EVALUATION OF BIOLOGY CURRICULUM IMPLEMENTATION IN PUBLIC SECONDARY SCHOOLS IN KADUNA METROPOLIS

BY

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DECLARATION

I here by declare that this thesis has been written by me in the Department of Education under the supervision of Dr. S.S Bichi and Dr. M. Ben Yunus. The work has not been presented in any previous application for a higher degree. All sources of publication and information are specifically acknowledged by means of references.

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ZAINAB ZUBAIRU **Signature** **Date**

DEDICATION

This research work is dedicated to my mother and my brothers namely; Musa, Bashir, Ibrahim (Imam), Abdullahi, Aminu. May Allah Subhanahu Wata'ala continue to give them wisdom, protection and direction towards the right path.

CERTIFICATION

This thesis entitled "**Evaluation of Implementation Of Biology Curriculum in Public Secondary Schools Within Kaduna Metropolis.**" Meets the regulation governing the award of degree of M.ED (Curriculum and Instruction) of Ahmadu Bello University and is approved for its contribution to knowledge and literary presentation.

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This study was carried out to evaluate the implementation of Biology Curriculum in public secondary schools in Kaduna metropolis. The target population was the S.S 11 Biology students and their teachers of selected schools in Kaduna metropolis. A sample of 21 Biology teachers and 142 Biology Students were selected using the stratified random sampling technique. The instruments used were BTQ with a reliability co- efficient of .66; questionnaires, checklist, and observation schedule Data from Biology Students and Teachers were collected and enclosed in relation to 4 Null hypotheses. Analysis of data collected shows that: Qualified Biology Teachers are inadequate in all the sampled schools. Evaluation of student's performance at end of every term shows little or no improvement after Biology instructions. Most physical facilities where available are grossly in adequate or not available at all. The smaller the class size the more adequate it is for proper implementation of the Biology Curriculum. Based on these findings recommendations were made, one of which is the sensitization of various stakeholders of secondary schools education in Kaduna State to ensure the provision of adequate facilities to schools and employment of qualified Biology Teachers for the effective implementation of the Biology Curriculum.

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OPERATIONAL DEFINITION OF TERMS

Educational Technology – Is a complex, integrated process involving people, procedures, ideas, devices and organization for analyzing problems and devising, implementing, evaluating and managing solutions to those problems involved in all aspects of human learning. AECT (1979).

Metropolis – A very large city, often the capital of a state or the urban city of a country.

Retention - To keep or continue to have the knowledge acquired or achieved through received Biology instruction.

Outdoor laboratory method – Is a method of teaching in which the teacher uses the natural environment like open field, farm land, rivers and so on in order to teach his students. This method of teaching tends to give to high rate of achievement and retention of learnt ecological concepts. Champagne A.B and Lovitts B.E (1989).

Indoor laboratory method - Is a method of teaching in which the teacher uses the conventional laboratory, to teach students. This method of teaching encourages abstract learning, low achievement and poor retention of learnt ecological concept. . Champagne A.B and Lovitts B.E (1989).

Flora – Plant life especially all the plants found in a particular country region, or time regarded as a group. Encarta (2007).

Fauna – Animal life in general. The animal life of a particular region or period, considered as a whole. Encarta (2007).

ABBREVIATIONS USED

ERC	-	Educational Resource Centre
WAEC	-	West African Examination Council
NPE	-	National Policy on Education
CESAC		Comparative Education Science Adaptive Centre
SSCE	-	Senior School Certificate Examination
ANOVA	-	Analysis of Variance
TSM	-	Teachers Service Manual
NERDC	-	Nigerian Educational Research and Development Council
NTI	-	National Teachers Institute
PGDE	-	Post Graduate Diploma in Education
STAN	-	Science Teachers Association of Nigeria
NBTE	-	National Board for Technical Education
NECO	-	National Examination Council
BSCS	-	Biological Science Curriculum Study
PTA	-	Parents Teachers Association
CIPP	-	Context, Input, Process and Product evaluation
NSSP	-	Nigerian Secondary Schools Project
BSNSS		Basic Science for Nigerian Secondary Schools
NISP	-	Nigerian Integrated Science Project

CHAPTER ONE

The Problem

1.1 Background of the Study

In the year 1960, Nigeria gained her political independence from Britain and this brought about national consciousness, awareness and increased interest in improving and expanding science, technology and mathematics education at all levels. The interest came as a result of the importance and indispensable role science and mathematics play on the technological advancement of any nation. Major development that occurred was good indicators of the interest and attention of Nigeria to science education. The Federal Government of Nigeria having observed that the secondary education system and its curriculum were more theoretical and certificate oriented and did not cater for students talent, ability and interest, called for a conference in Ibadan in 1969, with the aim of exploring other areas of diversification in the existing secondary school curriculum.

The introduction of National Policy on Education in 1977, revised in 1981, 1988 and 2004 made it necessary to develop a new curriculum in every subject. According to the National policy on Education, the aims of secondary education are to equip the students to live effectively in the modern age of science and technology.

To emphasize the importance of the sciences, the federal Government established Universities of Science and Technology across the country and the major admission requirement for the four programmes in these universities are credits in science subjects and mathematics. The National Board for technical education (NBTE) was also established by decree No. 9 of January 1977, in order to co-ordinate all aspects of technical and vocational education outside the universities, and make necessary recommendations for the fulfillment of the National Policy necessary for the development of Technical Education. The Ministry for Science and Technology was later created in 1988 in order to strengthen the government's commitment in popularizing science and technology.

The government's admission policy of 60:40 ratio for science and arts courses, in Nigerian universities was another development of post – independence period. Indeed science and mathematics teachers were awarded scholarships or paid bursaries or granted study leave with pay throughout their undergraduate programme. All these measures were taken to attract more students to science education and also to retain the few available science teachers in the classroom.

The last major event which occurred during this period involved a large number of curriculum innovations carried out in science education. In the forefront of these reforms were establishments of the following bodies;

(a) The Comparative Education Study and Adaptation Center (CESAC)
(b) The Nigerian Educational Research Council (NERC)
(c) The Science Teachers Association (STAN)
(d) The West African Examination Council (WAEC)
(e) The National Examination Council (NECO)

The science Teachers Association of Nigeria (STAN) in 1968 revised the science curriculum in secondary schools. The results of this singular effort were the revised WAEC syllabus in science subjects first introduced in 1974. This revised syllabus put more emphasis on the utilization of practical work as the basis for modern science teaching. After this, subsequent revision has been carried out on science syllabuses every five years.

Bajah (1985) observed that after the review of science syllabuses," there was a significant improvement on the science contents areas prescribed especially in the practical examination content where there was a shift from the use of foreign specimen to local species. Biology witnessed a determined effort on the part of WAEC to explore and use local fauna and flora".

A lot has been achieved during this era; unfortunately there has been an open gap between rhetoric and reality's promise and provision, investment and productivity particularly in science education. Bajah (1985).

One may not possibly realize the goals in Biology education, unless the problems contributing to the failure in Biology education are identified and attended to positively. Secondary schools play an important role in providing suitable preparations for further education because it provides the foundation stages. The state of science and technology at secondary school level is an important determinant of quality and quantity of intake into tertiary level whose foundation must be laid foe developing scientific and technological manpower.

In teaching and learning Biology therefore, emphasis should not only be placed on the knowledge acquisition of the subject in order to pass examination as a pre-requisite for further studies but also to be occupationally useful in the modern society. Most chemical warfare (biological warfare), vaccines, agriculture, cloning, drugs, environmental safety, test tube babies, transplant among others arise from the study of Biology.

According to the National Policy on Education (2004) the objectives of the Nigerian Biology Curriculum are to prepare the students to acquire:

1. Adequate laboratory and field skills in Biology;
2. Meaningful and relevant knowledge in Biology;
3. Ability to apply scientific knowledge to everyday life matters of personal and community Health and Agriculture;
4. Reasonable and functional scientific attitudes.

The Biology Curriculum recognizes the utilization of discovery approach in the teaching of Biology topics. This involves demonstration, individual practical works, group discussion, fieldwork, project work and building models. Topics of importance for the promotion of our communities were provided by the curriculum developers. These include ecological studies and principles applied ecology, man and microbes, public health and personal hygiene.

Being scientific literate cannot be define as having the ability to remember scientific facts, scientific literacy involves more than that. It means that our students will not only understand important concepts in science, but also be able to apply what they know to the health, safety and environmental issues that are at the center of our every day lives.

Science assessment play a critical role in determining whether our students are mastering the science knowledge and skills they need in order to be scientifically literate and academically successful or not. The judgments is based on many things such as the teachers, school facilities etc. an understanding of science will help the children to be better informed and more capable of making decisions that will affect their lives and environment.

Literature search shows that many factors affect proper implementation of science curriculum. For instance empirical studies on class size by smith and glass (1978).

published a Meta analysis combining the results of 77 empirical studies pertaining to the relationship between class size and achievement and soon followed it with a second Meta – analysis analyzing the relationship between class size and other outcomes. Overall they found out that small classes were associated with higher achievements. In their second study they concluded that small classes were superior in terms of students' reactions, teacher morale, and the quality of the instructional environment The National policy on Education (2004) recommends a class size of 40 to be optimum in the Nigerian context. In this study, class size was also investigated in relation to curriculum evaluation in Biology in Kaduna Metropolis.

Availability of instructional materials is another factor that is important in curriculum implementation. Adequate provision of teaching materials is known to affect student's achievement. This study investigated the effect of availability or lack of it on academic achievement of students in Biology in Kaduna state public secondary school in Kaduna metropolis.

Teachers' qualification is known to affect students performance in many instances, the general trend is that the higher the qualification of a teacher the better the performance of students. This study investigated the influence of teacher qualification on student's achievement and curriculum implementation.

Retention is the ability to retain and remember what is learned or experienced by an individual. It takes place when learning is coded into memory. Several factors are known to influence retention. The study investigated retention of learned materials in relation to curriculum implementation in public secondary schools in Kaduna state.

1.2 Statement of the problem

There is a growing anxiety recently by the Kaduna state stake holders of secondary education about the standard of science education in its secondary schools. There has been a steady increase in the no of students who sit for WAEC examination in Biology yearly in Kaduna state but not much progress has been recorded. Table 1.2 shows the enrolment and result of Biology Students in Kaduna state in WAEC between 2003-2006.

Table 1.2 **Enrolment and Results of Kaduna State Biology Students in WAEC Examination between 2003-2006.**

Year	No of registered candidate	No of distinction / credit	No of D7	No of F9	No with 0%	No of absentees
2003	18,636	731	804	1720	782	844
2004	35,321	926	913	1618	741	902
2005	3759	1340	1201	1384	370	736
2006	4431	1834	1333	1215	361	981

Over the years Kaduna State government undertook several measures on its secondary schools to ensure effective implementation of the curriculum in general. In 1985 the book policy was launched, in 1987 some schools were selected to serve as models of academic excellence, equipping the science laboratories, technical workshops and home economics laboratories. Latitude was also given to the Secondary School Principals in Kaduna state to spend money realize from school fees to improve on their facilities and to boost the morale

of their staff without the interference of the Ministry of Education in order to develop positive attitudes and better academic performance. (Gambo 2005; Halidu 2005; Mohammed 2005).

When after all efforts by the Kaduna state proves abortive, the reasons for the poor performance of the secondary schools especially in the science subjects including mathematics was largely blamed on the science teachers. The science teachers were accused of lack of commitment to duty not qualified enough teachers to teach science subjects, going to work late, laziness and involved in an unhealthy relationship with students of opposite sex. (Gambo 2005; Halidu 2005; Mohammed 2005) in Rikichi (2009). Little consideration was given to the environment which they operate. Whether the environment is adequate for the proper implementation of the science curriculum, whether sufficient and adequate instructional material for the science teachers to use, whether the prescribed standards whether or not were met in the implementation of the science curriculum.

Consideration was also not given whether the State Government, the school administration respond to quick supply of chemicals and specimen for the proper conduct of Biology practical.

It was this reason that the study investigated into how Biology curriculum is being implemented in public secondary schools in Kaduna metropolis with a view to determining the extent to which physical facilities, human resources, instructional resources and the way the Biology curriculum implemented had been in agreement with the set standards of the National implementation policy. It is glaring that the attainment of Biology education objectives and performance in the external examinations will only be possible if Biology curriculum is fully and well implemented. A lot of efforts and measures put in place by the stake holders of Kaduna state secondary education has not achieved the desired objectives.

This study investigated all the issues listed above from the literature.

1.3 Objectives of the Study

The objectives of the study centered on the evaluation of Biology Curriculum implementation. Specifically, the study intends to:

1. to ascertain the qualification and preparedness of the biology teachers in Kaduna metropolis;
2. to ascertain whether there is remarkable improvement in Biology Students performance at the end of every instruction.
3. to ascertain effective utilization of instructional materials in teaching and learning Biology in the study area;
4. to ascertain the classroom size of the Biology teachers in the metropolis;

1.4 Research Questions

These questions are raised to guide the study and were answered in the course of the investigation;

1. What is the effect of Teachers qualification on the proper implementation of Biology curriculum in Kaduna metropolis?

2. Is there remarkable improvement from the Biology Students after each Biology Instruction?

3. What is the effect of adequate supply or otherwise of instructional materials on the implementation of Biology curriculum in Kaduna metropolis?

4. What is the effect of class size on the proper implementation of Biology curriculum in Kaduna metropolis?

1.5 Null hypotheses

The following null hypotheses were formulated;

Ho_1: Teachers qualification has no significant effect on the proper implementation of Biology curriculum in Kaduna metropolis.

Ho_2: There is remarkable improvement by the Biology Student at the end of every Biology instruction received.

Ho_3: The effect of adequate supply or otherwise of instructional materials has no significant impact on the proper implementation of Biology curriculum in Kaduna metropolis.

Ho_4: Class size has no significant effect on the proper implementation of the Biology Curriculum in Kaduna metropolis.

1.6 Significance of the Study

Over the years stakeholders of secondary education in Kaduna state has been concerned the poor academic performance of its students especially in science subjects. This study is therefore significant because it provides an empirical understanding of the reason despite different approaches and techniques to reinvigorate secondary education in Kaduna state has not been achieved. This will serve as a reference material for effecting reforms in the implementation of Biology curriculum in Kaduna state.

The findings from the study will help the Biology teachers and students, national, educational organization and curricular developers towards improving of teaching and learning of Biology.

The findings will also help in the school academic planning; will also serve as a guide to educational policy makers and planners at the planning level. It will also guide in the selection of Biology curricular content and learning experiences to be selected and also the methodology of implementation.

The findings of the study would contribute to the improvement of Biology instruction in Kaduna public secondary schools and the nation in general.

It shall serve as a motivator to the students by channeling them towards the right direction, to see Biology in the proper perspective and study it with appreciation and recognition of its utilitative nature to the students in particular and the society in general.

1.7 Scope/Delimitation of the Study

The study is limited to only senior secondary schools in Kaduna metropolis of Kaduna state. It only involved the students offering Biology in SS II and the Biology teachers. The choice of SS II students is guided by the fact that these categories of students are relatively stable and well exposed to the Biology curriculum. The evaluation of the implementation of the curriculum at the school level is best done with SS II. The evaluation at this level is more justifiable. The SS I students are avoided because they are neither fully exposed to the Biology Curriculum nor settled down, while the SS III students are avoided because they are preparing for their SSCE examination.

CHAPTER TWO

Review of Related Literature

2.1 Introduction

This study evaluates the implementation of Biology Curriculum in public secondary schools in Kaduna metropolis. Specifically this chapter is presented under the following sub headings: Theoretical frame work. History of science education in Nigeria. Secondary education in Nigeria. The Biological science curriculum study (BSCS). The Biological science curriculum in Nigeria. Curriculum implementation. Teachers as implementers of Biology Curriculum. The role of the Ministry of Education in the implementation of Biology Curriculum. Supervisory role in the implementation of Biology Curriculum. Activity/child centered curriculum. Teaching method in Biology Curriculum implementation. Role of curriculum materials in Biology curriculum implementation. Instructional strategy and students retention. Instructional design. Quality and Quantity of Teachers. Empirical study and Summary

2.2 Theoretical frame work

The theoretical frame work of this study is Griddle's Model of Policy Implementation. Griddle's model elucidate on how content and contextual variables intervene in the implementation process. The model claims that implementation of a policy is influenced by the interest affected by the policy; to an extent that the policy implementation seeks to introduce change such as political and economic relations. Those whose interests are threatened by such policy oppose it, and those who stand to gain, support it.

According to Garba (1996:100:102), models of curriculum implementation include the center periphery model proliferation of center model, and shifting center model. The center periphery model is said to be centralized model where implementation of the curriculum or change is centrally controlled, resources are centrally acquired and controlled and from there they are distributed to the points of consumptions. It's hinged on effective communication, availability of many experts, materials and training facilities.

