ISSN No:-2456-2165

"Factors Inhibiting the Effective Teaching and Learning of Integrated Science at the Junior Secondary Schools in Sierra Leone and Related Implications" ?

Dr. Tamba Kebbie
Acting Director, Science Curriculum Development Centre
Njala University, Sierra Leone

Abstract:- This study investigated the factors inhibiting the effective teaching and learning of integrated science at the junior secondary school level in Sierra Leone. The study employed a descriptive survey design. The population of the study comprised of junior secondary school pupils, integrated science teachers and integrated science Heads of Department. A random sampling technique was employed in the study to determine the selected junior secondary school .and a purposive sampling technique to select the subjects for the study. A sample size of 1,300 participant were administered questionnaires .This comprised of 1,000 JSS pupils, 200 integrated science teachers and 100 integrated science HODs from the selected schools. One thousand two hundred and nine (1,209) fully completed questionnaires were returned, making a response rate of (93.0%).The main instrument employed for the study for data collection was Self-Administered Integrated Science Questionnaire (SAISQ) and analysed using frequency counts and percentages. The findings of the study revealed that there are untrained and unqualified teachers teaching integrated science. Some of the teachers are trained and qualified but are not professionally qualified in integrated science as a subject. The study further revealed that there are teachers in the profession that serve as heads of integrated science department that are untrained and unqualified. The instructional materials used in the schools are mainly textbooks, blackboard chalk. Most of the schools lack laboratory and library facilities. The few schools with laboratory facilities lack equipment. Teachers use wrong pedagogical strategy to teach integrated science. The time allocated for integrated science is not enough; bribery and corruption in admission and promotion of pupils. It was therefore recommended that only trained and qualified teachers in integrated science should be employed by the Teaching Service Commission to handle integrated science at the junior secondary school level. Government should build more schools reduce congestion in classes. Workshops, seminars and conferences should be organized for integrated science teachers to expose them to new pedagogical skills and assessment procedures for their professional development. There is the need for the government to provide adequate learning materials and laboratory equipment for the different types of schools. The teaching period for integrated science in the schools should be increased for both theory and practical. This would allow teachers to teach every aspect of integrated science effectively.

Keywords:- *Integrated Science, Teaching and Learning, Inhibiting; Junior Secondary School, Effective.*

I. INTRODUCTION

A. Background to the Study

Education in every nation is a catalyst to the nation's political, social and economic development. Sierra Leone in the 60s was referred to as the "Athens of West Africa." Students from other West African countries had their university education in Sierra Leone which serves as a bedrock in helping those nationals to develop their own nation with the knowledge, skills and innovations they had from Sierra Leone university education .They were able to adapt the university knowledge gained by adapting it to their country thereby contributing to their national development. The expanded knowledge they got was due to the effective teaching/learning they were exposed to in Sierra Leone

Over the years, the standard of teaching and learning at the junior secondary schools has dropped considerably due to many factors that are multi-dimensional

The educational system (6-3-3-4) in Sierra Leone is based on seven major objectives:

- to provide a broad-based education for class 1 to JSS children through the development of relevant curricula, teaching/learning resources and teacher education;
- to increase access to basic education especially for girls through the development of incentives, cost recovery measures, scholarships, community involvement and work study programme;
- to improve the quality and relevance of education through improved curricula, teacher effectiveness, school facilities, environment, developing a new structured teacher education programme for pre and in-service teacher education and also to provide adequate teaching/learning materials;

- to expand technical and vocational education within the formal and non-formal sectors of education;
- to increase opportunities for the acquisition of literacy, numeracy, technical and vocational skills within the formal and non-formal sectors of education;
- to provide equity in education by enforcing the policy of non-discrimination in all schools and also to monitor the standards and quality of education to be similar in all schools for all children regardless of where they attend school;
- to develop in children relevant skills, attitude and values that will enable the individual to be an effective and responsible citizen. (GOSL, 1995).

In the 6-3-3-4 system of education, the first six years comprise primary education followed by three years of junior secondary education for all primary school graduates. This 6-3 block (a total of 9 years) makes up the formal part of the basic education. To move to the senior secondary school level, candidates are required to take a national public examination referred to as the Basic Education Certificate Examination (BECE), conducted by the West African Examinations Council (WAEC) that is charged with responsibility of conducting both national and international examinations. Students who pass this examination and meet the requirements may continue to the Senior Secondary School level or enter the Technical and Vocational institutions and, upon graduation, enter the workforce and become self-reliant.

The basic education in the present system of education includes the provision of facilities for all citizens to be literate and numerate, as well as to cultivate desirable knowledge, skills, and attitudes that will enable the citizens to earn a good living, thereby improving on their social and health circumstances, becoming patriotic citizens of Sierra Leone, and understanding the complexities and opportunities in the modern world. The basic education programmes comprises of both non-formal education for school dropouts, children and adults who did not have the opportunity to go to school.

The contents of the Junior Secondary School curriculum have been designed with a deliberate attempt to avoid both irrelevant and purely academic focus. This has been achieved by introducing new pre-vocational subjects and Sierra Leonean Languages into the curriculum and by ensuring that the newly produced teaching syllabuses have contents that are in line with the objectives of junior secondary school. There are nine core subjects which pupils must study at the junior secondary level which include: Agriculture, French, Integrated Science, Language Arts, Mathematics, Physical and Health Education, Religious and Moral Education, Social Studies and Sierra Leonean Languages (one either from Krio, Limba, Mende, or Temne). The electives are sub-divided into two groups, pre-vocational and non-vocational. In each of the three years of schooling as well as the nine core subjects, each pupil must study three electives, two of which must be chosen from the pre-vocational group. (GOSL,1994).

From the contents of the Junior Secondary School Curriculum, Integrated Science as a core subject was purposely introduced with the hope that it would be taught as a single subject of integration. That is, when the subject is taught as a science course, it is devised and presented in such a way that students gain the concept of the fundamental unity of science, and does eliminate the repetition of subject matter from the various specialized basic science subjects.

The principles of integration are intended to produce a course, which is relevant to students' needs and experiences, lays adequate foundation for subsequent specialist study, and also adds cultural dimension to science education. Integrated Science if presented this way would be a good move to achieve scientific literacy, understand the processes of science, increasing interest in science, meeting the needs of the learners and showing the humanistic character of the discipline where science is married to society.

Integrated Science as the name implies is one of the core subjects offered at the junior secondary level meant to orient the students into the world of studying and practicing scientific methods having been exposed to the basic or General Science at the Primary School level which serves as a bedrock for the Junior Secondary School.

As Integrated Science has been described or defined in various ways by different people, so also has it been labeled and criticized in various ways. Some people regard it as the General Science of the past, and they do not seem to see any difference between them, that is General Science and Integrated Science. Integrated Science is unique from Biology, Chemistry, Geography and Physics because it is holistic in nature and satisfies the following:

- traditional subject boundaries do not exist
- the course is taught towards the realization of certain learning outcome,
- logical sequencing of themes/concept is discernible
- has a lot of activities which makes student actively involved in learning. (Gbamanja -1992)

The Government of Sierra Leone through the Ministry of Education approved higher institutions with Polytechnic status, so that teachers who want to qualify in Integrated Science can enter these institutions to pursue Integrated Science as a course of study rather than qualifying as a Physics, Chemistry or Biology teacher. This means that on completion of the course of study, they would be employed in the junior secondary schools later to teach Integrated Science.

