Problems of Teaching and Learning Science in Junior Secondary Schools in Nasarawa State, Nigeria

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Abstract
Both parents and state government have repeatedly expressed the need to trace out the causes for the good results the fact that the specific goals of every state in Nigeria is to produce qualified students for admission into institution of higher learning both within and outside the country. It has been observed that students shy away from the study of science. This is a negative attitude that brought about poor performance of students in basic science subjects. It was as a result of this that prompted the research into the problems of teaching and learning science in junior secondary schools. The research aimed at identifying the problems and suggests solution to them. As a result of these, two research questions were raised. (1) What factors are responsible for the difficulty in the teaching and learning of basic science in secondary schools?   (2) What strategies could be adopted to enhance better teaching and learning of basic science in junior secondary schools? Some factors such as quality and quantity of teaching staff, attitude of students, physical facilities, parents and government were investigated. Two different questionnaires were administered to one hundred and fifty (150) science students and twenty (20) science teachers drawn from ten (10) secondary schools in Nasarawa State in order to collect data. In administering it, Likert rating scale was used and simple mean was used to analyzed it. Some of the findings are: (a) The teaching and learning environment is not conducive (b) The foundation of teachers in science subjects is poor (c) The Students have poor foundation in science. Based on the findings, it was recommended that (1) For effective teaching and learning to take place, the government should send science teachers for training (2) It has become necessary for Government to provide the necessary infrastructures and facilities that will enhance teaching and learning of basic science in the junior secondary schools.
Keywords: Science, Teaching, Learning, Performance

1.   INTRODUCTION
Science has been and would continue to be of tremendous importance because of its ability to explain many natural occurrences and the central role it plays in the world's current technology development. In our century, it is the soul of the prosperity of nations and it is an economic and technological development as well as improving the quality of life of the individuals and the society at large.

Science, as a school subject, has over the years gained prominence in the school curriculum world wide. In the last five decades, the world has witnessed science curriculum innovations and several changes in the teaching of the content in different levels of education.

Trowbridge and Bybee (1996), Ajaja (2007) identified the objectives of teaching science to include:-

Knowledge of science academic discipline; to acquire the skills of scientific method; having clear explanations for societal issues through increasing interest science literacy and societal goals; for personal needs and for career awareness.

In Nigeria, the sciences are taught in school subjects as Biology, Chemistry, and Physics. The National Policy on Education in the National curriculum for secondary schools volume 3 science stated specific objectives to be achieved by each subject curriculum.

Some of the most distinct characteristics of science are experimentation, observation, and discovery. It provides the development of skills of students asking questions and making investigations, making hypothesis, inference of results of experiments to students.(Acikgoz, Kaygusuz & Oncul, 2004) Laboratory method is often used in science and it is targeted that students do trial and error activities. Therefore, the laboratory applications are integral part of science (Orbay, Ozdogan, Oner, Kara, & Gumus, (2003). The success of science programmes depends largely on the classroom teachers. They constitute the most important agent in the on going exercise to revolutionize the teaching and leaning of science. According to (Awotua – Efebo, 1999) science Teachers have the potentials for enhancing the quality of education by bringing life to the curriculum and inspiring students to curiosity and self directed learning

Some definite demands on the teaching of science were made by (STAN) Science Teacher Association of Nigeria. This means that there are some demands made of the teacher if he or she is to teach his or her course effectively.   So also are some demands made of the students if they are to benefit maximally from the programme. Some of these demands, according to (STAN) Science Teacher Association of Nigeria, are as follows:

Demand of the Teacher are the quality of the teacher-Skills and successfulness, teacher seeking new

information on new teaching techniques, regular in service training, regular or frequent evaluation of the students, re-thinking of the teachers approach in the class to assess the class   and be able to modify his teaching method if such an approach is not working adequately and how well equipped are the laboratories.

Demands made of the pupils are wrapped round aims and objective of the STAN. Some of these demands are:- Student should be able to recall, should be able to relate their experience to other subjects, should be able to communicate effectively, should be active involvement in the learning and should be able to apply their knowledge to new situations.