The proliferation center model advocates a system whereby several centers with equal powers are established with each controlling a number of secondary centers. Secondary centers are answerable to their own primary centers. This model gave advantage of giving room for individual differences and adaptation of implementation to the peculiarities of environment.

The shifting centre model is that in which implementation is carried out in one area at a time before trying it in any other place. This implies that the resources are concentrated on only the area of concern at a given point in time.

The purpose of this study is aimed at improving the standard of Biology education in public secondary schools in Kaduna metropolis. The model provide a general frame for this study which is evaluating the implementation of Biology Curriculum in Public Secondary School in Kaduna Metropolis. The Model considered the major indices of curriculum implementation, for example the model hinged the importance of contents, effective communication, availability of many experts, provision of adequate materials/equipment, the students and their individual differences, the stake holders and even the environment among others for effective implementation.

Curriculum

These two implementation perspective have dominated contemporary curriculum text books. Curriculum implementation as fidelity of study should relinquish the notion of the fidelity perspective and should create a new constellation where the role of the teacher can be realistically constructed in light of whose authority is of most important within the classroom.

The text describes three paradigms, positivism, post positivism, and constructivism in order to compare and contrast the basic assumption of each perspective. The paper examines in detail the enactment perspective in order to discover an alternative method of professional development, claiming that the teacher – as – member – of – classroom – community is likely to provide both the teacher and the students with enhanced educational growth.

Iglesia's Model of Implementation

This model views implementation process as a function of the administrative capacity of the implementing agency. Algasia's concern is with administrative implication of implementing a policy i.e planning and management of resources, organizational arrangement and not with the desirability of the programme. The model isolates and identifies those factors that enhance administrative capacity of an agency to implement policies and as well as overcome those factors that could impede. The critical inputs identified include:

(a) Resources which include human (personnel) and non human (funds, physical plants and equipments, materials and components)
(b) Structures – e.g. Stable organizational roles and relationships which are relevant to the programme, prescribed legally, informally, or both.
(c) Technology – the technical skills required to implement the policy such as planning, organization, control budgeting etc.

(d) Support – the actual or potential roles and behaviors of persons and entities which tend to promote attainment of the policy goals e.g. ability to mobilize resources.

The model emphasizes on strengthening and building institutional capacity for services delivery at federal, state and local levels, developing leadership capacity and human resources for programme implementation.

2.3 History of Science Curriculum in Nigeria.

Although it is not certain when science teaching was introduced in Nigeria, the genesis of science teaching could be traced back to 1859 when the rudiments of science were first introduced following the establishment of missionary secondary schools in Lagos (Omale 1977).

Abdullahi (1982) claimed that the foundations for science teaching were led in Nigeria between 1861 and 1897 when rudiments of science were introduced in the time table of some missionary secondary schools and the teacher training colleges notable among these institutions were the C M S Grammar school Lagos, C M S girls school Lagos, St. Gregory's college Lagos opened by Roman Catholic mission in 1876, Methodist high school Lagos, Baptist Boys High school and St. Andres college Oyo (a teacher training institution established by church missionary society in 1876). Waddell Institute Calabar opened in 1861, the

Baptist training college Ogbomosho opened in 1899 and Wesleyan training institute founded in 1905. These two had science curriculum In their programmes.

Abdullahi said that many schools were established during this period. The school time-table of these schools showed the inclusion of such subjects as botany, nature study, physiology and natural philosophy. (Missionary schools in Nigeria).

Unfortunately the number of students offering sciences at that time and the extent to which science was taught in these schools remain unclear.

Bajah (1982) claimed that the rudiments of science as of that time was nature study that involved the teaching to pupils to learn about the environment in form of outdoor observation of plants, animals, and non-living things" some facts that emerged with regards to the teaching of science during this period include:

a. Lack of science laboratories.
b. Lack of qualified science teachers

c. Lack of interest or enthusiasm shown by colonial government in Nigeria towards encouraging and supporting the efforts of the missionaries
d. Lack of instructional objectives in science teaching
e. Lack of funds to promote science textbooks
f. Lack of any uniform curriculum in science

The period 1883 – 1930 marked the beginning of colonial government participation in the development of secondary education.

An educational ordinance was passed in 1908 which among other things stipulated certain conditions for government grants to missionary schools. With these grants some of the missionary schools were able to acquire some sort of science equipment for laboratory instruction (acquire in 1871). The king's school established in 1909 was the first to have a chemistry laboratory in the country. Abdullahi (1982).

Taiwo (1975) said king school remained for many years the only school consistently offered science to the standard of Cambridge university senior local examination.

Omolewa (1977) reported that science Education was by no means popular in schools during this period as only very few students offered science subjects at external examinations. For example he reported that in 1930 only seven candidates sat for Guilds of London only. Institute examination (for technological) in Nigeria, which further demonstrated the poor state of Science Education in Nigeria.

Many more missionary schools were established during this era in Lagos and southern parts of the country. The establishment of many more schools, the teaching of science spread mostly in the southern part of the country.

Omolewa reported that an attempt to open such missionary schools in the northern parts of the country met with stiff opposition because of the religious intolerance of Muslims, although few schools existed during this period in the north, but the colonial Government was most reluctant to start the teaching of science due to the fact that teaching Biology might offend Muslim susceptibilities.

In 1883 – 1930 the pace of development of science education in Nigeria was retarded to some extent by the following factors:
(a) The uncooperative attitude and reluctance of both the colonial Government and the missionaries to allow Nigerians form learning science as they both believed that Africans in general were biologically inferior and incapable of learning sciences.
(b) Inadequate financing of science education.
(c) Insufficient time devoted to science teaching on the school time table

(d) Lack of suitably qualified teachers
(e) Absence of science textbooks in schools.
(f) Lack of laboratory facilities and science equipment in schools.

At the end of 1930, African Education Commission was set up in 1920 sponsored by West African colonies. The commission expressed complete dissatisfaction with the extent and level of science teaching in Nigerian schools and therefore directed that science subjects be included in the curriculum of all secondary schools.

Bajah (1982) said, in 1920 Nature study was beginning to decline Nature study had become popular subject in teacher training colleges and in some primary schools.

The concepts of general science as a subject which had its historical root from Britain had started to gain recognition in secondary schools. According to Abdullahi (1982) the general course was design to meet the following objectives:

(1) As a means not merely of giving the child a lot of scientific information, but also of developing in him certain attitudes and skills such as accurate observations, logical reasoning, and desire to experiment.
(2) General science deals with every day application of science.
(3) General science shows the unity of science rather than the compartmentalization of science into separate discipline such as physics, chemistry and Biology

In 1982 school certificate examination was introduced in Nigeria with Oxford and Cambridge boards serving as moderators. Hence secondary schools in Nigeria began to adopt syllabus for English high schools in teaching of sciences.

Science education was not popular before 1931, very few students offered sciences at external examinations, while those who even attempted it failed. In 1932 the colonial established the Yaba college, upgraded it in 1963 to be known as Yaba college of Technology, with the objectives of providing well qualified assistants in medical, engineering and other vocations and also to provide teachers to teach basic science subjects in secondary schools. The college at its inception offered degree – courses studies, survey, veterinary sciences and teacher training to fill specific vacancies in relevant Governments departments.

It operated on four year programme leading to award of master's, degree, diploma in sciences and mathematics and other subjects' areas. The first graduate from Yaba College went to secondary school to teach science and laid foundation for the development of an appropriate curriculum in science for the secondary schools.

1931 – 1959 local communities were more involved in spreading science Education in Nigeria as individuals, groups, communities and tribal unions by establishing more secondary schools. Prominent amongst were professor Eyo Ita, professor Oyerinde N.D, Chief Daniel Henshaw Rev. O.O Offing and Alvan Ikoku, formed National Education movement.

They later opened secondary schools which were technically orientated with much emphasis on training in trades such as printing, carpentry, tailoring and bakery; such schools were opened in lagos, Calabar, Aba, port – Harcourt, Ikot – Ekpene and Arochukwu, Eke (1982). Aggrey Memorial College was established in 1933 by Alvan Ikoku.

Enitonna High School was also established in 1932 by Rev. Patts – Johnsons, Ibadan Boys High school Ibadan, established in 1938 by oyesina.

The enactment of 1948 Education ordinance further promoted the teaching of science. Education policy and practice in Nigeria was first published during this period. the primary purpose of the ordinance was put into effect the Educational provisions of the 1947 constitution of Nigeria which divided the country into three regional administrative units.

Adesina (1988) said the ordinance contained the following significant features.

1. Appointment of Director of Education for Nigeria.
2. Appointment of Deputy Director of Education for the regions.
3. Establishment of a central Board of Education for Nigeria
4. Establishment of regional Boards I Education and a central colony
5. Establishment of Native Authority and Government Schools.
6. Registration of Teachers
7. Regulations for school inspections
8. Grants – in Aid Regulations
9. Tuition fees.

The Elliot commission in 1943 recommended inter alia that there should be a university in Nigeria. University college of Ibadan as an outpost of the University of London was established. Over hundred and twenty one students were admitted to study sciences in 1962 the university terminated its fourteen years of apprenticeship with university of London and thereafter started awarding its own degree.

The introduction of higher school certificate (ITCS) course in 1951 afforded many students the opportunity to further study physics, chemistry and Biology at higher level with emphasis being on laboratory work so as to meet the practical requirements of the science subjects.

In 1950 the Jeffery Report set up by British Government suggested that setting of examination board. In 1952 the West African Examination Council (WAEC) was set up with headquarters in Accra and with Nigeria Ghana, Sierra Leone and Gambia as member nations. This body later influenced to a greater extent the introduction of science curriculum in schools.

In attempt to popularize science by the science teachers, resulted in the formation of the Science Teachers Association (STAN) which was inaugurated on the 30th November 1957. STAN (1973) pointed out that its aims were to promote the spirit of co-operation among Science Teachers in the country.

In order to promote to science teaching and in helping more students learn sciences was the establishment of Federal colleges of Arts, science and Technology at Ibadan in 1950, Zaria in1952, and Enugu 1954. The special honorable nesses of these colleges were that they administered a fairly comprehensive curriculum in science education and science related fields such as Engineering, pharmacy and architecture. Two of these colleges metamorphosed into Ahmadu Bello University Zaria and University of Nigeria Nsukka. However all colleges of science and Technology seize to exist by 1962 when their assets were taken by the new Universities. To promote science education, Federal School of Science located at Lagos was established 1958. The school specialized in offering both basic science for those who intended to sit for ordinary and advanced GCE, and those who intended to start learning sciences for the first time.

The science curriculum existing in the Nigerian secondary schools prior to and after independence in 1960 was traditionally oriented both in outlook and practice. The content did not provide enough learning experiences for the students even become useful to the society. The syllabus was characterized by the topical approach in the structure of the content. Science was then presented as “bits” and “pieces” of information with no conceptual relationships. The method of teaching science the was the teacher directed lecture method with little or no demonstration or experiments by teachers to enable their students comprehend and enjoy what was being taught Evaluation of subjects was nothing more than the recall facts.

The first in the series of curriculum innovations in science at secondary school level came as a product of multi – agencies approach and the result of an urgent response to the new 3-3 system of secondary education. Participants in this major curriculum development were STAN, WAEC, NERC and CESAC. Efforts made in this direction resulted in the following science curriculum projects undertaken at the secondary school level and at different periods of time.

Ivowi (1978) highlighted some of the defects which characterized Nigerian science curricula at the time thus:

1. They did not meet the needs of the society which the schools served
2. The emphasis was placed on passing examinations
3. The contents were designed to satisfy requirements for further studies.
4. Learning was accomplished by recitation of facts all the time.
5. The Basic Science for Nigerian Secondary Schools (BNSS)
5. The Nigerian Integrated Science Project (NISP)
6. The Nigerian Secondary Schools project (NSSP)
7. The National Science Curriculum for Senior Secondary Schools.

2.4 Secondary School Education in Nigeria

Secondary school education has increasingly become a central policy concern of Nigeria and other developing countries among those that have rapid progress in universalizing primary education , and those in which demographic transition has shifted towards adolescents, Nigerian Educational system is grappling with the challenge of how to either provide skills and knowledge to enable the young people to move to tertiary education, or ensure a smooth transition to work for students whose secondary education is terminal (Holsinger and cowell 2000).

Secondary education also addresses proterms of unique human development, without requisite education to guide their development not only would young people be ill prepared for tertiary education, or work place, but would also be susceptible to risk – taking behaviors and associated outcomes. It is evident therefore that the challenge of secondary education is enormous.

At secondary school level, science must be more than the memorization of facts; secondary school science curriculum is designed to build essential skills and knowledge that the students will need to be scientifically literate citizens.

Students should be provided with multiple opportunities to experience science directly their by giving them tools and skills necessary to understand the methods scientist used to investigate the world. Secondary school students must be able to examine concrete examples of science phenomena in order to understand and apply abstract science concepts. It is important that educators teach the entire science curriculum so that students can develop a complete understanding of critical science concepts. In 1964, a conference was called for in Lagos with the aim of exploring other areas of diversification in the existing secondary school curriculum. Many decisions were identified which include the 6-3-3-4 system of education with much emphasis on science and technology.

The 6-3-3-4 system has the two tiers of secondary education comprising 3 years each junior and secondary school education. The focus of this study is on the second tier of the 6-3-3-4 system (senior secondary school).

The National policy on education has made provision for the curriculum of the senior secondary education in diversified nature to cater for the differences in talents, opportunities, development of thinking skills and roles possessed by or opened to the students after secondary school course.
According to NPE (2004) the broad goals of secondary education is to prepare the individual for; (a) useful living within the society: and (b) higher education.

In specific terms secondary shall provide trained manpower in the applied sciences technology and commerce at sub – professional grades inspire students with a desire for self improvement and achievement of excellence. Foster national unity with an emphasis on the communities that unite us in our diversity. Raise generation of people who can think for themselves, respect the views and feelings of others, and respect the dignity of labor, appreciate those valves specified under our broad national goals and live as good citizens and also provide technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development.

The secondary Education in Nigeria is currently under threat as a result of negative societal trends. Most private secondary school and even some public schools are used for commercial purposes. Students are no longer committed to secondary education because they believe in acquiring those credits with help funds.

The current post joint admission and matriculation exams carried out by most universities identify such candidates. Most parents frowned at discipline steps taken to correct their children and inculcate moral values into them, some of this offences include irregular class attendance, exams malpractice, failure to do their home work and imposition (hiring somebody to write exams for another person) this has great effect on the implementation of the Biology curriculum.

2.5 The Biological Science Curriculum Study (BSCS)

When the American Institute of Biological Science (AIBS) became an independent organization in 1955, the first standing committee established was on education and professional recruitment. This action reflected the continuing concern of Biological

Scientist and AIBS Governing Board with education in the life sciences. The charge to the committee was to develop a vigorous programme of education at all levels which would become the basic policy of the institute: Dr Oswald Tippo of Yale University was the chairman of the committee from its establishment. Committee membership has been drawn from persons interested in Biological education in universities and preparatory schools.

After an initial grant of £143,000 was made to the AIBS by the National science foundation a biological science curriculum was established with Arnold B. Grabman as the director of the study. Headquarters for the Biological science curriculum study were established in the Biology building of the University of Colorado in Boulder.

The Biological science curriculum study programme began in 1959 and considerable debate about the approaches to be taken in teaching of Biology. How should it be molecular, organismal, developmental or ecological? Should the curriculum include one textbook or several? How much and what kind of attention should be given to laboratory work? All these were as a result of the challenges posed on America by the defunct socialist Soviet Union Republic (USSR) with the launching of the sputnik 1 in 1957.

2.5.1 Objectives of the Biological Science Curriculum Study Programme (BSCS)

It is the responsibility of schools at every level to impart to students an understanding of the sciences which become a part of their thinking and their philosophy.

The basic science taught in schools should include Biology in proper perspective so that everyone will be able to count among his philosophical resources an understanding of evolution of genetics of every energy relationship and what makes a sputnik go.

The objectives of the Biological science curriculum study as outlined by Sohwab (1963)

1. An understanding of Man's own place in the science of nature as living organism that has much in common with all living organism.
2. An understanding of man's body, its structure and function
3. An understanding of diversity of life and of the interactions of creatures.
4. An understanding of the Biological basis of many problems and procedures in medicine, public health, agriculture and conservation.
5. An appreciation of the beauty. Drama and tragedy of living world
6. An understanding of what man presently knows and believes regarding the basic sociological problems of evolution development and inheritance.
7. An understanding of the nature of scientific inquiry.

