conferences having means of 2.26 and 2.33 respectively.

IV. DISCUSSION

The results from table 1 and 2 clearly showed that content knowledge and practical sciencereceived from the tertiary institution is adequate to a great extent, the teachers in the sample perceived that the training prepared them adequately for teaching the subject they teach. This finding is in agreement with the findings of Omorogbe & Ewansiha(2013) and Ogunmade (2005) who noted that content knowledge is adequate in teaching science subjects. However, global reforms in science teacher education have persistently called for improvement in the preparation of teachers in the area of metacognitive skills for teaching. From the results in table 3 and 4science teacher's shows thattheir pre-service training prepared them to use curriculum resources, they received adequate pedagogical knowledge. However, Adaramola & Obomanu (2011) found that lack of well-trained teachers led to the consistently poor performance

of students in SMT subjects in Nigeria.The findings of this study are in agreement with those of Akinfe, Olofinniyi, &Fashiku (2012) who found that teachers should be able to teach science by inquiry to improve students learning. Ademulegun, (2001) also observed that most teacher training institutions in Nigeria need to train teachers adequately to use relevant infrastructure and skilled manpower.

The result from table 4 revealsthe extent at which the training received by science teachers prepare them to observe and enforce work habit and safety are adequate in the areas of maintaining a safe environment for students in the laboratory, checking and using equipment properly, avoiding risks from fire hazards, avoiding risks from biological/chemical contaminants, giving First Aid when required and planning and preparing for laboratory activities. Ogunmade (2005) however suggests that the initial training can be bridged by robust in-service training in form of short courses, workshops, and seminars. Because lack of personal development by science teachers can inhibit the teaching and learning of science. Most of our teachers have to develop themselves. Because, when a teacher is not professionally developed, how could such a teacher be adequately informed about the discoveries in sciences? Most ofour teachers have beenteaching a particular subject for over a decade and yet are not conscious of the latest discoveries in their fields. The inability of teachers to develop themselves will result in them being deficient in the latest methods, approaches, and strategies of teaching and learning science.

The result from table 5 revealed that science teachers sampled indicate the type of in-service training they have benefitted from their school or educational district which includes workshops, seminars, conferences, short-term courses, school-based teacher professional support. The findings are in agreement with Sakiyoand Badau (2015),Oyelekan, Igbokwe, and Olorundare (2017)who found out that Self-development is very necessary for teachers of science, and as such the school authorities or the government should make room for teachers to develop themselves professionally through regular meetings, such as attending seminars, conferences, and workshops or having focus group meetings where they can discuss the problems encountered so far in the course of their teaching and students' learning.A good profession should adopt a professional code of ethics to guide and regulate the conduct of its members and practitioners. This would ensure the welfare, harmony, and satisfaction of the people.The teacher's knowledge base for effective science teaching is very important in that they are to help the students completely understand the content and underlying philosophy of science. This has long been stressed and culminated in recent emphasis on teacher preparation programs that will produce sound and effective scientifically literate teachers. Teacher's preparation had a direct impact on student's achievement in science subjects. The result has supported the view that improving teacher's preparation will enrich the instructional process thereby improving student's achievement.

The implication of the study

The researchers agreed that the objectives of secondary education can only be realized if there is an effective assessment of the science teacher's preparation. Thus, gaining an appreciation of teacher and students' performance in science may provide useful insight into their area of weakness and future performance as well as their suitability to be sponsored by the relevant agencies. The findings of the study might help the ministries of education and relevant stakeholders including the teachers in evaluating students' performances in their various capacities. It will also give curriculum developers new insights into emerging issues on performance and influence the authorities on policy formulation. Students will also benefit from the findings; because improved science performance will give them opportunities to pursue a career in Medical, Environmental, Pure, and other related sciences programs in institutions of higher learning in the country

V. CONCLUSION

The study has found that science teachers perceived that the education courses they took prepared them to a great extent for science teaching. Also, that their training in pedagogical skills, as well as work habit and safety, were adequate. However, the teachers were not prepared adequately to use metacognitive skills and ICT. Teachers, professional development was mainly through attendance of workshops and seminars

VI. RECOMMENDATIONS

1. Teachers should be sensitized through in-service and continuing education courses
2. Revision of teacher training curriculum should be made to include improvement inthe use of innovative teaching methodologies.
3. In-service training should target building the capacity of teachers in the use of ICTs for teaching and schools should be equipped with hardware and software for science teaching and learning by the government.
4. The alternative power supply should be made available by the schools.

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