Integrated Science has been defined in various ways and has been labeled in different forms. Some people regard it as the General Science of the past (a kind of old wine in a new skin), others look at it as basic science, undifferentiated science, or some science for the weak learner. Gbamanja (1992) explains that despite the multiplicity of labels or definition attached to it by its critics, as long as the contents of Integrated Science forms a foundation for scientific literacy and provides for general education and social relevance, it has achieved its purpose.

The content of General Science comes from the different disciplines but is not unified. Ruther and Garner cited in Stan (1999) describe General Science as "Nothing more than collection of short units in several of the individual science and cannot be thought of as Integrated Science.

Brown, also cited in Gbamanja (1999) describe Integrated Science under four broad characteristics. These include;

- The unity of all knowledge: that is, integrated science has a holistic view of knowledge as essentially one and undivided;
- The conceptual unity of the science: that is, various conceptual units that make up the framework are identified.;
- A unified process of scientific enquiry: that is, this characteristics places emphasis on the methodological distinctions and similarities among the sciences;.
- An inter disciplinary study: that is, a collaborative venture between subjects and viewing of topics or theme from logically different viewpoints with the learner left to synthesize any way he chooses..

UNESCO/UNICEF (1971) describes Integrated Science as a science programme;

- in which concepts and principles of science are presented as to express the fundamental unity of scientific thought;
- emphasized the underlying methodology and processes which characterizes scientific outlook, and
- embodies on scientific study of the environment and the technological requirement of everyday life.

Gbamanja (1999) said one primary reason why Integrated Science was designed and why it became a universal concern so quickly is based on the assumptions of a unified universe.

Research studies have showed that there are a lot of challenges confronted by school principals, teachers, heads of integrated science department and the JSS pupils on the content of integration of the subject at the junior secondary schools because the subject was new and only introduced after the former system of education (7-5-2-4) where the subject was taught as independent subjects as physics, chemistry and biology at then Form 3. All these challenges encountered by these key players in the teaching and learning process had influence or served as the bedrock to the academic performance of pupils in integrated science at the JSS level in Sierra Leone.

The government in its drive to the new direction has focused on education in introducing quality and free education from the pre-primary school to the senior secondary schools. The government has allocated over 40% of its budget allocation to the education sector in order to improve on the teaching and learning process. Despite all the efforts made by government to promote education and introduction of a science education department at the Ministry of Education, by allocating huge amount in the education sector, the teaching and learning of science still remain to be a challenge in Sierra Leone.

According to Bajah (1982), the factors affecting science teaching and learning process which make students perform poorly in science subjects are as a result of poor teaching method, poorly equipped science laboratories, over dependence on print materials, lack of laboratory, lack of qualified science teachers, and institutional objectives in science teaching.

This idea was also confirmed by a study carried out by Ayodele (1999) who asserted that the problem of adequacy of textbooks, lack of learner's interest, unqualified science teachers and psychological fears of science subjects by the pupils are the factors responsible for poor performance in science subjects. He further stated that textbooks are not adequately available. The available textbooks in the schools are written by foreigners with their own language and cultural background.

Most laboratories are not well equipped, schools rely more on imported laboratory apparatus and equipment. Large class size in science subjects teaching and lack of incentives for teachers. 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. Poor primary school background in science subjects as factor responsible for the poor performance of students in the science subjects.

According to Ogunbiyi, (2004), one of the fundamental problems facing science teaching today is the question of how current are the professional teachers. The majority of teachers who were teaching before 1995 lacked the pedagogical strategies to deliver their lessons well. What account for this is the fact that teachers have not been given the opportunity for re-training He therefore recommended that teachers should be encouraged to go for workshop

training in their areas of specialization. Farounbi (1998) on the other hand argued that students tend to understand and recall what they see more than what they hear as a result of using laboratories in the teaching and learning of science.

B. Statement of the Problem

The teaching and learning of integrated science at the junior secondary school is a cause of concern to most education stakeholders. Most parents are with the view that when their children successfully go through the Basic Education Certificate Examination, they would opt for the sciences. The bedrock to choosing the science subjects at the senior secondary school hinges on the performance of pupils in integrated science and mathematics at the BECE. Report from WAEC, Chief Examiner (2018) revealed that pupils' under performance in integrated science at the Basic Education Certificate Examination (BECE) is surrounded around poor school infrastructure, lack of trained and qualified integrated science teachers, absence of school laboratories and the schools opportune to have laboratory facilities are poorly equipped, science teachers find it very difficult to improve on their pedagogical skills because they do not attend workshops and seminars for professional development.

When there is effective teaching and learning in the schools it help improve on the pupils' understanding of the subject concept thereby promoting their development as learners. For the teaching of integrated science to be effective and efficient, the integrated science teachers must have adequate knowledge of the subject content, also be able to understand the type of pedagogical skill to be employed in the subject delivery and also comprehend the characteristics of the pupils he/she teaches.

The status of integrated science teaching and learning has affected the effective delivery of the subject. This problem has direct link to so many factors that are multi-dimensional. It is therefore against this backdrop that the researcher sought to examine the factors that inhibit the effective teaching and learning of integrated science in the junior secondary schools in Sierra Leone.

C. Objectives of the Study

The study seeks to address the following objectives of the study:

- To determine the academic qualification(s) of teachers teaching integrated science in the selected Junior Secondary Schools in Sierra Leone
- To identify the number of trained and qualified teachers specialized in integrated Science in the selected schools
- To determine the type of instructional materials available for effective teaching and learning of integrated science at the junior secondary schools in Sierra Leone.
- To identify the teaching strategy employed by integrated science teachers in the selected schools.
- To identify some factors inhibiting the effective teaching/learning of integrated science in the junior secondary schools in Sierra Leone
- To suggest ways of improving on the teaching and learning of integrated science at the junior secondary schools.

D. Delimitation/ Scope of the Study

The study is delimited to the factors inhibiting the effective teaching and learning of integrated science in the Junior Secondary Schools of Sierra Leone. The study is also delimited to only Heads of Integrated Science Department, Integrated Science teachers and pupils of the junior secondary schools who have been in their school for at least two years before attaining the Basic Education Certificate Examination class.

II. METHODOLOGY

A. Research Design

The research design for the study is descriptive survey design. This design is important because it involves a systematic collection of facts and accurate information or data about a given population or areas of interest, object or class of events in other to analyze, describe, compare, contrast and to interpret the facts without manipulating any variable. A survey method is described as scientific methodology that collects information from a large population for purposes of description, exploration and explanation. It uses a questionnaire or interviews to collect the data (McMillan & Schumacher, 2010 p.23; Livingstone, 2005 p.61).

B. The Study Area

The study was carried out in selected Junior Secondary Schools in Sierra Leone. Sierra Leone shares borders with Liberia and Guinea. According to the 2014 Population and Housing Census, Sierra Leone has 7,000,000 population. There are about 16 indigenous African ethnic groups in the country that make up about 90% of the population. The Mende, Themne and Limba ethnic groups form the greatest proportion of the ethnic group. The official language of Sierra Leone is English. Christianity and Islam are the predominant religions practiced by the people.