2.5.2 C**ontents of the Biological Science Curriculum Study.**

The contents of the Biological Science Curriculum Study (BSCS) were presented in the form of themes. Evolution became one of the major themes and central among the other themes, which were particularly related to evolution. The position of the Biological Science Curriculum Study (BSCS) on the importance of evolution in teaching Biology was started first 1963 and second 1970 edition of the Biology teachers hand book. It is impossible to give a complete account of living things without the story of evolution. Many of the characteristics of living things are products of evolutionary process.

These themes were identified and were in the several approaches and different materials developed by the Biological Science Curriculum Study during the past twelve years. The themes are:

- Change of living things through time and evolution
- Diversity of type and unity of pattern in living things
- The genetic continuity of life
- The complementarily of organism and environment
- The Biological roots of Behavior
- The complementarily of structure and functions.
- Regulations and homeostasis; preservation of life in the face of change.
- Science as inquiry
- The history of Biological conceptions.

2.5.3 **Achievements of the Biological Science Curriculum Study Programme (BSCS)**

In Nigeria, both secondary and post secondary schools the number of students offering Biology has out numbered those offering other science subjects like chemistry and physics. Biological science curriculum study programmes (BSCS) have helped replaced vote memorization as a traditional goal of learning with an emphasis on thoughtful inquiry and decision making.

That student learns best by being actively engaged with subject matter rather than listening passively to a teachers lecture. The Biological Science Curriculum (BSCS) uses an instructional model characterized by the SEs, Engage, Explore, Explain, Elaborate and Evaluate. The approach encourages students to view science as an ongoing, relevant process of learning as well as a body of currently available information and theories. Students also appreciate nature of science and its impact on their lives.

The success of the programme lies on the fact that the teachers were involved in the theoretical as well as practical aspect of the students learning inform of supervision. There were many laboratory activities. The programme was student centered.

2.5.4 Problems/Challenges of BSCS Programmes

The language of the curriculum being English a foreign and not indigenous language to Nigerians, has made it difficult for learners to understand the Biological Science and express themselves properly.

The Biological Science Curriculum study is activity orientated it is capital intensive and it has not been easy for Nigeria / Nigerians to cope with the needs and realizations BSCS.

In Nigeria the teaching profession is not a respected and uncreative one especially at the primary and secondary level and those that are trained prefer to join other creative profession and so teachers who taught to be drivers of the curriculum are not available.
For the past 10 years in Nigeria Universities have been in and out of strikes due to fund issues between workers and Government. And this has resulted often a time to rushing through syllabus in order to cover up and Students in ability to carrying out all activities as they are taught.

Another challenge faced by the BSCS is the ever growing class size and inefficient facility making objectives of Biological Science Curriculum Study nearly impossible to be achieved.

The BSCS programme is a significant and intellectual activity in the interest of many nations which Nigeria is inclusive. It is an exciting challenge in recommending what curricular in the Biological science should be and resist all attempts to influence the BSCS materials in ways that portray non scientific explanations of life on earth.

At fifty years the BSCS still remain committed to the accurate and through representation of evolution as the conceptual keystone to our understanding of life on earth.

2.5.5 Biological Science Curriculum in Nigeria

Modern Biology thrives on casual chains that permit the understanding of physiological evolutionary process in terms of physical activities entities such as molecules, cells and organisms. Spiritual divine forces were accepted as both and necessary until the end of the 18^{th} century.

The objectives of the Biology Curriculum are to prepare pupils to acquire:

1. Adequate laboratory and field skills in Biology
2. Meaningful and relevant knowledge in Biology
3. Ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture.
4. Reasonable and functional scientific attitudes apart from the general objectives, an array of performance objectives are easily measurable. Jenkins (1981) stated that curriculum is one of the educational fields that is taken as problematic. What should be planned, taught and learned in schools. For Jenkins, it is a central and centralizing study organized around the choice facing the practitioner.

The Biology curriculum also recommended the use of the guided discovery approach which involves the use of various activities such as demonstration, individual practical, group discussions, field work, project work, and building models. Odunusi (1993) said the content of the Biology curriculum consist of thirty major topics focused mainly on seven concepts in Biology;

1. concept of living
2. Basic ecological concepts
3. Plants and animal nutrition
4. Conservation of matter/energy
5. Variations and variability
6. Evolution
7. Genetics.

The aims and objectives of the Biology Curriculum syllabus derive from the National policy on education (1971, 1981) and specifically they are aimed at evaluating the students;

2. Mastery of the structures and functions of living organisms.
3. Appreciation of nature and the need for its conservation
4. Acquisition of adequate laboratory and field skills in Biology necessary to carry out and evaluate experiments and project in Biology;
5. Ability to observe, classify and interpret Biological data (the scientific skills);
6. Acquisition of meaningful and relevant knowledge in Biology as a pre requisite for pursuit of careers in Biological Sciences and related disciplines;
7. Acquisition of acceptable scientific attitudes for problem solving and
8. Ability to apply Biological knowledge/thoughts to every day life in matters of personal, social, economic. Environmental and community health.

These concepts/topics are sequenced spirally into instructional units, such that each unit is treated in great depth for each successive year. The curriculum developers also provided topics that are of direct relevance to the community. These include ecological studies and principles applied ecology, man and microbes including public health and personal hygiene. Smith (1950) says a curriculum is always in every society, a reflection of what the people think, feel believe and do.

2.6 Curriculum Implementation

In Aku (2005) refers to implementation as a process of converting inputs (financial, institutional material, technical, human resources e t c) into outputs (good and services). It involves translating goals and objectives of a policy into concrete achievements through execution of various programmes. (Lithwood 1982).

Ben-yunus (2001) said curriculum implementation is the actualization of curriculum plans. It is the actualization of what has been planned. Buoro (2000) said implementation involves putting curriculum to work, considering the process necessary to accomplish the predicted behavioral outcome in the learner. Hawes (1982) in Buoro (2000) sees curriculum implementation as part of the process which involves determining whether the school has or has not received the recommended materials, determining whether it was being used, and assessing teachers and students attitudes and understanding in relation to the desired outcomes. Curriculum implementation is very crucial for any curriculum. Adeshina (1981) in usher (1994:37) as cited in Buoro (2000:30) observes that:

> *Implementation is the Achilles of educational planning. Even when a plan is rational, comprehensive and coherent, its implementation may well be partial, slow and inefficient and result may even be inferior to what has been expected in the absence of a plan.*

It means that good curriculum without good implementation will not yield the desired results. For any curriculum to be effectively implemented certain principles must be observed, certain things must be put in place.

Beauchamp (1968) and Dare (1986) said these includes a good school and classroom environment, development of instructional strategies to communicate, good planning of lessons and organization of inductive courses and provisions of all the necessary publications and materials for effective implementation. Looking at the issue from a broader perspective, Sofolahan (1987:54) observed that the following factors influence curriculum implementation;

a) physical plan – the adequacy of workshops and equipments in laboratories, studios, libraries, classroom etc

b) Population – in schools population which results in extra large and over crowded classes.

c) Number and quality of teachers to implement the curriculum

d) The task of curriculum implementation as further noted by Beauchamp (1968:60) and Dare (1986:112) included;

- Arrangement of the school environment using curriculum as a point of departure or (guide)
- Teachers need to develop their instructional strategies to communicate the content of the curriculum to the students.
- Strategies for curriculum planning and successful implementation which should seek behavioural outcomes, which can only be brought to lights through teaching/ learning activities
- Head Teachers need to organize induction courses for their teachers on the best way to approach the implementation of the courses.
- All already prepared publications, materials, e t c which should be made available to teachers to enhance successful implementation.
- All Teachers need to undergo a full seminar or workshops on the techniques of continuous assessment for its effective use in classes.
- Teachers need to communicate frequently with the curriculum development sections of the ministry of education on details of implementation.

Based on the contribution of Beauchamp (1968),Dare (1986) and Sofolahan (1987) showed that effective curriculum implementation requires good school and classroom environment, qualified teachers, the use of appropriate school and classroom population, relevant equipment and instructional materials, the right type of communication and relationships between teachers and students and in – house training for teachers.

2.6.1 Context, Input, Process and Product of Evaluation Model.

The CIPP model of Stufflebean Guba and their associates (1971, 2003), defines evaluation as the process of delineating, obtaining, reporting and applying descriptive and judgmental information about merit, objects, probity and importance in order to guide decision making, accountability, disseminate effective practices and increase understanding of the phenomena involved. These evaluations emphasize the systematic provision of information for programme management and operation. It connotes context, input, and process and product evaluation. The four types of evaluation provide relevant information for four different types of decisions.

The model required planning (a) decisions to design objectives, (b) structuring decisions to design structural procedures (c) implementation decisions to use monitor and improve these procedures. (d) the final stage of this model is the recycling decisions to judge and react to the outcomes produced by those procedures. (Awotunde and Ogundulunwa 2004:153) and Bhola in Ughmadu (1992:97). It was recommended that for each of those different types of decision, a corresponding type of evaluation be sued from among the content, input process and product evaluations preceded above.

The four decisions are vital in the evaluation of the implementation of biology curriculum in Kaduna state public secondary schools within Kaduna metropolis which target all aspects of the curriculum that is planning, structuring, implementation and feedback.

The CIPP model recommends that for each type of decision, there should be a corresponding type of evaluation to be used from the context, input, process and product of evaluation.

Context Evaluation – This type of evaluation defines the relevant environment, describes the desired and real conditions pertaining to the environment. It also identifies needs that are not met; opportunities not utilized, and identity those problems that prevent the achievement of desired goals and opportunities not actualized. Context evaluation is descriptive and comparative.

Input Evaluation – This type of evaluation provide information on how to utilize available and minimal resources to achieve the desired set objectives of a program. The resources include both human and material resources. It also involves the nature of available capabilities of the program.

- The potential strategies foe achieving the desired goal objectives for the designed program which were identified through context evaluation.
- Design for implementing a selected strategy.

Popham (1975) said that input evaluation assist decision makers to select, and design procedures considered suitable for promoting achievement of programme objectives. The success in the implementation of Biology curriculum in Kaduna public secondary schools can be attained by applying input evaluation methods because it seeks to promote, improve program inputs, procedures in order to sustain the program.

Process evaluation – it provides feed back to the managers of program that have been designed, approved and are implemented. Process evaluation has three main purposes.

- Detect, predict defects in the procedural design or its implementation during the implementation stages.

- Provide information for program decisions,
- Maintain a record of the procedure as it occurs.

Process evaluators monitor the actual procedures in education in order to help educational decision maker expect and overcome procedure difficulties. It points out to the need for analyzing and assesses the manner in which the curriculum is being handled by the stakeholders, proprietors, Teachers, Parents and Students.

Product evaluation – This type of evaluation seeks to measure and interpret attainment as often as necessary in the process of the program and at the concluding stage. The implementation of Biology in the secondary schools curriculum content like any other educational level requires regular assessment in order to ensure continuous effectiveness and relevance.

Awotunde and Ogondulunwa (2004:154) say product evaluation utilizes different methods which are:

- devising operational definitions of objectives
- Meaningful criteria associated with objectives
- comparing the measurement with absolute or relative standards
- making rational interpretations of context and process evaluation.

The CIPP model was considered appropriate because:

a. it relates with context, context deals with planning, define relevant needs, environment and the formulation of objectives.
b. It is important in evaluating the success of any curriculum implementation, and tied to environment created for actualization.
c. Input which is an important accepts of curriculum implementation in secondary schools
d. Process evaluation is also important in order to determine the level of effectiveness in any on going program.
e. Product evaluation assist in examining the out come of a program and the changes brought about as a result of the program implementation to the beneficiaries of the program.

Michael Provu's Discrepancy Evaluation Model

The model has four components

- determining program standards
- determining program performance
- comparing standards with performance
- determining whether discrepancies exist between standards and performance

The model has five stages at which program performance is compared to program standards, which are:

a) Design vs. design criteria – is concerned with internal soundness – congruence with philosophical stance adequacy of resources e.t.c.
b) External soundness – comparison with similar programs.
c) Identification and resolution of initial problems
d) Installation vs. installation criteria. This stage tries to answer the following questions.

Is the program operating as intended?
Are all parts (people, equipments e.t.c) in place?
Process vs. process adjustment. This stage seeks answers to these questions.
Are communications lines functioning as intended?
Are planned activities functioning as intended?

Product vs. product Assessment – at this stage one embarks on the evaluation of the entire program in terms of original goals and also looks at the effect on all that were affected.

Cost vs. benefit – the cost involved is compared with what the participants derive from the program.

The above model believes that evaluation is concerned with standards and the extent to which the performance agrees with set standard. This model has a lot of similarity with Stufflebean input process evaluation which lay emphasis on standard. This study also found this model as a guide because it is concerned with the evaluation of implementation how it relates to the set standard.

Stake Responsive Program Evaluation Model.

Stake proposed this model (1973) was not concerned with the stated objectives of a program but with acquiring information about project. The attribute of this model are orienting more, directing to the programme activities than to programme intents, responding to audience for information and concern with variables that depict or indicates values.

Stake (1973) said that responsive evaluation takes a broad holistic view of a programme. It is descriptively and analytically reporting and makes specific and special effort to communicate with the learner, personnel and the audience. Stake advised that the evaluators using this model should operate more informally but systematically within the environment and interact with people, drawing information and conclusion out of the observations, anecdotes, opinions, impression and discussion. This model comes with pre identified information and recommendations are based on those information. It adopts a flexible, open – minded approach to the identification and assessment of general searching. The model associated itself with many goals, involving the teachers, learners and the public. This study also adopted this model because it is primarily concerned with the stated objectives and standard of curriculum.

Tyler Model – Evaluation is an integral part of curriculum process Tyler in Gotan (2004). Tyler was of the view that evaluation was essential for determining the extent the programme of curriculum and instruction is actually realizing educational goals. Tyler was concerned with how to determine whether the stated goals, sub goals, and objectives of a programme were valid or rejected. Newton Metfessed, William Michael, improved on Tyler's work and formulated seven step evaluation model, the work determine the extent to which secondary schools education is implemented based on set goals, the model provided some insight. This model is similar to context evaluation of Stufflebean, the study is also hinging to this model because it is concerned with the implementation of secondary school curriculum.

The review of some of the models has indicated that evaluation involves:

b. The extent to which set goals have been achieved. Objectives of every programme must be given much emphasis.
c. Implement a comprehensive universal approach looking at the whole aspects- the context, input, process and product.
d. The use of descriptive methods.
e. The prevailing context, input, process and product must be assessed against the earlier prescribed standard. The decision taken must be based on the observed gap between prescribed standards and performances.

2.7 Teachers as Implementers of Biology Curriculum.

Curriculum implementation can be described as the ways and means by which designed educational programme is being translated at the classroom level. Education is a kind of all round development (intellectual, physical, spiritual and moral) for the learner. The duties and responsibilities of the school over the learner overlap with those of the society. It is incumbent on the teacher who is professionally trained and employed to execute the functions of the school. The classroom teacher forms the cornerstone in curriculum implementation.

The teacher is the man force and the last person that ensures that the curriculum is implemented according to specification. It is the classroom teacher who decides on what to teach at what time even some kind of teaching schemes may have been prepared in advance for him. Ben – Yunus (2000).

Ben further said that, the classroom teacher interprets the syllabus and breaks them into teaching schemes and lesson plans. He decides on what instructional materials to use, the methodology to adopt, the amount of time to spend on each aspect and equipment and space to use. Decisions of this nature determine the pace of success that can be attained in any curriculum implementation. Therefore, if a teacher is untrained or unwilling to implement the curriculum plans, the desired success cannot be attained.

No matter the amount of inputs – infrastructural facilities and equipment on a programme, such is bound to fail, if teachers in quality and quantity are not trained for the implementation of the programme. Therefore in order to achieve the intended objectives, teachers that are to implement the curriculum at the classroom level should be appropriately and adequately trained. Teachers generally prefer to teach and have confidence in the subject they specialized in.

Odunbunmi (1987) Ughamadu (2006) said the teacher is the heart of any curriculum planning and development endeavor. This is because he is the key factor in a strategic position to make worthwhile contributions to the development of school curriculum. He went further to say that the teacher usually controls the learning experiences that on in the classroom and also evaluates the learners' achievement of objectives. The teacher is more at close contact with the learner; he knows the learners' characteristics.

The general level of education of the teacher, his professional preparation, personal disposition and motivation, capabilities, needs and interest can exert profound influence on the degree of success of a planned and developed curriculum.

Oluyemisi (1998) said, the teacher have some tasks to perform in the implementation of the curriculum, the task of teaching in such a way that learning will be stimulated. It is the task of the teacher to guide the activities of the learner for learning to be effective. Since learning best takes place when students are active, it is desirable for the teacher to in co – operate students' participation activities as part of the lesson format. The teacher makes sure that the rate and amount of material to be learned in any lesson must be related to the complexity and difficulty of the material in terms of the students' ability.