The above listed demands constitute themselves into a number of definite problems in the classroom.

Generally, the education of a nation is evaluated in part by the quality of its teachers. The quality of teachers itself depends largely on the kind of training they received both at the academic and professional levels.

For these reasons, teachers of science need good training to enable them meet a better requirement and enough academic information in a variety of the basic science subject as said by Bajah S.T. (1982).

Akpan (1992) observed that Nigeria problems have been that of implementation. He said that a visit to primary and secondary school science classrooms by a well informed and concerned science teacher will show that the nursed hope in curriculum reform are expensive venture in the past decade. So therefore, turning out, in the nearest future, qualified and dedicated scientist, engineers, medical doctors etc from these schools are in serious danger.

Furthermore, Akueshi (1997) warned that the world is developing scientifically and technologically in every sphere of human endeavours; we should thrive to join this technologically train or else we shall be left behind and it will be disastrous and unpleasant.

As a result of poor teaching method, poorly equipped science laboratories over dependence on print materials, students performed poorly in science subjects in Nigeria.

Despite all the efforts made by government to promote science education in Nigeria coupled with several research works that has been carried out, the problems of teaching and learning science are still persisting. The problems are according to Bajah (1982) between 1959 and 1982: are Lack of laboratory, lack of qualified science teachers, and institutional objectives in science teaching.

According to Adebayo (1999) on educational policy 1977, he stated that Lack of finance to execute the project, shortage of manpower, lack of facilities and lack of policy itself (i.e. the planning and implementations) are factors responsible for poor performance in science subjects in our secondary schools.

Adeyemi (1993) and Adeyegbe (1990) stated that even though a number of science curriculum reforms were inquiry based and problem – solving in style research finding have continued to show that teaching and learning in science remain problematic.

Ayodele (1999) stated the problems as in adequacy of textbooks, lack of learner's interest, unqualified science and psychological fears of science subjects as factors responsible for poor performance in science subjects.

Textbooks are not adequately available. The ones that are available are written by foreigners with their language and cultural background, making it difficult for indigenous teachers try to complement by writing textbooks, most of their work lack in standard, probably because they are horridly written just to bridge gabs, without adequate research.

Most laboratories are not well equipped, schools rely more on imported laboratory apparatus and equipment and grants are never enough. Although government took a giant step by establishing science laboratory manufacturing industries like 'PRODA' Enugu, such industries have been long neglected by the same government that established them.

Large class size in science subjects teaching and lack of incentives for teachers. One teacher to 25 students are the recommended still remains a dream in schools classes are over populated to the tune of 50 and above.

Inadequate science teachers, approach to science teaching, science is an abstract course and will only be understood through practice. Some teachers do not put effort in improvisation of teaching aids and most importantly students' attitude and aspirations:

Some students' attitude has made up their mind that they are not going to study science, therefore will not waste time on science subjects.

Poor primary school background in science subjects as factor responsible for the poor performance of students in the science subjects.

With these problems in mind the researcher decided to investigate the extent to which these demands are being met and possibly suggest ways in which they could be successfully met.

2   STATEMENT OF THE PROBLEM

This study was carried out in an attempt to identify the problems hindering the effective teaching and learning of sciences in secondary schools. The teaching and learning of sciences have standards to be followed by science

teachers if effective learning by students is to be acquired.

Despite the fact that Government has invested a lot on science education, there are some persistent problems in our secondary schools.

Agun & Imogie (1988) prompted out the shortage of qualified teachers in many of our secondary schools particularly in the rural community. This will invariably affect the use of instructional materials in the teaching – learning activities because (a)   The students' population may be much (b) The incompetent teacher who lacks the pedagogical skills may not be able to utilize the materials effectively even when they are available.