C. Population and Sample of the Study

The target population for the study included all the junior secondary school pupils offering integrated science in the selected junior secondary schools who have been in their school at least two years before attaining JSS 3, integrated science teachers and Integrated Science Heads of Department of the Junior Secondary School level.

➢ *Sample and Sampling Technique*

The researcher selected the following participants: Integrated Science HODs, Integrated Science Teachers and JSS pupils, for the study based on a simple random selection process without any form of biasness. Heads of Integrated Science Department were however selected using purposive sampling technique because every Integrated Science HOD had to be part of the study. In all, sample of 1,300 respondents were administered questionnaire in the selected schools. This comprised of 1000 JSS pupils, 200 integrated science teachers and 100 integrated science HODs from the selected schools. A total of 1,209 questionnaires were returned.

D. Research Instrument

The main instrument used for the study was Self-Administered Integrated Science Questionnaire (SAISQ). This type questionnaire was used purposely to elicit information from the integrated science HODs, integrated science teachers and the JSS pupils of the selected schools on the factors inhibiting the effective teaching and learning of integrated science in the junior secondary schools in Sierra Leone.

E. Validity and Reliability of Instrument

Draft copies of the instrument were given to a team of Science Education experts cof Njala University. They were requested to evaluate the items on each of the sections based on clarity and appropriateness of the language used and adequacy of the items in addressing the objectives that guided the study. This was done to ensure the face and content validity, after which the questionnaires were pre-tested to estimate the reliability. The items of the questionnaire were subjected to item analysis to enhance the internal consistency of the instrument, which produced a Cronbach alpha coefficient value of 0.75. This reliability coefficient of the questionnaires was obtained before they were administered to the subjects.

F. Data Collection Procedure

Upon ensuring the validity and reliability of the research instrument, the primary data was obtained using structured questionnaires. The questionnaires were administered to 100 HODs, 200 Integrated Science teachers and 1000 JSS3 pupils sampled for the study. The questionnaires were given to the HODs through the principals of the selected schools and were later retrieved from these principals by the researcher. The Integrated Science teachers' questionnaires were given through the HODs. The students' questionnaires were given to them through their integrated science teachers, who later collected the completed copies from the pupils. The wrongly completed questionnaires were discarded while the good ones were used for analysis. A total of 1,300 questionnaires were administered and only 1,209 were properly filled and returned, thus making a response rate of (93.0%).

G. Data Analysis

Data collected for the study were first coded and analyzed according to the objectives that guided the study. The information or data collected were first summarized to come up with raw scores and tabulated into frequency counts, some of which were converted into percentages. The analysis was done using the Statistical Package of Social Science (SPSS) software. These results of the findings were graphically displayed on bar charts and pie charts to give clear understanding of the findings of the study.

RESULTS AND DISCUSSIONS

A. Percentage Distribution of Respondents by Gender and Region

Gender of the study refers to whether the respondent is a male or female. This is indicated in Table 1 of this section**.**

Table1 indicates the percentage distribution of the responses of the participants on their gender. The study revealed that in the Northern Region, there are 100% male HODs, 90% male integrated science teachers, 10% female integrated science teachers, 50.7% male pupils and 49.1% female pupils.

In the Southern Region, there are 95.7% male HODs, 4.3% female HODs 93.3% male integrated science teachers, 6.7% female integrated science teachers, 47.9 % male pupils and 52.1% female pupils. There are more female JSS pupils than male pupils in the South Region than in the Northern Region as indicated in the table.

In the Eastern Region, there are 96.3% male HODs, 3.7% female HODs, 86.3% male integrated science teachers, 13.7% female HODs, 50.2% male JSS pupils and 49.8% female JSS pupils.

In the Western Area, there are 72.2% male integrated science HODs, 27.8% female integrated science HODs, 84.4% male integrated science teachers, 15.6% female integrated science teachers, 52.3% male JSS pupils and 47.7% female JSS pupils.

From the table there are more female JSS pupils in the Eastern Region than all the other two regions and the Western Area. Summarily, there are 92.3% male HODs, 7.7 % female integrated science HODs, 91.1% male integrated science teachers, 8.9% female integrated science teachers, 50.3% male JSS pupils and 49.7% female JSS pupils. The study showed that there are more male participants than females.

The implication and observatory disparity regionally on gender, for HODs, teachers and pupils from the table, is that there are more (100%) male HODs in the Northern Region

compared to the other regions. That is Eastern (96.3%), and Southern (95.7%).

In terms of female representation there is higher percentage of female HODs in the Western Area (27.8%), followed by Southern Region (4.3%). For the teachers, it is observed that most of the teachers of the survey are males. The Northern Region had the highest percentage (98.0%), followed by the Southern Region (93.3%). The percentage of female representation was more in the Western Area (15.6%) followed by the Eastern Region (13.7%).

For the pupils, there is slight difference in terms of percentage of male and female representation in the Northern Region with (51.0%) male and (49.0%) female respectively.

In the Southern Region, there are more (52.0%) female, than the male (48.0%) while in the Eastern Region there is almost equal percentage of male pupils to female pupils. The Western Area has higher percentage of male pupils (52.3%) when compared to the other regions. See Table 1 for details.

Region in Sierra Leone	**N=97**		**N=179**		**N=933**	
REGION	**Integrated Sc. HOD**		**Integrated Sc Trs**		**JSS Pupils**	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Northern Region	29(100%)	0(0.0%)	50(98.0%)	1(2.0%)	141(51.0%)	137(49.0%)
Southern Region	22(95.7%)	1(4.3%)	42(93.3%)	3(6.7%)	115(48.0%)	125(52.0%)
Eastern Region	26(96.3%)	1(3.7%)	44(86.3%)	7(13.7%)	123(50.2%)	122(49.8%)
Western Area	13 (72.2%)	5(27.8%)	27(84.4%)	5(15.6%)	90(52.3%)	82(47.7%)
TOTAL	**90(92.8%)**	**7(7.2%)**	**163(91.1%)**	**16(8.9%)**	**469(50.3%)**	**464(49.7%)**

Table 1:- Frequency and Percentage Distribution of Respondents According to Gender in the Selected JSS

B. Qualification(s) of the Integrated Science Teachers in the Selected Junior Secondary Schools

➢ *Qualifications:*

The study sought to determine the qualification(s) of the integrated science teachers. Qualification for this study refers to the academic certificate received upon completion of the course offered at the Tertiary institution of learning. The findings of the study on qualification is indicated in Table2

The results of the study for Northern Region shows that majority (45.10%) of the teachers have HTC(s), followed by 19.61% that have WASSCE, that is those who have no professional qualification for the teaching job. There are none with post-graduate degree, 5.89% and 9.81% have B.Ed. and B.Sc. Education respectively.

In the Southern Region, 24.48% have B.Sc. Education, 11.12% have B.Ed. Equal percentages (4.45%) have HTC (Primary) and WASSCE. None in the South have Post-graduate degree.

In the Eastern Region, 31.38% have HTC(Secondary) and equal percentages (17.65%) have HTC (Primary) and B.Sc. Education respectively.