Classroom planning by the teacher is also paramount importance so as to completely bring the curriculum developed to teachable and learnable level. The teacher decides on how to break and organize the course work based on term, month or week period. Well planned and developed curriculum of not well implemented by teachers can turn out to be the most inadequate and irrelevant to learners. The teacher decides of the objectives of the curriculum have been achieved or not through his/her evaluation techniques.

The Science Teachers Association of Nigeria after revising the science syllabus of the secondary school should have collaborated with Nigerian Examination bodies to ensure that the public schools are scientifically well equipped to a standard as criteria for allowing the schools to partake in any external examination.

This would have drastically reduced the level corruption; the schools would have been standardized. Most schools have no laboratories, no technicians; no qualified teachers for the proper implementation of the Biology Curriculum, the state government are releasing funds to schools for the teachers to upgrade their knowledge. STAN, WAEC, NECO should be organizing seminars and conferences for science teachers in order to influence and sell their ideas to them and also seek their advice. This will go along way in making the teachers feel responsible and also motivated. The three bodies should come together at this period as one body and speak with one voice.

2.8 Quality and Quantity of Teachers

On the ratio of teachers to students, the implementation guidelines provided that there should be two teachers to a class, where a class is understood to be not more than 40 students. Besides the issue of numbers, some standards were set in regards to the qualification, quality or category of teachers.

The implementation guidelines provided that there should be

- One graduate to non NCE teachers in schools operating senior secondary only.
- three graduates to two NCE teachers in schools operating secondary and junior secondary levels
- One graduate to two NCE teachers in a school operating junior secondary school only. (Implementation Guidelines 1988:32).

When the number of teachers in a school is not adequate, the available ones are over worked which will also result in low production and inefficiency. The quality of the available teachers is affected. Lack of qualified teachers could lead to misinformation or shortage of information by the teacher; this could affect the proper implementation of the curriculum.

2.9 **The role of Ministry of Education in the Implementation of the Biology Curriculum.**

The state and local governments have various and vital role to play in the organization and management (administration, planning, policy, structure, supervision and control) of education in Nigeria is centralized at certain levels and decentralized in others with greater emphasis on decentralization.

Each state in the country has a state Ministry of Education, a state school board and local school board. Each state is relatively free or autonomous in the day – to –day management of school in its area. The ministry of education plays a role in promoting national objectives. It administers two vital advisory bodies the National Council of Education (NCE) and the joint Consultative Committee on Education. (JCC). According to Brown and Tomori (1970) the federal Government of Nigeria provided the working document, curriculum monitoring units and see to it that the programme is effectively implemented in the country.

The three tiers of government ie federal, state, and local governments have the privilege of recruiting qualified teachers and paying their salaries, textbooks, registers, scheme of work, dairies and other working materials are provided by the Government. The planning of the curriculum in the Ministry is being done in consultation with other bodies from time to time, such as University professors, WAEC, eminent educationist e.t.c. The curriculum development unit of the ministry deliberates on such curriculum matters. The drawing of the syllabus is being done by the curriculum development unit in the Ministry. WAEC is more prominent in the task of making the examination syllabus for secondary schools in Nigeria today.

Inspectors from the Ministry of Education help to supervise the implementation of curriculum and syllabus in schools. Changes in the curriculum must be approved by the Ministry of education before they are introduced in schools.

Because of the high level of corruption in both our state and local Government education is not given much consideration. Politics does not consider the educational level of a candidate, an uneducated person can be given the appointment of education supervisory councilor, or a chairman house committee on education at state level with such contribution in moving education forward can they offer? The favor given to some unqualified teachers to serve as administrators has great effect on the management of schools leading to lack of control.

2.10 Supervisory Role in the Implementation of Curriculum

The role of supervisor section of Ministry of education and area inspectorates could not be over emphasized in the implementation of Biology Curriculum GWYMM (1974) in tracing the evolution of school supervision and inspection says that supervision grew out of school administration.

Afolabi (2001) stressed on the importance of supervision and inspection, he argued that supervision help teachers see the problem and needs of the children and youth and also provide effective, democratic leadership in promoting the professional improvement of the school and its activities. In fostering harmonious and co – operative staff relation in stimulating professional in service education of teachers and in enhancing school community relations.

He went further to say, supervision help the professional teachers develop greater competence in teaching. Some instructors may neglect lesson notes, scheme of work or pedagogical materials. Supervisors could remind them of the significance of the part they neglected.

According to Wiles (1991) supervision is a service activity that exists to help teachers do their job better. The classroom is like a production unit likened to a factory and each classroom teachers role is likened to a work pattern, so the individual teacher is responsible for providing or imparting knowledge to the individual pupil according syllabus. The supervisor does much than inspect. As quality control agent, he provides leadership in the execution of school programme and he is in that capacity as a leader, first among equals the supervisor help the teachers see the problems and needs of children. It also provide effective democratic leadership in promoting the professional improvement of the schools and its activities in fostering harmonious and co – operative staff relations in stimulating professional in service education of teachers and in enhancing school community relationships. A supervisor also helps the professional staff develop greater competence in teaching. A supervisor evaluates the results of each teacher’s effort in terms of students

growth towards pre – determined goals. Supervisor helps the teacher in the diagnosis and remediation of learning difficulties.

Most secondary schools supervisors are not trained, supervisors are suppose to be moved from schools to ministry of education or education department in local government after serving for a long period of time as classroom teachers in the schools assuming to have acquired all the necessary skills and knowledge to be able to correct and impart the knowledge acquired through experience to the incumbent classroom teacher, which they are later trained or sent for out for different workshops/seminars. This day's most of the supervisors have not acquired such knowledge either due to god fatherism or the corruption that has eaten up our system they are made supervisors. Supervisory role in secondary school is very essential because it awakens the school administrators. Supervisors, teachers and government should on up to their responsibilities in ensuring effective curriculum implementation in our schools.

2.11 Instructional design

Instructional design refers to the process involved in the preparation towards the actual implementation of instructions usually presented in the document called lesson plan (Nkom 2008:76). Lesson planning is often proceeded by or derived from the syllabus, and the scheme of work. The syllabus is the academic content of the curriculum, and with it starts the process of mellowing down in the instructional design process. It is derived from the curriculum. It describes the content of instruction in the form of subject offering, how content is organized in sequence, topic by topic and year by year. Thus the syllabus is organized by topic, grade and year.

The scheme of work is a break down of the syllabus in each subject into topic on the basis of a term, month or week in order to ensure adequate coverage, knowledge of the number of lessons to be taught in the term, month, week, are derived from the scheme of work and are developed by individual teachers with their learners in mind. The last stage in the process of instructional design is the lesson plan. This task of planning a lesson is that of the individual teacher responsible for teaching a lesson.

The content of the lesson is derived from the scheme of work. Lesson planning is the road map for every lesson taught. According to Danladi (2007) lesson planning helps the teacher in sequencing knowledge, be familiar with subject matter; define the roles of the teacher and learner; Danladi further noted that it helps the teacher organize the lesson within the time allocated; it helps the teacher to identify and acquire the materials required for the lesson advance.

Through lesson planning, the teacher becomes prepared for his lesson and makes a projection of problems that could arise in a lesson and equips him. If a lesson is well planned, the chances of effective classroom implementation are bright (Nkom: 2006: 29), Danladi (2006 : 110) asserted that a poorly planned and unprepared lesson can destroy the effectiveness of any carefully selected and interesting topic; by extension, if a lesson is not planned, there would be nothing important to teach. In essence, lesson planning is important for effective teaching. Lesson planning as stressed by educationists such as Adeyemo (1980) and Ughamadu (1992) for every lesson a teacher should teach there should be a plan.

In any Curriculum implementation the Classroom teacher and his activities are essential. The essential activity of the teacher is the ability to breakdown the curriculum into the simplest means without losing its meaning for the student's assimilation. Is only when a teacher is well prepared that he could achieve the desired goal of implementation. That is why this study choose this design because it believes that is only when teachers are academically ready that they can inculcate the knowledge. The design also gave consideration to the importance teaching material which is an indices of effective curriculum implementation.

2.11.1 Classroom and School Population

School and classroom population in secondary education, has been described (that of JS 11 and SS11) as functioning under the same roof, the school population should not exceed 1,400 students, similarly, it has been provided that in a normal classroom, students should not exceed 40 per class. On teaching load, a maximum of 24 periods per week was recommended. (Ministry of Education Kaduna State: 2004).

The prescribed number would have a great influence in the learner teacher relationship, effective communication, discipline, and classroom management. The prescribed work load will give the enough time and ample opportunity to make researches and communicate with world and other teachers across the globe for more knowledge in his/her subject field.

2.12 Importance of Biology Teaching Method in Curriculum Implementation

After designing a particular curriculum in terms of organization and integrating the learning experiences and content, it is important to apply the appropriate method of implementing the curriculum. Recommendation of a particular method of teaching will enable the evaluator to be aware of the frame reference they could work with. Method prescribed by the Nigerian Biological Curriculum is discovery/laboratory and experimental method of teaching, the discovery method of teaching according to Ughamadu (2006) said, method of teaching where the classroom teacher provides the learners necessary opportunities to discover new facts, new rules, new methods or techniques of solving problems as well as new values for themselves.

Modern science curricular emphasizes learners' involvement in science activities through discovery method. According to Abdullahi (1982), involves an unstructured exploration in the laboratory in which student, through his mental processes such as observing, measuring, classifying, and can draw general conclusions from data which he has gathered. From the instructional point of view two discovery methods are recognized. Guided inquiry and unguided inquiry.

The philosophical basis for this type of curriculum is derived from the work of Jean Jacques Rousseau who declared education as the outcome of personal experience.. Effective teaching methodology provide for individual differences among students, taking care of their needs and interest, coupled with; there should be the provision of physical facilities such as large classroom, reads and flexible building to allow for many activities and free play.

In addition the learners are highly motivated to learn as what they are learning is an outcome of their desire rather than adult prescribed content. The motivation is a directed result of the relevance, reality, and meaningfulness of what is being studied. The teaching method challenges the learner to find out information for him. This makes instruction students centered Teaching method facilitates assimilation and retention of knowledge discovered by students themselves. It helps the students to develop manipulative skills as they have contact with materials and apparatus. Mental adventure, which this method encourages, is very rewarding. It encourages analytic thought. Ughamadu (2006).

According to Nwagbo (1995) outdoor laboratory experience enables the science teacher to: teach for acquisition of scientific skill which is a major goal of science education. apply scientific concepts, ideas and principles properly; communicate effectively in science see the tentativeness of ideas and principles in science which he passes on to his students;

Nwagbo further said teaching method in curriculum implementation it assist the
teacher to be more organize in his teaching in terms of content, methodology and assessment; have more confidence in teaching,
the discovery teaching method equips the learner with a vital means of acquiring knowledge on his own through active participation and he develops his mind by using it to solve problems.

2.12.4 Role of Curriculum Materials in the Implementation of Biology Curriculum

The term such as audio visual aids, visual aids, teaching materials, instructional materials, instructional aids, instructional technology, have been refer to as curriculum materials. Onyejemezi (1981) says the term curriculum material is more accommodating term than others. This is because it covers the general discussion of educational materials, techniques and devices or instructional materials. Curriculum materials are indispensable in the teaching and learning process/curriculum implementation. The teacher is the central figure in the use of curriculum materials for curriculum implementation. The teacher is expected to have knowledge of a wide range of curriculum materials available for curriculum implementation. There is need for the teacher to have knowledge of the roles of these materials in the teaching and learning process; qualities of useful curriculum materials and other issues related to curriculum materials.

Curriculum materials which are a subset of educational technology, can be simply referred to as the different kinds of materials, or resources or forms of media that the teachers and the entire class use in the teaching /learning process so as to make it more effective and productive.

Varieties of curriculum materials are available in the educational scene. There is no definite classification of curriculum materials, this is because there is often some overlapping when curriculum materials are being classified, a particular curriculum material can be placed in more than one category.

Curriculum materials have been classified as printed materials, audio materials or aids, visual aids and audio visual aids or materials. Another classification is that of projected and electronics materials or aids. None projected materials or aids, hardware materials and soft ware materials.

Examples of printed materials are textbooks, journals, posters; audio materials include radio, audio tapes, and record players.

Examples of non printed materials are chalkboard, flannel board, models. Visual materials or aids are pictures, charts, maps, real things, models, mock ups. Audio-visual aids or materials include instructional or educational television projected and electronics materials or aids example still pictures in slides, film strips, motion picture films, overhead projector, opaque projector. Non projector materials or aids include various forms of chalk boar, flannel board, textbooks, while hardware materials are audio – cassette recorder, slide and film projectors. Software’s included; audio tapes, video tapes slides and transparencies.

Okedara (1981) argued that non of these instructional materials, could really be facilitating the implementation of curriculum without a trained instructor and the willingness of the learners to read.

UNESCO (1962) postulated that no meaningful teaching and learning could take place without instructional materials. Even in the pre-nursery and nursery schools the teachers and learners require teaching materials to hold attention and develop interest in the lesson.

Awotunde and Ugodulunra (2004) observed that Hemi zing the importance of the instructional materials was tantamount to a par lour game which amounted to killing of time. Creative use of curriculum materials by teachers and students increases the probability that the students will learn more, retain better what they learn and improve the performance of the skills that they develop.

The importance of curriculum materials by Ughamadu (2006) which include;

- stimulation of learners interest
- making teaching – learning more productive
- taking care of wide audience or large number of students
- Providing meaningful sources of information to learners.
- Helping to overcome physical limitations in the teaching – learning environment or situation.
- Making learning become more concrete, real and immediate
- Contributing to performance analysis
- Stimulation of problem solving in students
- Helping to clarify complex events or situation and also magnifying or reducing objects.
- Helping to individualize instruction
- Extending human experience.

Mkpa (1987), noted that in order for curriculum materials to be useful, they must satisfy some criteria which include the following:

1. Appropriateness to the age of the learners for whom they are meant.
2. Relevance to the lesson they are meant to serve
3. Simplicity in presenting just the essential details
4. Adequacy in size
5. Interest in respect of the learners
6. Simplification of concepts
7. Durability

8. Readily improvisable
9. Truthfulness of materials in the sense of presenting the most accurate reflection of the idea reflected.

Ogunleye (1999) says one of the objectives of teaching science in schools is to communicate the spirit of science and to ensure that students acquire the process skills of science. This cannot be effectively achieved unless students are exposed sufficiently to practical work and laboratory experiments.

MCGrawhill (1974) define textbook as a standard book used for instruction and arranged so as to develop an understanding of a branch of knowledge rather than to impart information for its own. Textbooks over the years have supported the teachers in their teaching and the students in their learning. The content of textbooks have always been used to determine the adequacy of textbooks, while other factors as coverage, diagrams, figures, activities, illustrations, assignments, presentation have always been used to evaluate textbooks.

Ndukwe (1993) in his research as shown that some of the recommended and newly produced textbooks in Biology were defective in some of these factors; hence a lot of inadequacies ‘are inherent in them. If this is so, then what type of teaching and learning would have taking place over the years?

The use of internet has drastically reduced teachers/students dependence on the textbooks which help to correct some inadequacies in the textbooks.

2.13 Instructional Strategy and Students Retention

Understanding and retention are products of meaningful learning when teaching is effective and meaningful to the students, Bichi (2002). Retention is the ability to retain and remember things experienced or learned by an individual at a later time. It takes place when learning is coded into memory. Thus appropriate coding of incoming information provides that index that may be consulted so that retention takes place without an elaborate search in the memory lane (Oyedokun 1998 in Bichi 2002). The nature of the materials to be coded contributed to the level of retention. Materials are related to the quality of retention in terms of their meaningfulness, feminity, concreteness and image evolving characteristics (Adeniyi 1997).

Several factors are known to influence retention. Blair et al (1968) in Bichi (2002) reports that anything that aids learning should improve retention while things that lead to confusion or interference among learned materials decrease the speed and efficiency of learning and accelerates forgetting. Retention level in relation to age has been investigated by

researchers. Cross (1974) in (Bichi 2002) reported that retention increases from infancy throughout the teenage years followed by a slow recession in middle age.

2.14 School Environment

The school environment includes the physical environment/facilities where school activities are carried out such as laboratory, library, classroom, workshops, games facilities, open spaces and learning resources. It also embraces subject offered and their weight on the time table, the social climate and the social activities such as clubs and societies, which create room for moral and physical development. The nature of the school environment influences the way learning is organized and conducted.

12.14.1 Physical Facilities

Table below is an indication of standards of physical facilities including space per student, expected of any secondary school for the effective implementation of the curriculum.