Moa Dowell (1969) conducted a survey of science teaching in secondary schools in Nigeria. His study was confined to the nine states outside the war zones. The survey was designed to examine certain critical aspects of science teaching in secondary schools, teachers, support facilities and equipment text book, chemicals prepared slides, community resources and inventive to teachers. He arrived at the following conclusions: That a large number of science teachers are untrained and that there is alarming turn-out of teachers at individual schools for a "better job".

Adesenuga (1981) also commented that if any science is to be taught well, it should be taught practically, hence the need for sufficient materials for effective teaching of science within and outside the laboratory.

In view of the above, it is, therefore, important to evaluate once again if there has been any significant improvement in the availability of these materials and qualified teachers.

3   PURPOSE OF THE STUDY

 The purpose of this study was to investigate the problems militating against the effective teaching and learning of basic science in Junior Secondary Schools in Nasarawa State and suggest ways to enhance the teaching and learning of basic science in secondary schools.

Towards the achievement of this aim the study set out the following objectives:
1.   To identify the factors that militates against teaching and learning of basic science.
2.   T examine the strategies that could be remedy the difficulty in the teaching and learning of science subjects.
3.   To make suggestions on the ways to enhance the teaching and learning of basic science in secondary schools.

4   RESEARCH QUESTIONS

To guide this study, the following research questions were raised and answered after through investigation.
1.   What factors are responsible for the difficulty in the teaching and learning of science in secondary school?
2.   What strategies could be adopted to enhance better teaching and learning of science in secondary schools?

5.   RESEARCH HYPOTHESIS

The following hypotheses were tested in the study:
(a)   The availability of qualified science teachers is in adequate.
(b)   The improvisation is not a solution to unavailable instructional materials.
(c)   The provisions of instructional materials in our secondary schools are grossly inadequate compared to the class size.
(d)   The time allocated of fund for the procurement of science equipment and materials is grossly or completely unavailable.

6.   RESEARCH METHODOLOGY

The research was conducted using the survey research design method. This design was most appropriate and suitable for the study since questionnaire was the major instrument used for collection of data from sample segment of the society of interest. As a rule, any study which employs the questionnaire in data collection is a survey research. A little part of the study employed both oral interview and observational study design. This is to fish out some of the information which was not revealed in the questionnaire. The data collected was limited to science students of junior secondary schools and their teachers. The findings from the sample segment of the population were used to generate for the entire population.

6.1.   POPULATION FOR THE SUDY

The population of the study consists of all junior secondary school science students in Nasarawa State.

6.2   SAMPLE AND SAMPLING TECHNIQUE

The samples of the study include (150) One hundred and fifty science students were selected from ten (10) secondary schools in the state while (20) twenty science teachers, especially basic science teachers were also involved in the study. The study employed a proportionate random sampling technique in the collection of sample.

6.3   INSTRUMENTATION

The major instrument used for data collection was questionnaire called the Science Teachers Questionnaire. The modified four point Likert-type rating scale was adopted for the questionnaire. Some questionnairs were adopted from internet. Responses were of the types Strongly Agree, Agree, Strongly Disagree and Disagree. Simple means and percentage were used to analyze the data. The questionnaire consists of two sets with given options. The first set was designed and distributed to twenty (20) basic science teachers, two (2) from each of the schools selected. The second set was designed and administered on one hundred and fifty (150) science students; (15) fifteen from each of the schools selected. Respondents marked which of the options best describe the situation in their own environment. The other strategies employed was interviews and personal observations of what goes on in science classroom with the science classroom interaction category adapted by Ajaja (2005) from Shamansky's science laboratory interaction category.

Two weeks was spent for the administration and collection of questionnaire.

6.4   VALIDATION OF INSTRUMENT

The questionnaire was validated by a jury of three experience science teachers; each from Biology, Chemistry and physics and an expert in Measurement and Evaluation. Science content validity was accurate and determined. The choice of a jury and its composition was accurate and agrees with the recommendations of Wiseman (1999), Johnson and Christenson (2000). The reliability of the questionnaire was found using the Product moment correlation coefficient (Mean deviation method). As a rule, high reliability of 0.70 or higher shows that a test is reliable. Accurate measuring the characteristics it was designed to measure (Thorndike and Hogen 1977. Wisemen (1999). Johnson and Christenen (2000) and Borich (2004).