In the Western Area according to the table, 37.50% have B.Sc. Ed, 25% have HTC(Secondary), 15.63% have B.Ed. and 26.25% have M.Ed. and M.Sc. respectively.The table further reveals that the Northern Region have the highest percentage (19.61%) of WASSCE teachers followed by the Eastern Region (17.65%). The highest percentage (38.55%) of qualified teachers have HTC(Secondary) followed by B.Sc. (20.67%).

The study further reveals that most integrated science teachers are professionally qualified with just a few with WASSCE results who are yet to obtain the teaching qualification. However, the presence of WASSCE teachers is an indication that the teaching field still accommodates people without the requisite professional knowledge. It cannot therefore be contested if one posits that this is one of the reasons for high failure of candidates in Integrated Science in public exams.

ISSN No:-2456-2165

REGION	Response on Qualification n=179							
	HTC(P)	HTC(S)	B.Ed	B.Sc Ed.	M.Ed	M.Sc	Diploma	WASSCE
Northern	6(11.77)	23(45.10)	3(5.88)	5(9.80)	0(0.0)	0(0.0)	4(7.84)	10(19.61)
Southern	2(4.44)	22(48.89)	5(11.11)	11(24.45)	0(0.0)	0(0.0)	3(6.67)	2(4.44)
Eastern	9(17.65)	16(31.38)	4(7.85)	9(17.65)	0(0.0)	0(0.0)	4(7.85)	9(17.65)
Western Area	1(3.13)	8925.00)	5(15.63)	12(37.50)	2(6.25)	2(6.25)	0(0.0)	296.25)
TOTAL	**18(10.01)**	**69(38.55)**	**17(9.50)**	**37(20.60)**	**2(1.12)**	**2(1.12)**	**11(6.15)**	**23(12.85)**

Table 2:- Frequency and Percentage Distribution of the Responses of Integrated Science Teachers on Their Teaching Qualification(s) in the Junior Secondary Schools in Sierra Leone

- *Qualifications of Integrated Science Teachers of the Selected Junior Secondary Schools and Their Subject Area of Specialization*

The study sought to determine the subject area of specialization of the qualification of the integrated science teachers in the selected schools. This is indicated in the Figure1below

In the Northern Region according to the figure, 31.38% have HTC(Secondary) in Integrated Science, 5.89% have B.Ed.and 9.81% have B.Sc.Ed. in the basic sciences.

In the Southern Region, 40% of the integrated science teachers have HTC(Secondary) in Integrated Science, 6.67% have B.Ed. in Integrated Science and 8.89 % have B.Sc Ed in the basic sciences. Majority of the integrated science teachers though trained, they are not trained in integrated science as a subject of specialization but trained in other subject areas like mathematics, physics, agriculture and so on.

Similarly, in the Eastern Region, the findings from the figure shows that13.73% have HTC(Secondary) and specialized in integrated science, 7.81% have B.Sc. Ed but specialized in the basic sciences. Majority of these teachers are also trained in other subjects and have the highest percentage (17.65%) of Untrained and Unqualified Teachers with just WASSCE.

The study further reveals that in the Western Area, 28.13% have Bachelor's degree in the basic sciences and 6.25% in the other subjects, 18.75% have HTC(Secondary) in integrated science.It is observed from the figure that there are no WASSCE teachers of the selected schools in the Western Area.The implication is that a very good percentage of integrated science teachers of the survey are trained and qualified but they are qualified in other subjects area and were employed to teach integrated science in these schools. This obtains because of the scarcity of real trained and qualified integrated science teachers. The findings confirms the assertion of Jegede (1982),which affirms that integrated science teachers are mostly produced by teacher colleges and that most of the University graduates are qualified in other sciences like mathematics and physics, chemistry, biology, agriculture and are found teaching integrated science which they are not trained to teach.

Philippe (2000) also confirms from the findings that both the academic and professional qualifications of teachers is important in the teaching and learning process. The teachers' educational background in the field of instruction is a value index of teachers' understanding as experts in their field.

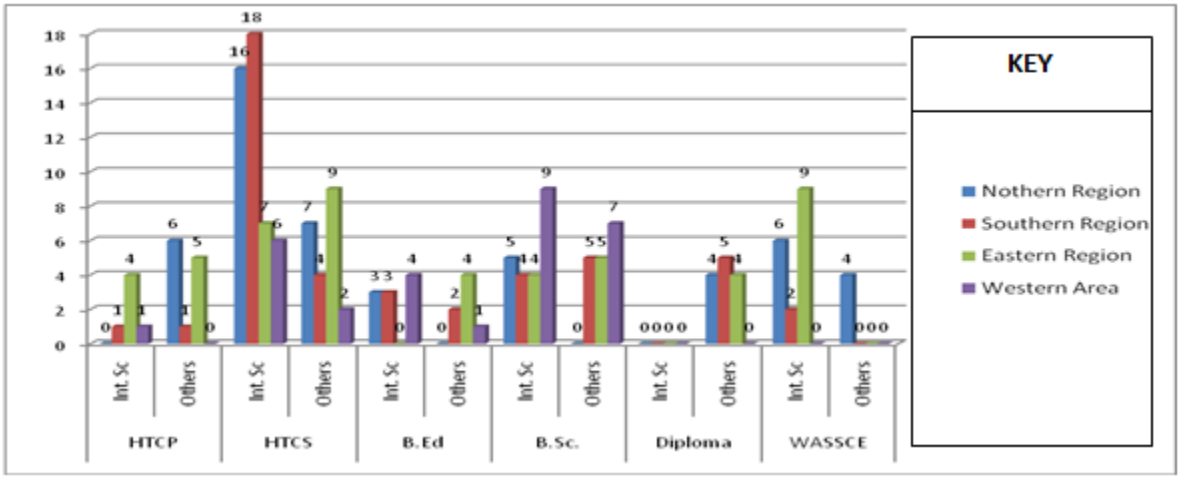

Fig 1:- Bar Chart Showing Qualification(s) and Area(s) of Specialization of Integrated Science Teachers.

ISSN No:-2456-2165

➢ *Socio-Economic Status of Pupils' Parents*

The socio-economic status of pupils' parents has greater influence on the children's education. Some literature indicated that children from economically well-off families and socially exposed parents, seemed to do well in their school. The most important aspect considered for the study is the socio- economic status of the parents. This includes:the educational background of the pupils' parent, their occupation etc.The aspects of the educational background of pupils' parents is presented in the bar chart below. It is strongly believed that education and social exposure of parents lead to influence that motivates children to take their academic work seriously. Although the worth of education is admired by everybody in the country, the extent to which they value the work of education is more among the literates.

From the study, it reveals that majority (67.85%) of the fathers, (60.72%) of the mothers and (60.25%) of the guardians have primary, secondary and tertiary education.

However few parents, 31.91% of the fathers, 38.63% of the mothers and 33.22% of the guardians did not go to school, indicating that they are illiterates and 1.29% of the pupils never responded to whether their parents (father, mother or guardians) were educated.