FACILITY SPECIFICATION FOR SECONDARY SCHOOL EDUCATION

S/No	Facility	Unit space per student	Dimension	No of students
A	General classroom	1.4sqm per student	7.2m × 3.4m	04
B	Science laboratories (integrated science, physics, chemistry, Biology and Agric science) including preparation room and store	3,0sqm per student	7.2.m × 20m	40
C	Home economics room	3.0sqm per student	7.2.m × 16.17m	40
D	Workshops	3.sqm per student	7.2.m × 10.3.m	20
E	Technical drawing room	2.0sqm per student	7,2m ×8.4.m	20
F	Students typing room	2.5sqm per student	7.2m ×13.9.m	40
G	Library	11.2sqm per student	7.2.m × 16.m	
H	Guidance and counseling office	20sqm per student	3.6m × 5.56.m	
I	First aid/clinic/sick bay	A room should be available for this purpose		
J	Assembly hall	0.5sqm per student	0.5m × No of students	
K	Cafeteria	Provision may be made for day students as required		
L	Staff room	2.5sqm per member of staff	2.5m × no of teachers	
M	Principal's office. Toilet and secretary's office	25sqm	4.2m × 6.0m	
N	Vice principal's office	22.5sqm	3.6m × 5.56m	
O	Office of accounts and general duties	40sqm	4.2m × 9.52m	
P	Toilets	With bowl/urinary and wash hand basin	Per 40 students/ per 15 students	
Q	Generator house	This should be provided where it is needed		
R	Open (un built up) area, school farm for agric science	One hectare is the minimum size of land recommended per school in both rural and urban location		

Source: Nkom (2004:44) in Rikichi (2009)

Office of the Bursar/Account and general duties for financial functions
Toilets (for conveniences of all).
Generator is to ensure power supply especially in terms of need.
The open space is to be utilized as sport fields and school farms.

Teaching and learning processes meant to promote intellectual development, while welfare facilities recognize the fact that in curriculum implementation the welfare of both teachers and students must be catered for. Offices must be provided for supervision and co – ordination. Providing school facilities should be limited to only those that are essential to academic activities only should also include those that cater for physical and moral growth.

As provided in the NPE (2004), Implementation guidelines (1988) Kaduna state inspectorate hand books (1997), indicated that the school environment should possess appropriate infrastructure and facilities where learning can effectively takes place. These facilities include adequate classrooms, well equipped laboratories, workshops, libraries, hostels (for boarding schools) offices, clinics, assembly halls, games facilities, open space and instructional materials.

2.15 Prescribed Standard for Curriculum Implementation

Curriculum implementation as has been noted involves interaction of human and material resources with methods and content. It involves the co – ordination of content, and resources using different methods in a way that the learner derives the required or desire the required or desire the benefit. The implementers vary in their experience, orientation, philosophy at academics level and even understanding, they are liable to give and use different approach to interpret the curricular in their implementation. In order to ensure uniformity in the implementation of the senior secondary school curriculum some minimum standards have been prescribed for school heads of Nigerian Secondary Schools Nkom (1999) said the minimum standards can be grouped into three main environment to include the learner, the teacher and physical school environment. Nkom went further to explain the three environment and what they stand for, he said that the learner environment are those that are aimed at ensuring the learner attains appropriate maturation levels physically, mentally and psychologically, for entrance or movement from one class, or educational level to another. These embrace the school age and the school routine. The teacher's environment is concern with the teachers needs to be able to perform in his task of assisting the learner to learn. It includes the kind and level of his training, certification, the number of learners he can cope with and he is to carry his assignment including writing lesson notes and how he should motivated to do his work. This embraces the quality of teacher's method of teaching, number of learners per teacher and the teacher's welfare.

Nkom (1999) further explained that the school environment includes specifications that are provided based on the curriculum or the activities that are to be under taken for attaining the goals of the school. The facilities include physical spaces and how they should be fitted out and furnished. It includes the balance between all the three environments, learner – teacher. Facilities – it also includes time allocation and time management. It is believed that if each of these ones is appropriately handled, then the learner can be developed intellectually, morally and physically.

2.16 School Age

NPE (2004) stipulated that secondary school education is education received after primary school and before tertiary education. It is between the ages of 12 and 18 years. Any child below the age of 12 years is not matured for secondary education. The implication of this

for the school administration is that secondary education is primarily meant for adolescents/teenagers. What ever task are planned and conducted must be such that will benefit the adolescents/teenagers

2.17 The Teachers Personality Training

The teacher is a stake in the curriculum implementation process. Ben – Yunus (2000) said the classroom teacher forms the cornerstone in curriculum implementation. The teacher is the main force and the last that ensures that curriculum is implemented according to specification. The teacher decides what to teach and at what time to teach, even with some kind of teaching schemes may have been provided for the teacher in advance. The teacher interpretes the syllabus and breaks them into scheme of work and lesson plans. The teacher decides on instructional materials to use, the teaching methodology to adopt, the amount of time to spend on each aspect, the equipment and the space to use. Ukeje (1992) asserted that teachers are the main determinants of the quality of any educational system. The validity of any educational system depends on the quality of teaching and availability of the competent teachers.

Oshihi (1999) in Enesi (2001:60) observed that the teacher's personality is very important to effective teaching and learning. Enesi's study revealed that:

- Teachers who consider the plight of students are great facilitators.
- Teachers who hardly consider the plight of the learners inhibit effective teaching and learning
- Friendly teachers provide conducive and less stressful environment.
- Students taught by friendly teachers are better mean scores performance than those taught by unfriendly teachers.

It has been asserted that no education system can rise above the quality of its teachers. (NPE 2004)

In the NPE (2004), it has been provided that all teachers shall be professionally trained; teacher-education shall continue to be given major emphasis in all educational planning and development. A professional teacher is defined in the teachers service manual (TSM 1987:3) as a person who has the register able professional qualification which enables him/her to be appointed to teach at any appropriate level of recognize education in Nigeria, and who is of sound mind and is mentally alert. The minimum register able qualification is NCE, other qualifications include B.Ed, BA.Ed, BSC.Ed, M.ed and doctorate degrees PGDE/PGCE (NPE 2004)

2.18 Empirical Studies

Kwasau (1999) studied the implementation of the 6 – 3 -3 – 4 Christian religious studies (CRS) curriculum in selected secondary schools in Kaduna state. The study centered on how CRS curriculum was being implemented at SS level with particular reference to staffing, instructional techniques, facilities, text materials and mode of evaluation. Data for the study was collected from staff and students of 16 selected schools in Kaduna state. The study revealed that, Christian religious studies (CRS) teachers use group method, story telling and assignment as the adequate teaching approach in CRS. Essential facilities such as libraries, theatres and equipment (projectors, television set, radio sets, video recorders etc) were either in adequate or unavailable as well as relevant teaching materials. It was also

observed that qualified teachers were not available. In the area of evaluation the teachers used objectives essay test and assignments.
Kwasau (1999) study was similar to the present study because it was also concerned with how curriculum is being implemented. This study is concerned with the evaluation of the implementation of Biology curriculum in public secondary schools in Kaduna metropolis.

Kadiri (2004) studied the effect of interactive teaching techniques and strategies on junior secondary schools students' achievement in social studies. The study focused on 240 JS111 students sampled from four selected education zone in kano state, using pre test, post test group research design, the study found that irrespective of gender, location, school type, interactive techniques could raise the level of students performance in social studies. The study is related to the present study because it is concerned with teaching method which is an important aspect of curriculum implementation. The study has proven that the teaching methods affected/influenced the level of students understanding. The study however did not look at other variables that are important in the proper implementation of curriculum.

Bouro (2000) examined the effects of teachers' strategies and materials resources in the implementation of the 1985 curriculum for senior secondary schools in fine Art. The study focused on 270 SS11 and 111 students offering fine Art in three northern states of Kaduna, Katsina, and Kogi state. Two questionnaires (one for teachers and one for students) were used for the collection of the data. Major findings of the study were materials, equipment and facilities were not available in the schools, time allotted to, and methods used for teaching were found inadequate. Part of the recommendation was untrained teachers should be encouraged to go for post graduate diploma in education (PGDE). Unqualified Art teachers should be sponsored for further training, supply of equipment and facilities should be taken seriously, excursion method should be used or school visits. The study is related to present study because both studies are concerned with teaching strategies and materials. However it differed, the present study evaluated on how Biology curriculum is being implemented, while Bouro was only concerned with effects of teaching fine Arts not on the entire Art curriculum.

Denga (2001) studied teachers attitude to the implementation of the 6 – 3 – 3 – 4 system of secondary education in Nigeria. The study centered on sample population of 985 teachers made up of 645 males and 340 females drawn from estimated teacher population of about 1,046,400. Few final year students were selected for the interview. Structured questionnaire and structured interview were scheduled. The study showed that teachers were conversant with various teaching method; there was scarcity of both human and material resources; teachers were meant to teach in areas other than their areas of specialization; classes were overpopulated; no proper orientation in implementing continuous assessments instruments and scheme; teachers not sponsored for conferences; government responsible for the gap between policies and implementation. The study is related to present study as both are concerned with teacher's attitude to curriculum implementation at both junior and senior secondary school level.

Kolo (2004) studied secondary education in Kaduna state. The study investigated into the readiness of secondary schools in Kaduna state to absorb the products Universal Basic Education (UBE). Respondents were selected from all 12 Education inspectorate zones spread over three senatorial zones, included teachers, library and sanitary facilities, laboratories and work shops, chemicals, textbooks, medical and secretarial facilities were

either not available or where available but inadequate. Although it mainly investigated to determine the readiness of the school for UBE products, it is similar to the study because it actually assessed the schools for effective curriculum implementation. The study did not give attention to actual teaching and learning processes in the schools.

2.19 **Summary/Uniqueness**

The review of both indigenous and foreign author's works revealed a lot of affirmative and negative revelation. Some author's affirmed that there were a lot of discrepancies between the expected and observed effects of implementation of the Biology curriculum in Kaduna metropolis. Some author's sampled 250 respondents to represent the entire Kaduna State. This number is grossly inadequate to make a rational decision about the public schools in Kaduna metropolis. This is one of the gaps this was optimistic to narrow.

Using experimental studies in the assessment of the implementation of Biology curriculum in public schools cannot make a fair assessment. It has been premised upon preceding assertion that this study adapts descriptive and survey design.

The assessment of implementation of the Biology curriculum aims at improving, sustaining and enhancing output. However a good number of the works review merely adopted other designs such as quasi experimental design, historical designs in their approaches. These frailties are the areas that this study is optimistic to bridge.

Kadiri (2000) was only concerned with the importance of Teaching methodology in curriculum implementation, Bouro (2000) was also concerned about the effects of teachers strategies and material resources in curriculum implementation. Denga (2001) studied the teacher's attitude to the implementation of the 6-3-3-4 while Kolo (2004) studied the readiness of secondary school to absorb the products of UBE. This is concerned with the overall process of curriculum implementation studying all the singular indices studied above by the different authors mentioned above. All other frailties and discrepancies existing in the opinions and perception of the authors' are hoped to be ameliorated by the current study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The intent of this study is to evaluate the implementation of Biology curriculum in Kaduna state public secondary schools within Kaduna metropolis with a view of identifying the prospects and the challenges. In the last chapter, an attempt was made to review the literature relevant to the study. The focus of this chapter is to outline the methodology to be employed in conducting this study. Specifically the chapter is presented under the following sub headings:

- Research design
- Target population
- Sample and sampling technique
- Instruments for data collection
- Validity of the Instrument
- Pilot study
- Reliability of the Instruments
- Scoring Method
- Administration of instruments for Data Collection

3.2 Research Design

This study is a descriptive survey study designed to investigate few variables thoroughly in a narrow scope with a view to finding what obtains within the same variables at a wider perspective. The design enables one to collect data and describe in a systematic manner, the characteristics features or facts about a given population. Nwoargu (1991) specially the study evaluates the implementation of Biology Curriculum within the secondary schools in Kaduna metropolis so as to have insight on what obtains in the implementation of Biology Curriculum in Kaduna state as a whole.

3.3 Target Population

The population of a given study is the totality of subjects, or elements or individuals to whom the problem is concerned been made and from whom generalization are drawn. Gay and Delhi (1992) said the number of respondents acceptable for a study depend on the type of research involved. For descriptive research the sample should be 10% of the population. If the population is small 5% of the population is recommended. Hill (1998) there is a seldom justification in behavioral research for sample sizes for less than 30 or larger than 500. 500 assure the researcher that sample error will not exceed 10% of standard deviation. 30 assure the researcher the benefit of central limit theorem. The affirmation of Gay & Delhi (1992) and Hill (1998) guided the choice of the sample size of this study.

Table 3:1 Public Secondary Schools in Kaduna Metropolis Showing the Enrollment of SS2 Biology Students

Serial No	Name of School	No of Biology Teachers	Male	Female
1	GSS KAKURI	7	288	272
2	GSS NARAYI	5	325	210
3	GSS RIGACHIKUN	6	218	110
4	DGSS KAWO	5	278	192
5	GGSS MAIMUNA GWARZO	10	-	560
6	GGSS KAWO	13	-	508
7	CAPITAL SCHOOL	17	456	301
8	GSS UNGUWAR SARKI	7	300	235
9	SMC KADUNA	14	320	-
10	GGSS INDEPENDENCE WAY	7	-	495
11	GC KADUNA	14	508	
12	GSS DOKA	4	270	102
13	GSS KARGI ROAD	5	143	94
14	GSS RIGASA	9	192	108
15	GDSS SABON TASHA	8	213	182
16	GDSS TELEVISION	6	305	211
17	GDSS U/ROMI	7	214	175
18	GDSS GONI GORA	8	194	126
19	GDSS BARNAWA	12	287	210
	TOTAL	164	4511	4091

3.4 Sample and Sampling Technique

A sample is a subset of the population which actually received the treatment from which generalizations will be drawn. A total of seven schools have been randomly selected for the study details of which are found in Table 3.2. 30% of the population is used as sample for the study.

Table 3:2 Selected Samples of the Study

Serial No	Name of School	Type	No of Biology Teachers	No of students
1.	Government College Kaduna	Both	6	21
2.	GGSS Kawo	Both	6	21
3.	Capital School Kaduna	Both	6	21
4.	GSS Doka	Senior	4	21
5.	SMC Kaduna	Both	6	20
6.	GGSS Maimuna Gwarzo	Both	4	21
7.	GSS Rigasa	Senior	3	21
	TOTAL		**17**	**142**

According to Osuala (1993) random sampling is the method of drawing a portion or sample out of a population or universe in such a way that each member of the population has equal chance of being selected. Thus such a sample must have characteristic similar to the population as a whole.

Factors to consider in using random sampling are:

1. Every person or subject in the population has an equal opportunity/chance of being selected and
2. No one determines the choice of being selected and no choice predetermined another. This means that selection will be done without bias. Details of the sample are found in Table 3.2

The process of matching the sample to the population permits greater validity of inference from the sample to the population and the sample of the variables when the sample has been randomly selected.

Teachers are selected they are directly involved in the teaching of Biology to the Students.

3.4 Instruments for Data Collection

The data were collected through a research instrument called the Biology Achievement Test (BAT) questionnaires for both the Teachers and Students. The instruments were constructed using the processes of curriculum implementation which are: teaching methodology frequently used by the Biology teachers, the adequacy of the content of the Biology

Curriculum, availability/adequacy of the equipment in each school, level of teachers familiarity with the Biology curriculum Content, Teachers qualification as at the time of implementation. The observation schedule was conducted to determine the effect of class size in the curriculum implementation. Some Teachers were chosen and given written guide line to observe the teachers, while teaching in small, moderate, and large classroom.

The Biology Curriculum content has 7 questions using the 5 Linkert scale.
The second question centered on the lesson note to determine the level of preparedness of the teachers for their lesson. The method of teaching frequently employed by teachers was another factor of curriculum implementation 9 questions were raised.

The next question was on evaluation of the students after the instruction.
Questions were also asked about the availability/adequacy of the instructional materials that assist the teacher in his teaching about 28 questions were raised including those of physical facilities. The last questions were on how class size affects the teacher's implementation processes, the study raised five questions. Since Teachers qualification is a significant factor in curriculum implementation questionnaires were also raised to ascertain the response of the teachers. Five questions were raised.

The Students questionnaire was raised to determine how best they view the Subject Biology and its content. Interest is on e of the factors considered in curriculum design questions were raised on their interest in the subject. Ten questions were raised.

3.5 Validation of the Instruments

The content validity of the Biology Achievement Test (BAT) was be assessed by a panel of experts which included the following:

a) A science specialist
b) A curriculum specialist
c) A language specialist
d) A biology teacher at the secondary school level
e) An expert in mathematics education.