6.5   RELIABILITY OF INSTRUMENT

The instrument was subjected to test of reliability using test-re-test method and the coefficient of reliability of 0.85 was generated which is suitable for the study. The instrument is reliable for the fact that it gave constant and consistent results when used at various and different tim

6.6   METHOD OF DATA ANALYSIS

All the questionnaires were collected from the respondents as soon as they finished with their responses. Their responses were scored and organized in tabular forms. The modified four point Likert-type rating scale was adopted for the questionnaire, responses were of the types Strongly Agreed, Agreed, Disagreed and Strongly Disagreed. Simple means and percentages were used to analyse the data. In decision making, any calculated mean (x) that is above the mean rating (Xr) of 2.50 is "Accepted" while calculated mean (x) below the mean rating (Xr) of 2.50 is "Rejected".

7.   RESULTS AND DISCUSSION
7.1   Research Question 1.
What factors are responsible for the difficulty in the teaching and learning of basic science in junior secondary schools?

Responses to the first ten items in the teachers' and students' questionnaire were used to answer the above research question. The responses were computed using mean to evaluate them. The four point Likert scale was used. The mean value for acceptance is $X \geq 2.5$ otherwise rejected

Table 1. Teachers' opinion on factors responsible for the difficulty in teaching and learning basic science subjects in junior secondary schools in Nasarawa State.

S/N	items	responses				mean
		SA	A	D	SD	
1.	The poor foundation of students in primary school science poses problem in learning basic science .	12	7	1	-	3.35
2.	There are no incentives to motivate the teachers to put in their best	9	8	3	-	3.30
3.	Students psychological fear of the science poses a problem in learning	4	12	4	-	3.00
4.	Most science teachers do not teach science well because of their poor foundation in science	3	13	3	1	2.90
5.	Lack of instructional aids makes teaching of science difficult	8	9	3	-	3.15
6.	There are inadequate science teachers in term of number and quality.	5	11	3	1	3.07
7.	Students are no longer interested in hard work	7	9	4	-	3.10
8.	Students have problems in solving problems even when similar examples are given	1	13	5	1	2.80
9.	Large classes makes it difficult to practicalise science	5	10	4	1	2.95
10.	Science teachers do not prepare adequately before going to class due too much work load	1	5	13	1	2.95

Table 2. Students' opinion on the factors responsible for the problems of teaching and learning science in junior secondary schools in Nasarawa State

S/N	items	responses				mean
		SA	A	D	SD	
1.	The poor foundation of students in primary school science poses problem in learning basic science	67	60	15	8	3.25
2.	Lack of hard work on the part of students result in difficulty in understanding science	71	51	19	7	3.26
3.	The students lack interest while learning	25	68	40	15	2.70
4.	Students have problems in solving problems even when similar examples are given	14	66	36	12	2.82
5.	Students psychological fear of the science poses a problem in learning	39	72	30	7	2.97
6.	Lack of instructional aids makes teaching of science difficult	64	61	18	6	3.22
7.	There are inadequate science teachers in term of number and quality.	35	57	35	21	2.73
8.	Parents cannot afford to buy text books for their children	20	46	56	27	2.39
9.	Students do not solve science problems at home because nobody to guide them	32	58	39	19	2.68
10.	Large classes makes it difficult to practicalise science	46	61	27	14	2.93

The table above reveals that the factors listed (except) item 8, are responsible for the problems of teaching and learning basic science in secondary schools, it shows that students response to the items in the questionnaire were more on agree column than strongly agreed.

It should be noted that the teachers and students agreed strongly to the fact that, lack of instructional aids, lack of hard work on the part of the students and the poor foundation of students are the major problems of teaching and learning of basic science as revealed in the table.