The large proportion of educated parents of the study indicates that educated parents are keen in sending their children to school. They know the value of education and are prepared to invest in their children's education. See Figure 2 for more detail

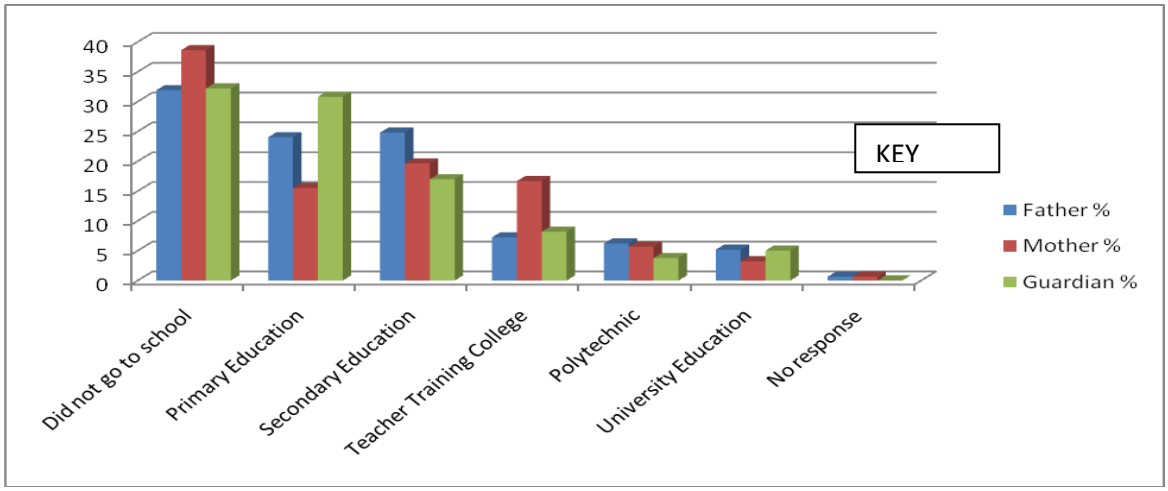

Fig 2:- Bar Chart Showing Educational Background of Pupils' Parents in the Selected JSS.

➢ *Distribution of Responses of Pupils on their Parents' Occupation*

The study seeks to determine the occupation of the pupils' parents. The economic status of parents has a significant role to play in the education of a child. This is illustrated in Figure 3. From the figure, 23.51% of the fathers, 16.24% of the mothers and 28.93% of the guardians are government employed serving as civil servants. In summary, slightly over half (50.86%) of the fathers, (44.55%) of the mothers and (50.94%) of the guardians are government employed as civil servants and as teachers, and lecturers. The results indicate that 10.85% of the fathers, 26.10% of the mothers and 32.70% of the guardians, are engaged in petty trading, while a small percentage (18.99%) of the mothers are house wives and a very small (6.07%) of the fathers, (5.56%) of the guardians are farmers.

The findings of the study reveals that a high proportion of the mothers participated in economic activities, by running small petty trading to augment their family income. Parents of the pupils are either in private or public sector employment which gives them good opportunity to provide for their children's education.

By implication, occupations of parents determine in all respect, the socio-economic status they enjoy in the community. The data show great disparity between the occupation of the father, mother and the guardian. From our social and economic set up, it is not surprising to see the disparity because majority of the mothers are relegated to mostly non-economic domestic activities.

ISSN No:-2456-2165

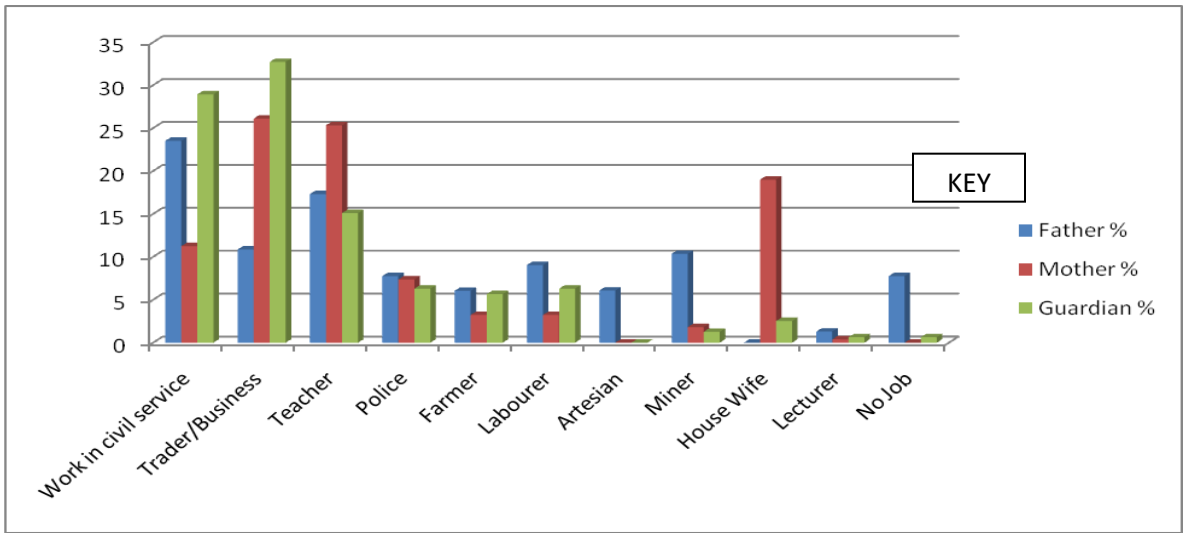

Fig 3:- Bar Chart Showing Distribution Students' Parents, by Their Occupation.

➢ *Responses on Average Class Size of Students in the Selected Junior Secondary Schools*

The conditions under which teaching and learning take place determine performance of pupils in the learning process. Table 2 shows the frequency and percentage distribution on the average size of pupils in the classes of the selected schools by regions as responded by the teachers of the survey. As indicated in Table 2, in the Northern Region, 43.14% have (60-69) pupils as class size and 19.61% have (70 and above) pupils. The table further shows that most of the schools in the Northern Region over crowded.

In the Southern Region, 48.89% of the schools have (60-69) pupils as class size and 35.56% have (50-59) pupils as class size. In the Eastern Region, 64.71% also have (60-69) pupils as average class size followed by 19.61%. In the Western area, 62.50 % have (60-69) pupils as average class size. From the study, it could be observed that most 54.19% of these schools are over-crowded or congested with (60-69) pupils as average class size.

According to the average class size by the Ministry of Education, the pupils-teacher ratio is 1:45. When compared with the table; most of the schools have above the pupil teacher ratio at national level. It is inferred that since majority of these schools are overcrowded with pupils it thus make teaching and learning ineffective and therefore affects pupils' performance.

The findings confirm the statement of Njoku (2004) who posit that overcrowded science classrooms are not easy to manage and organize for any meaningful lifelong learning; there is every need to reduce overcrowding of science classes. Gallacher (1988) he also made mention that class size should not exceed thirty pupils if a positive learning result was to be achieved.