The science specialist was requested to critically examine and assess all the items of the instrument with reference to the following:

(i) Is the content of the instruments correct, recent and appropriate to both SS2 standards?
(ii) Are the items clear, precise and of standard?

(iii) What general criticisms and suggestion could be given to improve the instruments?

The face validity of the instrument was improved through the inputs from the panel members that specialized in curriculum planning and development examined the items of the instrument in relation to the following:

(i) Is the content of the instrument correct recent and appropriate to SS2 standard?
(ii) Are the items clear, precise and of standard?
(iii) What general criticisms and suggestions could you give to improve the instruments?

The expert in educational statistics was asked to validate the instrument in relations to the following:

(i) Would the items of the instrument yield data relevant to the statistics to be used in data analysis which will be the t-test statistics?
(ii) Are the items clear precise and free from ambiguity?
(iii) What general criticism and suggestion(s) could be given to improve the instrument?

The expert in language was asked to look at the contextual structure of the instrument in relation to the following:

(i) Is the language used clear and precise and free from ambiguity?
(ii) Is the language grammatically appropriate readable and of standard to SS2 students?
(iii) What general criticism and suggestions could be given to improve the instruments?

The secondary school Biology Teacher translates the Biology curriculum at the classroom level. The teachers experience was sought to improve the items of the instrument. The teacher was specifically asked to assess the items with the reference to the following criteria

(i) Do the items relate to Biology concept expected of the secondary school students?
(ii) Are the items readable, appropriate and of standard?
(iii) What general criticism and suggestions would be given for the improvement of the instrument?

The panel members examined the test item of the Biology Achievement Test (BAT) in relation to the term of reference outline above. Feed back from the panel provided useful and constructive suggestions.

The panel advice that observation scheduled should be adopted to investigate the effect of class size on the implementation of the biology curriculum. The class size effect should be removed from the hypothesis but should remain in the research question.

The test re-test experimental method was advised by the panel to be dropped. In order to determine the retentive ability and performance activity between male and female biology students, the panels advice that last examination result should be obtained from exams officers of the various sampled schools. Same was obtained and used.

3.6 Reliability of Instruments

A pilot study was conducted in schools to ascertain the validity and reliability of the instrument. The split half reliability co-efficient was used to compute and calculate. The computed r-value for the correlation co-efficient reliability test for the research instrument was .646 approximately 0.65. This shows an appreciable level of reliability of the instruments administered.

3.8 Scoring of the Questionnaire

The items on adequacy and inadequacy was rated using three (5) Linkert scale. Ogunleye (2000) notes that people possess different attitudes towards different things or experience. Obe (2000) notes that attitude to a given subject is not hereditary but learnt from colleagues and significant adult like parents and teachers'. Many according to Obe however believe that attitude is learnt as a result of experience. The study evaluated the attitude and experience acquired by the Biology Teachers/Students during the implementation of the Biology Curriculum. The researcher adopted the 4 point, three point, and 2 point scale. They were scored as follows:

Strongly agree	SD	4
Agree	A	3
Disagree	D	2
Strongly disagree	SD	1

Total **10**

The mean will be calculated as $\frac{4 + 3 + 2 + 1}{4}$

All other statistical tool to be used in the analysis of data will be on this mean.

Three point rating scale

Adequately	3
Inadequate	2
Not available	1
Total	**6**

The mean was calculated as $\frac{3 + 2 + 1}{3} = 3$

Two point rating scale

Yes	2
No	1

Observation Schedule

Research question 3 was tested using the observation schedules to determine the effect of class size on the implementation of the Biology Curriculum with respect to some certain criteria. Six judges were employed each was issued with observation score sheet. The classes used were large class size consisting about 50 Biology students', moderate class size consisting about 30 biology students', and small class consisting 20 biology students'. The mean scores of the six judges was used to determine the effect of class size in the implementation of the biology curriculum.

Ranking was 100% chi square method was used to compute the result.

1. Class organisation and control 20 marks
2. Students attention and interest during the process of instruction 20 marks
3. Visibility of instructional materials to all students' 20 marks
4. Active participation of students' during the process of instruction 20 marks
5. How often do the students ask questions 20 marks.

3.9 **Administration of Instruments for Data Collection**

142 copies of Students' questionnaire and 21 copies of the Teachers' questionnaire designed, printed and administered using direct delivery technique (DDT) or on the spot method. Two research assistants were employed.

CHAPTER FOUR
ANALYSIS, RESULTS, AND DISCUSSION

4.1 `Introduction:

The focus of this chapter is to analyze the data obtained via the research instruments in relation to research questions and null hypotheses of the study. Two types of data were collected using two instruments viz;

(1) Biology Teachers Questionnaire (BTQ)
(2) Biology Students Questionnaire (BSQ)

The data were analyzed using statistical method for social sciences SPSS. Scores from the data were converted to percentages, means standard deviations and the results are presented in forms of tables, outlined in the following paragraphs:

4.1.1 Analysis of Demographic Data

Item 1 of the Biology Teachers Questionnaire investigated the gender of the respondents. The data generated were analyzed and used to draw Table 4.1

Table 4.1 Biology Teachers by Gender in Kaduna Metropolis.

Sex	Frequency	Percentage
Female	13	63
Male	08	37
	21	100%

Table 4.1 shows that 13 out of the 21 Biology Teachers (representing 63%) are males while 8 out of 21 (representing 37%) are females. There is a preponderance of the male gender over the female gender in Biology teaching.

Item 2of the BTQ investigated the qualification of Biology teachers. The data generated were analyzed and used to draw Table 4.2

Table 4.2 Biology Teachers by Highest Qualification

Qualification	Frequency	Percentage
NCE	2	9.5
B. ed	2	9.5
PGDE	6	23.8
BSC/ed	2	9.5
M.ed	3	19.3
MSC	2	9.5
BSC	4	20.8
	Total = 21	100%

The results in Table 4.2 shows that 2 out of 21 (representing 9.5%) have NCE as their highest qualification, same applied to holders of Bed, BSC (Educ) and MSC. There is however a preponderance of BSC and PGDE holders, each having 23.8%.

Item 3 of the BTQ investigated the teaching experience of the Biology teachers. The data generated were analyzed and used to draw table 4.3

Table 4.3 Teaching Experience of Biology Teachers in Kaduna Metropolis.

Years of teaching experience	Frequency	Percentage
1 – 2years	1	4.8
3 – 4 years	5	23.8
5 – 6 years	5	23.8
7 – 8 years	7	33.4
Above 8 years	3	14.3
Total	21	100%

It is clear from Table 4.3 that 4.8% of the Biology teachers have teaching experience of 1 – 2 years, while 23.8% of the teachers have teaching experience of 3 – 4 years and 5 – 6 years respectively. About 33% of teachers have experience of 7 – 8 years while 14.3% have teaching experience of 8years and above.

4, 2 **Analysis of Data Generated via Section B of BTQ**

Section B of BTQ evaluated the implementation of the Biology Curriculum. Specifically the Biology Teachers were presented with statement s on the adequacy of the Biology curriculum; suitability of Biology textbooks, and the availability and utilization of Biology laboratory.

The items were rated using five point linkert scales. See appendix 1 for details. The rating of each was taken as indicator of proper implementation or lack of it. For the purpose of this study, all ratings between agreed and strongly agreed are regarded to indicate successful implementation, while ratings between disagreed and strongly disagreed are taken to indicate poor implementation; undecided responses are discarded as waste responses.

4.3 Assessing the adequacy of Biology Curriculum Implementation

Table 4.4 Biology Teachers' Rating of Adequacy of Implementation of Biology Curriculum

S/No	Items	Rating Responses (Effective Implementation)	Percentage Responses	Rating Responses (Weak implementation)	Percentage Responses
1.	The basic Biology Curriculum is adequate for the learners	4	19	11	52.4
2.	The Biology textbooks are too difficult for the learners to read and understand	4	19	14	66.7
3.	There are enough Biology instructors for the implementation of biology Curriculum	4	19	17	81.0
4.	All Biology Teachers used discovery and laboratory experimental methods of teaching	6	28.6	11	52.4
5.	Both indoor and outdoor laboratory activities are carried out as specified in the time table	8	38.1	12	57.1
6.	Laboratory is not ideal in the implementation of Biology curriculum	-	-	21	100
7.	Biology scheme of work are always reviewed, broken down and made available at the beginning of every term	1	4.8	20	95.2

The above response by the teachers indicated that all syllabuses are drawn from the approved Biology curriculum but other ingredients as specified on the above table to support the proper implementation of the curriculum, this indicate that there is significance difference between theory and what is being practice in secondary schools in Kaduna metropolis in the implementation of the Biology curriculum.

Table 4.5 Achieving the Objectives of the Biology Curriculum

The Biology Teachers rated the achievement of the objectives of the Biology Curriculum implementation with a view to determining whether the objectives have been achieved or not. Their assessment was analyzed using the five point linkert scales. Rating value of agreed and strongly agreed were considered effective implementation, while disagreed and strongly disagreed were considered weak implementation, undecided was discarded as no response.

Table 4.5 Teachers' Rating on the Significant Achievement of the Objectives of Biology Curriculum Implementation (statement of the lesson objectives)

S/No	Item	Rating Responses (Effective Implementation)	Percentage Responses	Rating Responses (Weak implementation)	Percentage Responses
1.	Previous knowledge is in agreement with present Biology topic	8	38.1	12	57.1
2.	Statement of previous knowledge always exposed the knowledge of the subject matter	17	81	4	19
3.	The stated objectives are in agreement with the Biology topic	20	95.2	1	4.8
4.	The Biology objectives has a performance statement	21	100	-	-
5.	The resources for the Biology theory/practical are listed prior to the lesson	5	23.8	8	38.1
6.	Biology resources listed showed the extent to which the teacher is good in teaching Biology	9	42.9	8	38.1
7	Biology resources provided during practical/theory lessons are adequate for the number of Biology Students	2	9.6	18	86.4

To measure the significant achievement of the objectives of Biology curriculum implementation some questions on the presentation of the lesson of the objectives for the implementation of the Biology curriculum.

The above findings show that the teachers make use of the objectives of the lesson note effectively during the teaching presentation of Biology this could enhance the proper achievement of the objectives of the Biology curriculum.

Table 4.6 Teachers' Rating on the Effectiveness of Lesson Note in Curriculum Implementation

S/No	Item	Rating responses (effective implementation	Percentage Responses	Rating Responses (Weak implementation)	Percentage Responses
1.	Introduction of the lesson create a conducive atmosphere	20	95.2	1	4.8
2.	introduction in Biology lessons linked the new lesson introduced to the previous ones	19	91.2	2	9.6
3.	Presentation steps/skills are always logical and sequential	4	19	12	57.1
4.	methods used in each step of Biology lesson are suitable	2	9.6	17	81
5.	The students always show interest and actively participate	11	52.8	8	38.4
6.	the Biology Teachers adequately rounded up Biology lessons	18	85.8	2	9.6
7.	The Biology teacher brought out the important points of the topic in the summary.	17	81	1	4.8

Introduction and presentation of the Biology lesson to the students is an important determinant in achieving the objectives of the Biology curriculum. All the teachers agreed that they follow their lesson notes in sequence in the presentation of the lesson.

Lesson is a teacher's guide and document which could be referred to any time the need arised. It allows orderly presentation of lesson to students, orderly conclusion and easy evaluation. It assists in commanding self respect for the teacher and improves teacher/students relationship, communication is always effective.

Table 4.7 Teachers Rating on Evaluation of the Biology Lessons

S/No	Items	Rating responses (effective implementation	Percentage Responses	Rating Responses (Weak implementation)	Percentage Responses
1.	Biology evaluation questions were suitable and easy to answer	10	47.2	10	47.2
2.	Biology questions adequately covered the lesson taught	1	4.8	20	95.2
3.	Responses of students showed generally that important parts of Biology lessons were well understood	4	19	17	81
4.	The evaluation questions were in agreement with the stated objectives prior to the lesson	16	76.2	4	19
5.	The assignment follow – up Biology already taught	21	100	-	-
6.	Biology follow – up activity are suitable	20	95.2	1	4.8
7.	Biology students are evaluated every week	4	19	16	76.2
8.	In every weekly evaluation there is remarkable improvement in the performance of Biology students.	6	38	13	61.9
9.	Biology syllabuses are adequately covered every term	1	4.8	18	85.7

The teachers rating on evaluation of the students after Biology instructions majority of the respondents indicated that Biology evaluation questions were suitable and easy to answer by the students after instructions, most of the teachers agreed that evaluation questions are in agreement with subject taught and the responses of the students indicated effective implementation, the majority of teachers disagreed that the syllabus are not always covered at the end of each term. This could affect the students performance in external exams, both WEAC, NECO and JAMB set their questions based on the syllabuses' whether completed by individual schools or not.

Table 4.8 Biology Teachers' Use of Teaching Method.

S/No	Methods	Frequency and percentage usage					
		Never		Occasionally		Frequently	
		Freq	%	Freq	%	Freq	%
1.	Lecture method	-	-	11	52.4	10	47.2
2.	Teaching	-	-	1	4.8	20	95.2
3.	Discussion	-	-	11	52.4	10	47.2
4.	Debate	1	4.8	16	76.2	4	19
5.	Experiments	1	4.8	18	85.2	2	9.6
6.	Discovery	6	28.6	5	23.8	10	47.2
7.	Assignment	-	-	5	23.8	16	76.2
8.	Excursion	10	47.2	9	42.9	2	9.6
9.	Questioning	-	-	11	52.4	10	47.2

The above result shows that the approved teaching methods by the NPE (2004), Teaching/Experimental method for Biology are not given much emphasis which has effects on the proper implementation of the Biology curriculum.

4.10 Teachers' Rating of Availability and Adequacy of Instructional Materials.

This section investigated information that gives account of the availability of instructional materials including the physical structures and furniture. The Biology Teachers rated the availability of the instructional material with a view to determine whether they are available and adequate for the attainment of the Biology Curriculum objectives. They registered using a rating value of adequate is considered as describing the instructional material available and useful; while undecided, inadequate describe them as not useful.

Table 4.9 Availability and Adequacy of Instructional Materials.

S/NO	Item	Rating Response (adequate)	Percentage response	Rating Response (not adequate)	Percentage Response
1.	Exercise books /pencils/pens	1	4.8	20	95.2
2.	Portable boards	9	42.9	12	57.1
3.	Television/video/VCD/DVD	11	52.4	10	47.2
4.	Radio/Radio Cassette	2	9.6	19	91,2
5.	Attendance register	21	100	-	-
6.	Microscope	3	14.3	18	85.2
7.	Refrigerator /grinders	8	38.1	13	61.9
8.	Measuring cylinders/scales	2	9.6	19	91.2
9.	Practical workbooks/textbooks	8	38.1	13	61.9
10.	Specimen/chemicals	5	23.8	16	76.2
11.	Hoe /cutlasses	1	4.8	20	95.2
12.	Gas cookers/cylinders/burners	7	33.3	14	66.7
13.	Test tubes/holders/.racks	1	4.8	20	95.2
14.	Fire extinguishers	3	14.3	18	85.2
15.	First aid box	3	14.3	18	85.2
16.	Biology Dissecting kit	2	9.6	19	91,2
17.	Buckets /plastics/basin/dustbins	8	38.1	13	61.9
18.	Charts/maps/pictures	1	4.8	20	95.2
19.	Classrooms	10	47.2	11	52.4

The above result shows that most of the instructional materials necessary for the successful implementation of the curriculum are inadequate or not available. The availability of instructional materials motivates the students and enhances learning, and it also reduces the stress of the teacher by presenting visible materials to further explain a point clearly. To the students seeing is believing which also promotes students/teacher relationship, students tend to be more involved physically in the classroom activities. This has a significant effect on the implementation of the Biology curriculum.

Table 4.10 Teachers rating the availability of physical facilities

S/No	Item	Rating response (available)	Percentage response	Rating response (not available)	Percentage response
1.	Independent Biology laboratory	4	19	17	81
2.	Botanical garden	2	9.6	19	91.2
3.	Internet facility			21	100
4.	Computers	2	9.6	19	91.2
5.	Utility water supply	14	66.7	7	33.3
6.	Electrical power supply	10	47.2	11	53.8
7.	Furniture's/cupboards	12	57.2	9	42.9
8.	Functional library with Biology updated text books	1	4.8	20	95.2
9.	School clinic	9	42.9	12	57.2

.The over collected data shows that most physical facilities necessary for the successful implementation of the Biology curriculum are not available in secondary schools used for this study. Independent laboratories, internet facilities, computers, functional libraries electric power supplies are very important in the study of modern Biology. Every day there are new discoveries in the world of Biology which the students will need to get in contact with. It promotes individual reading and instills the spirit of research in the students. They also assist and make the teachers work easy the students are able to find answers to questions that the teacher cannot answer instantly.