7.2   Research question 2

What strategies could be adopted to enhance better teaching and learning of science in secondary schools in Nasarawa State.

Responses to items 11 to 20 on the teachers and students questionnaire were used to answer the research question above. The responses were evaluated using mean and are presented in the table 3 and 4 respectively.

Table 3. Teachers response on the strategies to enhance better teaching and learning of basic science in secondary schools in Nasarawa State

S/N	items	responses				mean
		SA	A	D	SD	
1.	The teacher should arouse the interest of the students while introducing the topic.	11	8	1	-	3.53
2.	The lesson should be related to real life situation	6	12	1	1	3.26
3.	The class size should be such that the teacher can manage	10	10	-	-	3.53
4.	The teacher should use instructional materials to make the teaching real	9	10	1	-	3.27
5.	Teachers should use appropriate method to drive home their lesson.	9	10	-	1	3.34
6.	The teacher should make the students do more practical work than theoretical.	12	7	1	-	3.47
7.	The learning environment should be made conducive for effective teaching/learning to take place	12	8	-	-	3.60
8.	The necessary facilities needed in a school to facilitate teaching/learning should be made available	15	9	1	-	3.33
9.	The teacher should endevour to carry all along with respect to individual difference.	6	11	2	-	3.20
10.	The teachers should monitor the activities of their students.	9	11	-	-	3.40

The means response on table 3 above shows that the teachers accept the factors as the strategies that could bring about the effective teaching and learning gf basic science in secondary schools in Nasarawa State if adopted. The mean values are all in line with the criteria for accepting a factor.

Their agreement shows that the learning environment should be made conducive for effective teaching for learning to take place.

Table 4. Students' response on the strategies to enhance better teaching and learning of basic science in secondary schools in Nasarawa State

S/N	items	responses				mean
		SA	A	D	SD	
1	The facilities necessary in a school to facilitate teaching/learning should be made available	99	40	5	4	3.57
2	There should be enough instructional aids to make the teaching real.	97	40	10	1	3.55
3	Parents should buy the necessary learning materials for their children.	92	50	3	3	3.55
4	There should be willingness to work	104	43	1	-	3.63
5	Topics in science should be related related to real situation.	44	72	23	9	3.01
6	The learning environment should be made conducive for effective teaching/learning to take place	98	38	9	3	3.52
7	students should be made to work extra-hard to improve on their poor foundation	94	40	10	4	3.45
8	Students should develop a studying habit	75	60	9	4	3.62
9	Students should be involved in more practical work than theoretical.	107	33	5	3	3.37
10	Parents should keep track on the performance of their children.	92	48	7	3	3.53

The results as shown in table 4 reveal that all ten strategies listed in the table could enhance better teaching and learning of basic science in secondary schools.

8   DISCUSSION OF FINDINGS

From the data analysis, the researcher can now state the problems of teaching and learning basic science in the junior secondary schools in Nasarawa State.

It is important to note that the teachers and students agreed strongly to the fact that the poor foundation of students coupled with lack of hard work are the major problems of teaching and learning science in junior secondary schools. This agrees with the WAEC examiners Report on sciences (2004) which stated that most of the students fail practical examinations because they lack the basic skill for doing simple experiment in sciences. Lacks of instructional aids also contribute to the problems of teaching science subjects as revealed in the result. The findings overlap some of the studies of Ceni, Kucuk, and Aycaci (2003). They reported that course materials in schools were not enough and it was difficult to get those materials. The fact that they had difficulties in providing course materials for effective science teaching, they used different teaching aids in addition to science textbook. It should be noted that Posters, graphs, overhead projector and VCD were needed for effective science teaching. Therefore, when visual materials were used in science teaching, effective teaching will be done.

It was agreed to the fact that the learning environment should be made conducive for effective teaching and learning to take place. It is the adequate laboratory, apparatus equipment that can provide conducive environment. But in this study, the laboratory apparatus and equipment are not adequate. The implication is that teachers fail in the basic objective of science education which is to communicate the spirit of science and ensure that students acquire the process skill of science. There must be enough practical work and laboratory experimentation for science students. For these reasons, Government should invest more and revise the

institutions that supposed to manufacture that equipment especially Production Department Institute (PRODA) Enugu.