Region	***< 30 Pupils***	***30-39pupils***	***40-49Pupils***	***50-59Pupils***	***60-69 Pupils***	***70and Above Pupils***
Northern	0(0.0)	0(0.0)	2(3.92)	17(33.33)	22(43.12)	10(19.61)
Sourthern	0(0.0)	0(0.0)	4(4.88)	16(35.56)	22(48.89)	3(6.67)
Eastern	0(0.0)	0(0.0)	2(3.92)	10(19.61)	33(64.71)	6(11.76)
Western Area	0(0.0)	0(0.0)	0(0.0)	2(6.25)	20(62.50)	10(31.25)
TOTAL	**0(0.0)**	**0(0.0)**	**8(4.47)**	**45(25.40)**	**97(54.19)**	**29(16.20)**

Table 3:- Percentage Distribution of the Responses of Teachers on the Average Class Size of Pupils in the Selected Junior Secondary Schools in Sierra Leone by Region n = 179 (*Figures in Parentheses are Percentages)

➢ *Periods Allocated for the Teaching and Learning of Integrated Science in the Junior Secondary Schools*

The study sought to elicit information from the junior secondary school pupils and integrated science teachers on the adequacy of the teaching period allocated on the timetable to teach integrated science as indicated in Table 3. From the table, 94.96% of the responses from the JSS pupils, 89.94% responses of integrated science teachers show that the time allotted to teach integrated science in the schools is not enough as compared to 3.22% of pupils' responses and 10.06% responses of integrated science teachers show that the time allocated to teach integrated science is enough.By implication the period to teach integrated science has significant impact for effective delivery and completion of the syllabus before the pupils write the BECE. When the time is not enough there is the tendency for the syllabus not to be completed. This affects the effective delivery of the subject.

Adequacy	Responses of Junior Secondary Pupils		Responses of Integrated Science Teachers	
	Frequency	%	Frequency	%
Enough period	30	3.22	18	10.06
Not enough	886	94.96	161	89.94
No response	17	1.82	00	0.0
Total	**933**	**100.00**	**179**	**100.00**

Table 4:- Frequency and Percentage Distribution of Pupils' and Teachers' on the Period Allocated for the Teaching/ Learning of Integrated Science in the Selected Junior Secondary School in Sierra Leone.

C. Kinds of Materials Available and not Available to Teach Integrated Science in the Selected Junior Schools

From the table above, it was observed, 84.92% of the respondents did use textbooks, 100% blackboard and chalk, 64.25% used blackboard illustrations, 15.64% had laboratory facilities, and 30.75% had library facilities in their schools. It is inferred that, Integrated Science teaching and learning could be functional in schools, when the teachers have adequate materials to teach and equipped laboratory facilities to perform science experiments, for proper understanding. The study implies that little or no time is spent by the students to use either the library to make research in Integrated Science due to lack of libraries or the laboratories in their schools for performing experiments. This is supported by Tella(2007) who posit that the quality of integrated science teaching and learning could be affected by factors such as inappropriate and inadequate instructional materials, inappropriate instructional strategies used by teachers, poor teacher preparation before lesson and poor attitude and interest of students towards the subject. In the same vain, Opara and Etukudo (2014) confirmed that with adequate instructional materials and strategies, the teacher will be able to give students the chance to learn through their senses of hearing, smelling, tasting, seeing and feeling. Ogwa (2002) defines instructional material as all the materials that the teacher utilizes for the purpose of making teaching and learning more effective and meaningful to the students. With the help of instructional materials, it will be ease learning. Examples these instructional materials include; textbooks, blackboard, drawings on vanguards etc. In Sierra Leone's junior secondary schools, many of these instructional materials are not available. Schools with available instructional materials are not adequate. As a result of this integrated science teachers hardly teach with instructional materials, instead they just prepare notes for the pupils to copy.

Material/Facility	Available	Not Available
Textbook	152(84.92%)	27(15.08%)
Blackboard	179(100%)	0(0.0%)
Chalk	179(100%)	0(0.0%)
Blackboard Illustration	115(64.25%)	64(35.75%)
Laboratory	28(15.64%)	151(84.36%)
Cardboard	76(42.46%)	103(57.54%)
Library	55(30.73%)	124(69.27%)

Table 5:- *Teachers' Responses on the Kind of Materials/Facility Available and not Available in the Selected Schools*

- *Teachers' Responses on Availability of Science Laboratory, the Type and Whether They are Equipped or not.*

Table 5 represents responses from Integrated Science teachers on the availability of Science laboratory, the type and whether these laboratories are equipped or not. From the table, 42(23.45%) responded that there is availability of science laboratory while 137(76.54%) responded that there is no laboratory facility in their schools. Out of the schools where laboratories are available, the survey reveals that the type available includes General purpose laboratory, Biology, Chemistry and Physics laboratories. Of these, 83.33% are general laboratory type, 7.14% are chemistry laboratory type, and 4.76% are biology laboratory type and physics laboratory. The findings further reveals that 2(4.76%) of these laboratories are equipped while (95.24%) are not equipped.

This implies that majority of the selected junior secondary schools do not have Science Laboratories, the few schools with laboratories are mainly the General Laboratory type which are also used by the senior secondary school teachers especially schools with both JSS and SSS shifts in the same compound. From the findings, all the schools with laboratories are not equipped. This affects pupils' practical experience in integrated science learning.

ISSN No:-2456-2165

Available	Percent	Type of Laboratory Available				Equipped	
		Gen.	Bio.	Chem.	Phy.	Yes	No
YES	42(23.46%)	35(83.33%)	2(4.76%)	3(7.14%)	2(7.46%0	2(4.76%)	40(95.24%)
NO	137(76.54%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
TOTAL	**179(100%)**	**35(83.33%)**	**2(4.76%)**	**3(7.14%)**	**2(7.46%)**	**2(4.76%)**	**40(95.24%)**

Table 6:- Distribution of Teachers' Responses on the Availability of Science Laboratory, the Type and Whether They are Equipped or not. (KEY:- Gen-General, Bio-Biology, Che-Chemistry, Phy-Physics)

D. The Method(s) Employed by Teachers in the Selected Schools to Teach Integrated Science

A good teacher is expected to be sound and well informed in what he delivers in the classroom. He is expected to communicate information needed for background enrichment of his/her pupils.Figure 4 shows that the main method employed by teachers in the selected schools to teach integrated science. From the chart the teaching strategy is dominated by question and answer (45.25%), followed by the talk and chalk method (36.31%).The activity or inquiry method forms the basis for effective teaching of science. From the figure it is observed that only 12.85% used the inquiry method to teach integrated science.This implies from the findings that majority of the teachers used the wrong method to teach integrated science; this is an indication that though some of these teachers are trained and qualified they still lack the pedagogical skills of integrated science teaching. Diffy(2002) supported the fact that the level of instruction of the teacher has relationship with his or her level of understanding and that nothing can substitute for science teachers' education. Joof (2002), also affirms that integrated science teachers need updated concepts and processes in science as well as pedagogy. Various techniques and learning for monitoring and communication with learners are needed so that they can benefit of discovery learning.