4.4 Observation Results of Effects of Class Size and the Implementation of the Biology Curriculum.

Observation schedule was used to determine the effect of class size on the proper implementation of the Biology curriculum in secondary schools in Kaduna Metropolis. A total of 20 marks were awarded to each of the five guidelines for the collection of the observed data at 100%. 3 classes were used a large class consisting of 70 students, a moderate class consisting of 50 students and a small class consisting of 40 students. Summary of analysis are presented in Table 4.12.

Table 4.11 Observation Schedule on the Effect of Class Size on Implementation of Biology Curriculum

S/No	Item Description	Large Class Rating		Moderate Class Rating		Small Class Rating	
		scores	%	scores	%	scores	%
1.	Class organization	10	47.6	15	69.8	19	99.9
2.	Students attention and interest	5	23.8	18	99	18	99
3.	Visibility of instructional materials	5	23.8	18	99	20	100
4.	Active participation of students	5	23.8	15	69.8	19	99.9
5.	Frequency of the students asking questions	5	23.8	15	69.8	19	99.9

From the observation results presented in Table 4.11 it is clear that class size is a strong determinant in the effective biology curriculum. The smaller the class size, the more effective the implementation is.

4.12 Rating Responses of Teachers on the Importance of Class Size

s/no	Item	Rating Response (effective implementation)	Percentage response	Rating response (weak implementation)	Percentage
1	The biology class I teach has 40 students and below	-	-	21	100
2	A large Biology class is easier to manage in terms class organization and control.	2	9.6	19	90.4
3	Students participate more in a large class	1	4.8	20	95.2
4	Instructional materials are more useful in helping the students to understand the subject taught in smaller size class than in large class.	21	100	-	-
5	Objectives of the Biology lesson are more achieved in a large class size	10	47.2	11	53.8

The above table shows that the Biology class in the study area more than 40 students the size approved by the (NPE 2004) . On whether a large Biology class is easier to manage in terms of class organization and control only 2 respondents representing 9.6% agreed with the statement while 19 respondents representing 90.4% disagreed with the statement. On the issue of the level students participation more in large class only 1 respondent agreed with the above statement the remaining 20 respondents representing 95.2% disagreed with the statement. Instructional materials are more useful in helping the students to understand the subject taught in smaller size class than in large size class all respondents agreed with the statement. Objectives of the Biology lessons are more achieved in a large class size, 10 respondents representing 47.2 agreed with the statement while 11 respondents representing 53.8 disagreed with the statement.

4. 13 Teachers' Qualification has Significant Effect on the Proper Implementation of the Biology Curriculum.

The respondents were presented with questions using the five stage linkert scales. Agreed and strongly agreed as effective implementation, while disagreed and strongly disagreed were considered weak implementation, undecided was discarded as no response. Summary of analysis is presented in Table 4.13

S/No	Item	Rating Response effective implementation	Percentage response	Rating Response (weak implementation)	Rating response
1.	Teachers with BSC/ed teach Biology better than those with BSC.	16	76.2	4	19
2.	Those who read general education are not suitable for teaching in secondary schools.	11	53.8	10	47.2
3.	PGDE should be discouraged, education should be provided in all subjects from the undergraduate level only.	9	42.9	12	57.2
4.	Un qualified Biology teachers are contributing to the problems of poor Biology implementation	21	100	-	-
5.	Government should stop recruiting candidate with BSC to teach Biology in our schools	10	47.2	11	52.8

The result of the collected data in Table 4.13 shows that unqualified Biology teachers are contributing to the of poor biology implementation in our schools all the respondents agreed with the statement. The Government should stop recruiting candidates with BSC (Single honour) to teach Biology in our secondary schools .The above results also show that teachers' qualification is an important phenomenon in curriculum implementation as only a qualified teacher could deliver the academic message effectively, in order to achieve objectives of Biology Teaching in our schools.

4.2 **Hypotheses Testing**

4.2.1 Null Hypothesis one

Null Hypothesis One: There is no significance effect of teacher qualification on the effective implementation of Biology curriculum.

To test this hypothesis, data from BTQ were analyzed using analysis of variance. Summary of analysis are presented in Table 4.18

Table 4.14 Analysis of Variance of the Significant of Teachers Qualification on the Effective Implementation of Biology Curriculum.

	Sum of squares	df	Mean square	f
Between	63.167	12		1.234
Within	51.979	9	5.264	2.80
Total	115,143	21		

= p .05

Table value .678

The result in Table 4.14 shows critical value of F at .05 level of significance and df of 9 is equal to be 1.234. The calculated value of F is less than the critical value of 2.80. This implies that there is a significant effect of teacher qualification on the implementation of the Biology Curriculum in public secondary schools in Kaduna metropolis. Thus the null hypothesis is retained.

4.2.3 Null **Hypothesis two**: there is no significant effect of availability of instructional materials on the effective implementation of Biology curriculum in public secondary schools in Kaduna metropolis.

To test this hypothesis data from BTQ were analyzed and summary of analysis are presented in table 4.15

Table 4.15 Analysis of Variance on Effect of Availability of Instructional Materials in Biology Curriculum Implementation.

	Sum of square	df	Mean square	f
Between	67.843	9	7.538	1,383
Within	59.967	12	5.452	2.80
Total	127.810	21		

= p.05

Table value .301

The results in Table 4.15 show that the critical value of F at .05 level of significance and df of 9 to be 1.383. The calculated value is less than the critical value of 2.80. This implies a significant effect in the adequacy and availability of instructional materials on the effective implementation of Biology Curriculum in Kaduna metropolis. The null hypothesis is retained.

4.14 Null **Hypothesis three**: There is no remarkable improvement from the students after Biology instructions, during both formative and summative evaluation.

Table 4.16: Analysis of Variance on Students improvement

	Sum of square	df	Mean square	F
Between	**23.410**	**5**	**5.852**	**1.201**
Within	**91,733**	**16**	**5.733**	**2.85**
Total	**127.810**	**21**		

Table value .426

The result in Table 4.16 shows that, the critical value of F at .05 level of significance and df of 5 is equal to 2.85 the cal= p .05.

Calculated value of 1.02 is less than the critical value . This implies that there is no remarkable improvement from the students at the end of Biology instructions. The hypothesis is therefore retained.

Null Hypothesis Four: Class size has no significant effect on the proper implementation of the Biology Curriculum.

Table 4.17 Analysis of the Data Collected on the Effect of Class Size on the Proper Implementation of the Curriculum.

	Sum of squares	df	Mean square	f
Between	62,167	12	6.397	1.234
Within	52.976	9	5.364	2.80
Total	115.143	21		

= p .05
Table value .678

The results in Table 4. 17 shows that, the critical value of F at 0.5 level of significance and the df of 12 equal to 6.397 with a calculated value of .678 is less than the critical value. This means the effect of class size is significant in the proper implementation of the Biology curriculum. The null hypothesis is therefore rejected.

4.1 Analysis of Data Generated via BSQ

Section A of Biology Students Questionnaire deals with Biographical data of respondents. Item one investigated the age of the students. The data generated were analyzed and used to draw table 4.20

Table 4.18: Biology Students by Age Range

Age range	Frequency	Percentage
15 – 18 years	99	74.3
19 – 22 years	32	22.5
Above 22 years	11	7.7
Total	142	100

The result in Table 4.18 shows that 99 Students out of 142 (representing 74%) are between 15 – 18yrs, the students are within the normal age range for effective learning. Also 23 students representing 23% of the students are between 19 – 22yrs old,

Item 2 of the BSQ investigated subject combination of students. The data generated were analyzed and use to draw figure 4.19.

Table 4.19: Biology Students by Subject Combination

s/no	Courses	No	Percentage
1	Sciences	102	71.2
2	Arts	30	21.1
3	Commercial	10	7.4
	Total	142	100

The result of in Table 4.20 shows that most of the respondents are science students and Biology is one of the most important and crucial subject for their further studies.

Section B of BSQ evaluated the implementation of the Biology Curriculum from the students' point of view Specifically the Biology Students were presented with statement s on the adequacy of the Biology curriculum; suitability of Biology textbooks, and the availability and utilization of Biology laboratory and their interest in the Biology lessons. The items were rated using five point linkert scales. See appendix 1 for details. The rating of each was taken as indicator of proper implementation or lack of it. For the purpose of this study, all ratings between agreed and strongly agreed are regarded to indicate successful implementation, while ratings between disagreed and strongly disagreed are taken to indicate poor implementation; undecided responses are discarded as waste response.

Table 4.21 Rating of Students Response on Biology Curriculum Implementation

S/No	Items	Rating Response (effective implementation)	Percentage Response	Rating Response(weak implementation	Percentage Response
1.	I enjoy Biology Lesson	100	70.9	42	29.1
2.	Iam studying Biology to meet the SSCE requirement	77	54.7	65	45.3
3.	Biology text books are too difficult to read and understand	56	39.7	86	60.3
4.	Biology is too wide and un precise	43	30.5	98	69
5.	Iam going for science related career.	70	49.7	70	49.7
6.	There are enough Biology teachers in my school	17	10	124	88
7.	Most health problems could be solved through using Biological sciences.	141	93	1	7
8.	I like laboratory experiments	140	85.9	2	14.1
9.	The laboratory in my school is well equipped.	2	14.1	140	85.9
10.	All practical materials are provided by the school.	-	-	142	100

The results emanating from Table 4.21 shows that the Students' are interested in the study of Biology but all the necessary equipments and infrastructures are not made available to schools under study. Instructional are not adequate. The Biology text books are not providing the fundamental knowledge as the students indicated that they are too difficult for personal reading and understanding.

4.5 Discussion of Results

1. Hypothesis one was focused on the availability of qualified Biology instructors/teachers necessary for the implementation of the Biology curriculum. The study revealed that there was a gross inadequacy of qualified Biology Teachers for the proper implementation of the Biology curriculum. According the curriculum implementation guide lines "when the number of teachers in a school is not adequate, the available ones are over worked which will also result in low production and efficiency. Lack of qualified teachers could lead to misinformation or shortage of information by the teacher." Similar studies by Denga (2001) also confirmed that teachers tend to teach in areas other than their areas of specialization. Bouro (2000) as part his recommendation in his study in curriculum implementation suggested that untrained teachers should be encouraged to go for PGDE.

3. Hypothesis two sought to find out on the availability and adequacy of instructional materials, equipments, infrastructures and furniture's necessary for the proper implementation of the Biology curriculum. The null hypothesis was rejected because there is significant effect of instructional materials on the implementation of the Biology Curriculum. Most of the instructional materials are either inadequate or not available in the public secondary schools in Kaduna metropolis. This has a serious effect in communicating the objectives of Biology to the students. What the teacher will find difficult to communicate to the students the instructional materials assist. It also helps in stimulating the interest of the students towards the study of Biology and promotes the spirit of research and personal studies. UNESCO (1962) postulated that no meaningful teaching and learning could take place without instructional materials. The teachers and learners require teaching materials to hold attention and develop interest in the lesson.

4 Hypothesis three revealed that there is no remarkable improvement from the student after receiving instruction. This implies that both summative and formative evaluation does not show any remarkable improvement on the part of the students, which could be as a result of lack of adequate teachers, application of poor teaching methods or lack of infrastructure, independent Biology laboratory in schools and insufficient laboratory equipments, non availability of practical materials affects Biology practical. Thus most of things necessary in terms of manpower and equipments are not available for the practical aspect of teaching and learning of Biology in our public secondary schools in Kaduna metropolis. Kolo (2004) studied secondary education in Kaduna state and investigated the readiness of secondary schools in Kaduna state to absorb the products Universal Basic Education (UBE). Facilities, laboratories and workshops, chemicals, textbooks, medical and secretarial facilities were either not available or where available grossly inadequate for effective curriculum implementation.

5. Hypothesis four also revealed that class size has important effect in the proper implementation of the curriculum. The classes used for this study were also faced with overpopulation problem. According the Educational policy, 40 students are adequate for a class but most classes are 60, 50, 45 etc. the teachers were over loaded and face class control and management problems. The study investigated the teaching strategy frequently used by the teachers in the implementation of Biology curriculum. Majority of the teachers used lecture method. Smith and Glass (1978) in their study "relationship between class size and achievement" concluded that small classes were superior in terms of students' achievement, teacher morale and the quality of instructional environment.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This study evaluated the implementation of Biology Curriculum in Kaduna metropolis secondary schools. The essence of the study is to evaluate the implementation of Biology Curriculum with a view to improving quality of teaching and learning the subject subsequently.

In the last chapter data collected via Teachers/students questionnaire, and observation schedule were analyzed in relation to the null hypotheses and five research questions were stated in chapter one. The results were subsequently discussed.

This chapter summarizes the whole study, and is presented under the following sub-headings; Summary, Findings of the Study, Conclusions, Recommendations, For Further Studies and Limitations.

5.2 Summary

This study evaluated the implementation of Biology Curriculum in public secondary schools within Kaduna state. The sample for this study comprises of 142 SS11 Biology Students and 17 Biology Teachers drawn from seven secondary schools in Kaduna metropolis. They were selected by simple random sampling technique. The theoretical frame work used for the study is the Griddle's Model of Policy Implementation

The statistics collected showed increase the rate failures every year in WASC results without much improvement. This is an indication that there is a problem with the implementation of the curriculum in the secondary schools. This requires an emergency action by the stake holders of secondary education in Kaduna public secondary schools. Over the years the Kaduna State government undertook several measures on its secondary schools to ensure effective implementation of the curriculum in general.

In 1985 the book policy was launched, in 1987 some schools were selected to serve as models of academic excellence, equipping the science laboratories, leverage was given to the secondary schools principals to spend money realized from schools to improve on their facilities and to boost the morale of their staff without the interference of the Ministry of Education. Literature search indicates poor performance of secondary school Students especially in science subjects largely blamed on the science teachers. It is for this reason that Biology curriculum was investigated into how it was being implemented in the public secondary schools in Kaduna metropolis.

The study reviewed the History of science education, Secondary education in Nigeria, the Biological Science Curriculum Study, the Biological Science Curriculum in Nigeria, Curriculum Implementation Guide lines. Roles of Ministry of Education/Teachers in curriculum implementation. Others Included roles of curriculum materials, teaching method, supervisory roles, and empirical studies.

A sample size of 10% of the population was used which is quite adequate (Rascoe 1975). The students used for the study are between the ages of 15-22 years, who had completed their primary schools, and junior secondary school. About 80% of the students are from the low level class in the society that requires much attention by the state Government.

The instruments used for the Data collection were the Biology Students questionnaire and the Biology Teachers questionnaire. The instruments were validated by the science specialist, Curriculum specialist, a language specialist, research statistics expert, and a biology teacher at secondary school level. Five questions were raised for this research to serve as guide for the study.

The study came up four Null hypotheses which are:

1. Teachers qualification has no significant effect on the proper implementation of the Biology curriculum.

2. Supply of instructional materials has no significant effect on the proper implementation of Biology curriculum in Kaduna metropolis.

3. There is no remarkable improvement from the students after Biology Instructions.

4. Class size has no significant effect on the proper implementation of the Biology c curriculum.

The scoring method used was the five Likert rating scales. Observation schedule was also used to determine the effect of class size on the implementation of Biology Curriculum.

The instruments were administered using the direct delivery technique. The t test statistics at $P \leq 0.05$ level of significance was used to determine the differences between the mean. The data were analyzed using statistical method for social sciences SPSS. Scores from the data were converted to percentages, means, standard deviations and results are presented in forms of tables as outlined in the previous chapter.

The study in its findings revealed that:

1 That differences exist between theory and practice in the implementation of the Biology Curriculum in public schools.

2. The Objectives of the Biology Curriculum have not significantly achieved in the public secondary schools in Kaduna metropolis.

3. Most of the instructional materials in the under study are either inadequate or not available.
4. There is gross inadequacy of qualified Biology Teachers for the proper implementation of the Biology Curriculum.

5. The schools used for this study face overpopulation problem.

5.3 Major Findings

At the end of the study the following findings were made

1. Teachers' qualifications have significant effects on the proper implementation of the curriculum. Regrettably most Biology Teachers are holders of B.SC. degree in which is a non teaching qualification. Holders of B.SC. Degrees in Biology are not professional Teachers and therefore cannot effectively implement the Biology curriculum. There is gross inadequacy of qualified Biology Teachers for the proper implementation of the Biology Curriculum.

2. Provision of instructional materials has a significant effect on the implementation of the Biology Curriculum. According the results most instructional materials are either not functional or not adequately available. Most of the instructional materials in the under study schools are either inadequate or not available.

3. Remarkable improvement expected from Students after the Biology instructions in all the schools used for the study was below average. The record shows that both the formative and summative evaluation was not yielding acceptable result. This has given the education authority much concern.