Besides, students shy away from science subjects. Many research students including this study have confirmed that students shy away from science class. This may be because we unable to satisfy their aspiration or goals. Students become more interested in a subject when it has bearing on their practical life in their own goals. In the absence of adequate science equipment or laboratory, there is no way to provide knowledge to students in more practical and interesting way.

Science teachers share the blame on poor performance of science students. Teachers are not enough while some are not sufficiently trained to teach science.

Unfortunately, students are not aware of the benefits of a scientists and technologists. They are not even aware of the term "technology Transfer" which they suppose to be the beneficiary.

9   SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.
9.1   INTRODUCTION
The study was designed to find out the problems of teaching and learning basic science in junior secondary schools in Nasarawa State with a view to making suggestions towards improvement. This has become necessary in view of the poor performance observed in science subjects at both internal and external school examinations. In this chapter, the summary of the findings was carried out so as to be able to draw conclusion and make recommendations

9.2   SUMMARY OF FINDINGS
As a result of the analysis of the data collected, below are the summaries of findings:-

a Environment for teaching and learning are not conducive as a result of absence of infrastructures and basic facilities for science subjects.

b. Students attitude towards learning is very poor. Not only are they willing but also they are not ready to learn.

c. As a result of students' poor foundation in science subjects, they found it difficult to solve problems even when similar examples are given.

d Most of the teachers have poor foundation in science subjects. Besides, they are not committed due to lack of motivation. ensure effective teaching and learning in the school.

10   CONCLUSIONS
The findings of this study show that so many things are wrong with the teaching and learning of basic science in Nasarawa State. The absence of conducive environment has been the cause of poor teaching and learning in our secondary schools. Apart from the science teachers who are not well positioned to teach science effectively, the poor state of infrastructure has also negatively influenced the teaching and learning of basic science in the state,. Their deficiencies could be traced from the use of inappropriate teaching methods for teaching science, through lack of commitment and dedication while there has been inaccurate assessment of students learning outcomes in basic science. This was due to poor foundation of both science teachers and students in science subjects.

The problems of poor teaching of basic science in our junior secondary schools is, therefore, as a result of death of resources for teaching science, very few qualified science teachers and competency problems was as a result of the poor training of science teachers, large class sizes of science students, The existence of these problems has negatively influenced effective teaching and learning of basic science in our junior secondary schools in Nigeria. Most importantly, there has not been adequate supervision of instruction and monitoring of both teachers and students.

The present situation therefore, calls for the retraining of all science teachers in the area through seminars and workshops and provision of infrastructure to reposition science teaching in the area. This will enable teachers to teach basic science effectively with excellent performance in science subjects in our secondary schools by our students.

11   RECOMMENDATIONS
The following recommendations are made based on the above findings

1.   Provisions of the necessary infrastructures and facilities that will motivate teaching and learning of basic science become necessary.

2.   Teachers should relate their lesson to real life situation so as to reduce the abstract nature of science subjects.

3.   The government should motivate science teachers and reward hardworking teachers and students with adequate packages.

4.   The appropriate bodies should monitor teachers and students in order to leave up to their expectations

and be alive with their responsibilities as supervision of instructions will reduce laxity among science teachers and their students.

5. It has become necessary for the government to send science teachers for training and seminars to ensure effective teaching of science subjects.

6. Teachers should be trained on how to improvise for teaching aids (being a developing economy) may not have the fund to acquire all the basic equipment for science education. In addition, all the established science equipment manufacturing sectors should be encouraged to produce enough science equipment

7. Class size should be reduces to about 20 students per teacher.

8.   The policy that established the 6– 3 -3 – 4 system of education should be revisited and reviewed so that at the end of the junior secondary education, the candidate would have learnt basic technology like masonry, applied art etc.

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