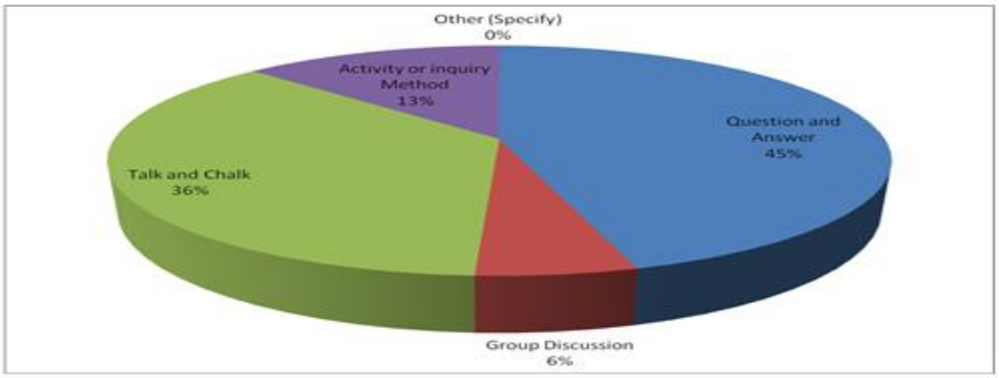

Fig 4:- Pie Chart Showing Methods Used by Teachers to Teach Integrated Science in the Selected Schools.

E. Responses of Teachers on some of the factors that inhibit the Effective Teaching and Learning of Integrated Science at the Junior Secondary Schools

Table 4 shows the response rate on views of integrated science teachers on some of the factors that inhibit the effective teaching and learning of integrated science at the junior secondary school. The Likert scale which includes:, strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD),was used. From the responses, it could be observed that the response on Strongly Agree and Agree fall under the same category and the response Disagree and Strongly Disagree (SD) also fall under the same category. If the total percentage response that is (SA + A) and gives a total response rate of 50%, it could be interpreted or regarded as a factor that inhibits effective teaching and learning of integrated science. On the other hand, if the total percentage response rate is below 50% it is not regarded as a factor that inhibits effective teaching and learning of integrated science. The table below shows some of the major factors that inhibit the effective teaching and learning of integrated science in the junior secondary schools in Sierra Leone:

- lack of trained and qualified teachers teaching integrated science
- wrong methodology employed by teachers to teach integrated science
- the integrated science syllabus is not completed before the pupils write the BECE
- unavailability of integrated science textbooks in the schools
- lack of laboratory facilities
- lack of laboratory equipment
- mass promotion of pupils leading to class congestion or increase in class size
- lack of teaching and learning materials in science
- lack of incentives for science teachers
- no time for pupils for personal study
- time allocated for integrated science is not enough on the teaching timetable

- weak primary foundation in science
- Low teacher motivation.
- high teacher attrition
- some teachers just read out notes to pupils in the classroom without explanation
- bribery and corruption in admission and promotion of pupils

These factors that inhibit effective teaching/learning of integrated science is confirmed by Adepoju(1991); Salam (1991) who identified factors like the teaching syllabus, teacher qualifications, workload, experience and disposition, general lack of teaching skills and ineffective style of delivery of subject matter as causes.

	Responses				
Inhibiting Factors	**SA**	**A**	**D**	**SD**	**Remarks**
Lack of trained and qualified teachers in Integrated Science	176(63.77)	100(36.23)	00 (0.0)	0 (0.0)	Factor
Teachers do not use teaching aids	76(27.54)	60(21.74)	100(36.23)	40(14.92)	Not a Factor
Some teachers only cater for those category of pupils who understand Integrated Science	06(2.17)	25(9.06)	45(16.30)	200(72.46)	,,
Teacher Centered method adopted in teaching Integrated Science	80(28.99)	120(43.48)	50(18.12)	26(9.42)	Factor
The Integrated Science syllabus is not completed before the BECE	155(56.16)	100(36.23)	15 (5.43)	6(2.17)	"
Teachers ineffectiveness in teaching integrated science	6(2.42)	14(26.52)	156(56.52)	100(36.23)	Not a factor
Poor quality and in availability of integrated science text books	80(28.99)	120(43.48)	40(14.92)	36(13.04)	Factor
Lack of Science laboratory for test of practical	215(77.90)	51(18.48)	04(1.45)	06(2.17)	A factor
Lack of laboratory equipment	180(65.22)	96(34.78)	00 (0.0)	0(0.0)	"
Mass promotion leading to class congestion	20(7.25)	120(43.48)	80(57.97)	56(20.29)	"
Lack of teaching/learning materials in Science	80(28.99)	160(57.90)	30(10.87)	06(2.17)	"
Lack of teachers' effective supervision	10(3.62)	20(7.25)	100(36.23)	146(52.90)	Not a factor
Lack of Incentives for science teachers	180(65.22)	80(28.99)	10(3.62)	06(2.17)	Factor
Problems of class size and space	178(64.49)	90(32.61)	05(1.81)	03(1.09)	"
Negative attitudes of pupils towards science	152(52.90)	60(21.74)	05(1.81)	60(21.74)	A factor
No time for pupils' for personal study	90(32.61)	120(43.48)	50(18.12)	16(5.80)	A Factor
Inattentiveness of pupils during science lessons	05(1.81)	10(3.62)	160(57.97)	101(36.59)	Not a factor
Failure of pupils to do personal study	70(25.36)	80(28.99)	10(3.62)	6(2.17)	A factors
Time allocated for Integrated Science is not enough	200(72.46)	74(2681)	02(0.72)	00 (0.0)	A factor
Irregular attendance of pupils in class	30(10.87)	70(25.36)	160(57.92)	16(5.80)	Not a factors
Weak primary school foundation in science	176(63.77)	80(28.99)	10(3.62)	10(3.62)	Factor
Teachers' do not improvise local materials to teach science	01(0.36)	10(2.62)	175(63.41)	90(32.61)	Not a factor
Teachers' laziness	05(1.81)	11(3.99)	120(43.48)	40(14.49)	Not a factor
Teachers' absenteeism from school	25(9.06)	65(23.55)	100(36.23)	86(31.16)	Not a factor
Pupils' absenteeism	56(20.29)	70(25.36)	180(49.68)	70(25.36)	Not a factor
Pupils' unseriousness with school work	6(2.42)	100(36.23)	90(32.61)	80(28.98)	Not a Factor
Low teacher motivation	166(60.14)	70(25.36)	40(14.92)	10(3.62)	A factor
Teacher attrition	100(36.23)	80(57.87)	90(32.61)	06(2.17)	A factor
Poor teaching	04(1.45)	12(4.35)	120(43.48)	140(50.72)	Not a factor
Some teachers are with the habit of just giving out notes to pupils without explanation	85(30.80)	91(32.97)	60(21.74)	40(14.92)	Factor
Some teachers are just incompetent	40(14.92)	100(36.23)	90(32.61)	46(16.67)	Factor
Some parents interfere in teachers' work	05(1.81)	01(0.36)	80(28.99)	190(68.64	No factor
Bribery and corruption in admission of pupils to new class	100(36.23)	70(25.36)	100(36.23)	6(2.42)	Factor
Bribery and corruption in promotion of pupils	180(65.22)	70(25.36)	10(3.62)	16(5.80)	"

Table 7:- Distribution of Teachers and HODs Response on Factors that Inhibit the Effective Teaching and Learning of Integrated Science at the Junior Secondary Schools (n= 276) Figure in parentheses are percentages

III. SUMMARY OF FINDINGS

The study revealed that:

- In terms of gender representation, there were more male participants than female
- there were more (100%) male HODs in the Northern Region compared to the other regions.
- There was higher percentage of female HOD in the Western Area (27.8%), followed by Southern Region (4.3%).
- For the teachers, most were male. The Northern Region had the highest percentage (98.0%), followed by the Southern Region (93.3%). Female representation was more in the Western Area (15.6%) followed by the Eastern Region (13.7%).
- For the pupils, it was observed that there was slight difference in terms of percentage of male and female representation in the Northern Region with(51.0%) male and (49.0%) female.There were more (52.0%) female, than the male (48.0%) representation in the Southern Region. In the Eastern Region there are almost equal percentages of male pupils to female pupils. The Western Area had higher percentage of male pupils (52.3%) compared to the other regions.
- The study revealed the qualification of integrated science teachers that majority 38.55% had HTC Secondary, followed by20.60% with B.Sc. Education.The study further revealed that 10.01% had HTC Primary and 6.15% had Diploma.These are academic qualifications that are not designed for the junior secondary schools. HTC Primary qualification is designed specifically for teachers of the primary schools.
- Teachers with HTC Secondary are the suitable qualified teachers to teach at the JSS and those with B.Sc. Education can teach at both levels (JSS and SSS).
- In terms of area of specialization the findings of the study revealed that ,31.38% had HTC in integrated science at the Northern Region,40% in the Southern Region, 13.73% in the Eastern Region and 18.75% in the Western Area. The findings further revealed that 5.89% and 9.81% respectively had B.Ed and B.Sc. Ed in the basic sciences in the Northern Region,6.67% and 8.89% respectively in the Southern Region,7.81% in the Eastern Region and 28.13% in the Western Area. The study revealed that a very good percentage of integrated science teachers of the survey are trained and qualified but they were not qualified in integrated science as a discipline, they were rather trained and qualified in other subjects.These are the teachers found in the junior secondary schools teaching integrated science.
- Interms of the educational background of pupils' parents, the study indicated that majority of the fathers, mothers and guardians of the pupils had primary, secondary and tertiary education with only few parents, 31.91% of the fathers, 38.63% of the mothers and 33.22% of the guardians did not go to school.
- A high proportion of the mothers participated in economic activities, by running small petty trading to augment their family income.
- The study showed that most integrated science classes are congested with over 50% of the pupils in class are between 60-69 pupils which according to the Education policy each class should have a pupil teacher ratio of 50: 1
- It was observed from the findings of the study that the main materials used by teachers in the classroom are textbooks, blackboard and chalk and blackboard illustrations. Only few schools 15.64% have laboratory and Library facilities in their schools. The few schools with laboratory facilities are used for general purposes and they are not equipped.
- The main method employed by the teachers in teaching of integrated science was dominated by question and answer, followed by the talk and chalk method.

The major factors that inhibit the effective teaching and learning of integrated science in the selected junior secondary schools include:

- lack of trained and qualified teachers teaching Integrated science
- wrong methodology in teaching Integrated Science
- the syllabus is not completed before the Basic Education Certificate Examination
- poor quality and unavailability of Integrated Science textbooks
- lack of laboratory facility
- lack of laboratory equipment
- mass promotion of pupils leading to class congestion or increase in class size
- lack of teaching/learning materials in Science
- lack of incentives for science teachers
- no time for Pupils for personal study
- time allocated for integrated science is not enough
- weak primary foundation in science
- students seriousness with school work
- bribery and corruption in admission and promotion of pupils.

IV. CONCLUSIONS AND RECOMMENDATIONS

The study concluded that: that there are much constrains/ challenges of integrated science teachers in the teaching and learning of integrated science at the JSS level in Sierra Leone. These challenges if not addressed will serve as impediment for the effective teaching/ learning of integrated science at the junior secondary schools in Sierra Leone. Based on this conclusion the following were recommended:

- More trained and qualified teachers should be employed in the schools by the Teaching Service Commission and

those teachers employed should have specialty qualification in integrated science.

- Government should build more schools in the district headquarter towns to reduce congestion in classes and should construct government schools in all the districts in the country, such schools should include either purely boys or purely girls or mixed sex schools. .
- Workshops, Seminars and Conferences should be organized for Integrated Science teachers since teachers need to be exposed to various methodologies, new teaching strategies, assessment methods and new developments in the teaching of Integrated Science.
- There is the need for the Sierra Leone government to provide adequate learning materials, laboratory equipment, textbooks for the different types of schools.
- Government should improve on the conditions of service of Integrated Science teachers by increasing their salaries, pay salaries on time and give allowances to teacher residing in the farthest rural settings
- The teaching periods for Integrated Science in the schools should be increased for both theory and practical at least one hour per period and four periods per week. This would allow teachers to teach every aspect of integrated science effectively.

REFERENCES

[1]. Adepoju, J.A(1991).Factors and problems in the Teaching and Learning of Mathematics in Nigeria Schools.Paper presented at the National Curriculum Conference Organized by the Federal Ministry of Education. Lagos.

[2]. Bajah, S.T. (1982). *Two Decades of Primary Science in Nigeria*. A Critical Evaluation 23rd Annual Conference Proceedings of Science Teachers Association of Nigeria.

[3]. Gallacher, T.N. (1988). *Effective Learning and Teaching* in Scottish Secondary Schools Mathematics, Education Project.

[4]. Gbamanja, S.P.T. (1992). *Teaching Integrated Science Effectively*, Pam Unique Publishers, Port Harcourt, Nigeria

[5]. Government of Sierra Leone (1994). *A Handbook for Junior Secondary Schools*. Freetown: The Government Printing Department

[6]. Government of Sierra Leone (1995). *New Education Policy for Sierra Leone*, Freetown. The Government Printing Department.

[7]. McMillan, J.H. and Schumacher.(2010).Research in Education Evidenced based inquiry.(7th Ed.).International Edition. Boston: Pearson Education Inc.

[8]. Njoku, Z.C. (2004). *Fostering the Application of Science Education Research* Finding in Nigerian Classrooms; Strategies and Need for Teachers Professional Development. 45th Annual Conference Procedures of STAN, 217 – 222.

[9]. Ogunbiyi, O. (2004). New challenges in the metholodiges of Teaching, A case of in-service programme for school teachers in Elaturoti, F and Babarinde K (eds) Teachers' Mandate on Education and Social Development in Nigeria

[10]. Ogwa, E.C. (2002). Effective Teaching Methods. Enugu. Cheston Press Ltd.

[11]. Opara, P.N. and Etukudo, D.U.(2014).Factors affecting teaching and learning of basic sciences and technology in primary schools.Journal of Education Policy and Entrepreneur Studies,1(1),46-58.

[12]. Tella, A.(2007).The impact of motivation on students' academic achievements and learning outcome in Mathematics among secondary school students in Nigeria.Euras Journal of Mathematics , Science and Technology Education.3(2), 144-156.

[13]. UNESCO – UNICEF, (1971). *Planning for Integrated Science Education in Africa*: Report of the Workshop for Science Education Programme Planners in English Speaking African Countries, Ibadan, Nigeria, September 20 – October 4, 1971. Paris: UNESCO – UNICEF

[14]. WAEC, (2018). *External Examiners Report on BECE Performance 2018*. Freetown.