4. Observation schedule was used and chi square statistics was used to determine its effect on the implementation of the Biology Curriculum. Classes used were large class, moderate class, and small class size. The smaller the class size, the more effective learning takes place and easier class control and management becomes.

(i) A large class consisting of 50 Biology students was used for the observation. The large class was noisy, disorganized only few students were paying attention (those at the front seats), students at the back seats lost interest and engaged themselves in either copying other notes or discussing issues with their mates. Lecture method was predominantly employed. Visual teaching aids were not effectively used to attract students' interest.

(ii) The moderate class size consisting of 30 students was better organized, there was less noise and half of the students were attentive. The students were able to relate well with the teacher generally. The teacher has control of most of the students. Visual teaching aids were more conspicuous and the attention paid by students was high.

(iii) 15 Biology students were used for the small class size. Organization was effective and students were attentive and related well with the teacher. Visual teaching aids were distributed to each student. The teacher was able to control the class. Students were allowed to discover things on their own. The students were asking questions at short intervals. There was effective communication throughout the lesson.

Most of the schools visited were faced with problem of over population, during practicals most of the students could not gain access to the inside of the laboratory, instead they watch from outside through the laboratory window.

5. The Students questionnaire indicated that about 61 respondents representing 52.3% said Biology is too wide and un – precise. Also 49 respondents representing 34.8% believed

that there were no enough Biology teachers for the teaching of Biology in their school. Besides 80 respondents representing 56.8% study Biology because they are going for science related courses. About 36.9% agreed that Biology text books are too difficult to read and understand. About 33.6% were undecided about their interest in laboratory experiment lessons. Also 80% of the students said all health problems could solve through Biological sciences. About 44% of the students indicated that materials needed for practical lessons are procured by the schools. Others said they are studying Biology to meet up the SSCE requirements only not because they interested in the subject.

5.3.1 Conclusions:

From the findings of this study, the following conclusions are drawn:

Teachers' qualification has significant effect on Students achievement. A qualified instructor knows what teaching methods/strategy should be employed in any situation to pass the message across to the students. A well qualified teacher and good teaching method has significant effect in arousing the interest of the students.

Availability of instructional materials or otherwise has a significant effect in the learning and teaching of Biology. There is no way any teacher; institution could achieve the desired objectives in teaching and learning Biology at whatever level without instructional materials. The teaching method according to National Policy on Education (2004) should be discovery/laboratory experimental method, in which activity should be child centered. With instructional materials students can even take 50% for their academic work and self evaluation.

The remarkable improvement expected from the students after they receive Biology instructions is below average. Both summative and formative evaluation record shows below average record. This the study revealed that factors like in adequate qualified biology teachers, poor application of teaching method, lack of or inadequate instructional materials among others has contributed to the poor performance of the students.

Class size has significant effect on the Biology Students' achievement. An over populated class hinders effective teaching and learning. A moderate class size is more effective and allows proper communication between the teacher and the students'

5.3 Recommendations

On the basis of the findings and conclusions emanating from this study the following recommendations are made:

1. There should be sensitization periodic seminar for all Biology Teachers about Biology curriculum. How it should be implemented using the available resources and instructional materials, and ways to make Biology students learn and retain effectively. The world is a global village which is dynamic. Most curriculum review is due to global changes. When there is such a review of the curriculum sensitization lectures, seminars in order to enlighten the teachers is important. The teachers translate and present Biology to the students,

breaking them into syllabuses and scheme of works. The first evaluation of the curriculum objectives is also done by the classroom teacher.

2. The use of laboratory method of teaching has been discovered in this study to be relatively inferior, with respect to retentive ability and performance activity of the Biology students' in learning Biology concept. Biology teachers should be more attentive and exercise their expertise, and also perform their assign educational responsibilities so as to avoid a situation were under achievement and rote learning is promoted in the course of their bad teaching.

3. In service training, in house workshops, seminars, and conferences for Biology teachers should focus more on the curriculum and the teaching method and the use of laboratory for instruction.

4. The community should sensitized through the Parents Teachers Association meetings of the need to assist the schools in providing those items that the Government cannot adequately provide.

5. Encouragement and boosting the teachers' morale will go a long way in motivating them in their work. Motivation should come from the Government body concerned, PTA, and the school authority. Provision of instructional materials for the proper execution of their lesson is also part of motivation.

5.4 Limitations of the Study

The Study was limited to Senior School Schools within Kaduna Metropolis due to the vastness of the state. The limited resources available for this research could not adequately cover the whole state.

5.5 Suggestions for Further Studies

The researcher wishes to emphasize that this study is not a conclusion in itself but is opened to meaningful criticisms and further researches. In view of the numerous problems encountered by the teachers and students in teaching and learning of Biology, it will be difficult to justify that this study is exhausted in approach. Therefore in order to enhance further research in this discipline the following areas are suggested.

1. Studies of this nature be made to cover a wider geographical area. This study only evaluated the implementation of Biology Curriculum in public secondary schools within Kaduna metropolis with a sample of only seven schools. The study may be extended to cover the whole Kaduna State.

2. The study can be extended to the tertiary level of education to investigate if educational level has an impact on the variable that this study dealt with.

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APPENDIX A

THE EVALUATION OF IMPLEMENTATION OF BIOLOGY CURRICULUM IN PUBLIC SECONDARY SCHOOLS WITHIN KADUNA METROPOLIS IN KADUNA STATE.

Students' Achievement Test for pilot Study:

Name of school: ……

Class: ……

Sex: male ( ) female ( )

Age:

ACHIEVEMENT TEST

INSTRUCTIONS:

Answer all questions
Each question is followed by four letter options lettered A – D or A – E. Find out the correct option for each question and shade in pencil on your answer sheet, the answer space which bears the same letter as the option you have chosen. Give only an answer to each question.

1. The source of Air pollutants are;
   (a) Industrial chimneys, burning fossil oils and river dams
   (b) Sulphur, dioxide, acid rain and pesticides.
   (c) Sulphur mines, vehicle exhausts and aerosol
   (d) Sewage, smoke and old vehicles.

2. Which of these cannot be controlled by killing the vector?
   (a) River blindness
   (b) Malaria
   (c) Polio
   (d) Cholera
   (e) Bilharzias (schistosomiasis).

3. Which of the following is not regarded as a pollutant on land or in the Air?
   (a) Smoke
   (b) Noise
   (c) Sulphur dioxide
   (d) Nitrogen
   (e) Carbon monoxide

4. Which of the following diseases could be exclusively associated with river basin.
   (a) Malaria

(b) Syphilis
(c) Onchorcerchiasis
(d) Cholera
(e) Poliomyelitis.

5. Which of the following causes pollution?
(a) Consumption of canned drinks
(b) The addition of fertilizer to farm land.
(c) Respiration of living organisms
(d) Burning of refuse.

6. The Mineral Nutrient that is most bound to the soil is
(a) Phosphorous
(b) Calcium
(c) Iron
(d) Potassium

7. Which of the following constitute pollution?
(a) Dropping birds
(b) Loud disco music
(c) A pack of cigarettes
(d) Refuse in an incinerator

8. Which of pollutant is responsible for causing Asthma?

(a) Air pollutant

(b) Water pollutant

(c) Noise

(d) Land pollutant

9 Which is the most important pollutant of the marine environment in Nigeria?

(a) insecticides

(b) Sewage

(c) Oil

(d) Inorganic fertilizers

10. Pollution in Latin language means pollure of an environment

True or false?

11. Air pollution can be caused by these chemicals except

(a) Carbon monoxide

(b) Domestic Combustion

(c) Fertilizers

(d) Fluoride

(e) Sulphur dioxide

12. Fluoride is involved in the manufacturing of

(a) ……..

(b) ……

(c) ……

(d) ……

13 Oil pollution affect directly the vertebrae of the following Sea animals except

(a) Sea birds

(b) Snakes

(c) Seals

(d) Fish

14 When the plank tonic vertebrates are affected by oil pollution the whole food chain is affected. True or false?

15 Coke and Coal contains about

(a) 5 – 6 % sulphur

(b) 3 – 1% sulphur

(c) 2 – 1 % sulphur

(d) 1 – 2 % sulphur

16 What is B.O.D?

17 Control of Oil rig pollution include all except
(a) Spraying the marine with insecticides
(b) Covering oil with an absorbent
(c) Spraying the oil with solution of plastic
(d) Adding heavy materials to the oil causing it to sink

18 Which is not a man made pollutant?
(a) Domestic fire pollution

(b) Grit pollution
(c) Sulphur dioxide pollution
(d) Carbon dioxide

19 Industrial waste pollution includes all except
(a) Tars
(b) Hydrogen sulphide
(c) Sulpuhuric acid
(d) Copper

20 Causes of terrestrial pollution does not include
(a) Radioactive numerals
(b) Dumped wastes
(c) Noise
(d) Derelict building s and lands

21 Enumerates the two distinct type of terrestrial pollution

22 The characteristics of a good pest should be …….. Expect
(a) Specific only to the pest it is directed at
(b) Rapidly broken down and not persist in the natural environment
(c) Should kill some terrestrial animals containing bacteria
(d) Not be accumulated through food chain.

23 Which of the following is not caused as a result of radioactive pollution?
(a) Mutation (Effect of human chromosomes)
(b) Cancer
(c) Bronchitis
(d) Leukemia

24 Radioactive pollution is caused by all except
(a) Nuclear Energy
(b) X- rays
(c) Long live Waste
(d) Oil spillage

25 Asthma is a disease of the
(a) Brain
(b) Digestive tract
(c) Respiratory tract
(d) Spinal cord

26 Land pollution can be controlled by ……Expect
(a) Proper Disposal
(b) By controlling the feeding habit of the people
(c) By providing Dustbin
(d) By recycling of bins

27 Noise pollution can cause
(a) Blindness
(b) Nervousness
(c) Deafness
(d) Asthma

28 Cholera can be caused by
(a) Air pollutants
(b) Land pollutants
(c) Water pollutants
(d) Noise pollutant

29 Eutroplucation and algae blooms leading to oxygen defiency in the river can be caused as a result of
(a) Organic fertilizer pollution
(b) Dead fish/seals pollution
(c) Oil rig pollution
(d) Over fishing

30 Leukemia is the disease of
(a) Red blood cells/bone marrow
(b) White blood cells
(c) Platelets
(d) Arteries

APPENDIX B

ZAINAB ZUBAIRU

Department of Education
Ahmadu Bello University
Zaria

BIOLOGY TEACHERS QUESTIONNAIRE

Dear Biology Teachers

Iam conducting a study evaluate how Biology Curriculum is being implemented in public secondary schools within Kaduna metropolis. It is hoped that the findings of the study will help to improve the quality of Biology teaching and learning. You have been identified as a source of data for the study.

You are therefore kindly requested to respond to the item of this questionnaire as it applies to you. Needless to say all responses will be treated confidentially and use only for the purpose of this study.

Thanks for your co operation.

SECTION A BIO-DATA OF RESPONDENTS

INSTRUCTIONS.

For item 1-5 tick the response that best applies to you.

1. Highest qualification
   - (a) N.C.E. ( )
   - (b) O.N.D ( )
   - (c) BA/ED, BSC/ED ( )
   - (d) PGDE ( )
   - (e) MA/MSC ( )
   - (f) M.ED ( )
   - (g) Ph. D ( )
   - (h) Others ( ) specify

2. Years of teaching experience
   - (a) 1-2 years
   - (b) 3-4 years
   - (c) 5-6 years
   - (d) 7-8 years
   - (e) Above 8 years

3. Gender: male ( ) female ( )

SECTION B

INSTRUCTIONS: For items 1- 7 in this section, statements are made, against each statement a 5 linkert scale is provided to measure the extent of your agreement or otherwise. For each item, tick the response that best applies to you

S/No	Items	Agreed	Strongly Agreed	Disagreed	Strongly Disagreed	undecided
1.	The basic Biology Curriculum is adequate for the learners					
2.	The Biology textbooks are too difficult for the learners to read and understand					
3.	There are enough Biology instructors for the implementation of biology Curriculum					
4.	All Biology Teachers used discovery and laboratory experimental methods of teaching					
5.	Both indoor and outdoor laboratory activities are carried out as specified in the time table					
6.	Laboratory is not ideal in the implementation of Biology curriculum					
7.	Biology scheme of work are always reviewed, broken down and made available at the beginning of every term					

SECTION C

INSTRUCTIONS: For item 1-7, tick the response that best applies to you

S/No	Item	Agreed	Strongly Agreed	Disagreed	Strongly Disagreed	Undecided
1.	Previous knowledge is in agreement with present Biology topic					
2.	Statement of previous knowledge always exposed the knowledge of the subject matter					
3.	The stated objectives are in agreement with the Biology topic					
4.	The Biology objectives has a performance statement					
5.	The resources for the for Biology theory/practical are listed prior to the lesson					
6.	Biology resources listed showed the extent to which the teacher is good in teaching Biology					
7.	Biology resources provided during practical/theory lessons are adequate for the number of Biology Students					

INSTRUCTIONS For items 1-7 tick the response that best applies to you

S/No	Item	Agreed	Strongly Agreed	Disagreed	Strongly Disagreed	Undecided
1.	Introduction of the lesson create a conducive atmosphere					
2.	introduction in Biology lessons linked the new lesson introduced to the previous ones					
3.	Presentation steps/skills are always logical and sequential					
4.	methods used in each step of Biology lesson are suitable					
5.	The students always show interest and actively participate					
6.	the Biology Teachers adequately rounded up Biology lessons					
7.	The Biology teacher brought out the important points of the topic in the summary.					

INSTRUCTIONS: For item 1-9 tick the response that best applies to you

S/No	Items	Agreed	Strongly Agreed	Disagreed	Strongly Disagreed	Undecided
1.	Biology evaluation questions were suitable and easy to answer					
2.	Biology questions adequately covered the lesson taught					
3.	Responses of the students showed generally that important parts of the Biology lessons were well understood					
4.	The evaluation questions were in agreement with the stated objectives prior to the lesson					
5.	The assignment follow – up Biology already taught					
6.	Biology follow – up activity are suitable					
7.	Biology students are evaluated every week					
8.	In every weekly evaluation there is remarkable improvement in the performance of Biology students.					
9.	Biology syllabus are adequately covered every term					

INSTRUCTIONS: For item 1-9 tick the response that best applies to you

S/No	Methods	Frequency and Percentage Usage					
		Never		Occasionally		Frequently	
		Freq	%				
1.	Lecture method						
2.	Teaching						
3.	Discussion						
4.	Debate						
5.	Experiments						
6.	Discovery						
7.	Assignment						
8.	Excursion						
9.	Questioning						

INSTRUCTIONS: For item 1 – 15 tick the response that best applies to you

Availability and adequacy of instructional materials.

S/No	Item	Rating Response (adequate)	Percentage response	Rating Response (not adequate)	Percentage Response
1.	Exercise books /pencils/pens				
2.	Portable boards				
3.	Television/video/VCD/DVD				
4.	Radio/Radio Cassette				
5.	Attendance register				
6.	Microscope				
7.	Refrigerator /grinders				
8.	Measuring cylinders/scales				
9.	Practical workbooks/textbooks				
10.	Specimen/chemicals				
11.	Hoe /cutlasses				
12.	Gas cookers/cylinders/burners				
13.	Test tubes/holders/.racks				
14.	Fire extinguishers				
15.	First aid box				
16.	Biology Dissecting kit				
17.	Buckets /plastics/basin/dustbins				
18.	Charts/maps/pictures				
19.	Classrooms				

INSTRUCTIONS: For item 1 – 9 tick the response that best applies to you

Table 4.10 Teachers rating the availability of physical facilities

S/No	Item	Rating Response (Available)	Percentage Response	Rating Response (not available)	Percentage Response
1.	Independent Biology laboratory				
2.	Botanical garden				
3.	Internet facility				
4.	Computers				
5.	Utility water supply				
6.	Electrical power supply				
7.	Furniture's/cupboards				
8.	Functional library with Biology updated text books				
9.	School clinic				

INSTRUCTIONS: For item 1 – 5 tick the response that best applies to you

4.12 Rating Responses of Teachers on the Importance of Class Size

S/No	Item	Rating Response (Effective Implementation)	Percentage response	Rating Response (Weak Implementation)	Percentage
1.	The biology class I teach has 40 students and below				
2.	A large Biology class is easier to manage in terms class organization and control.				
3.	Students participate more in a large class				
4.	Instructional materials are more useful in helping the students to understand the subject taught in smaller size class than in large class.				
5.	Objectives of the Biology lesson are more achieved in a large class size				

INSTRUCTIONS: For item 1 – 5 tick the response that best applies to you

4. 13 Teachers' Qualification has Significant Effect on the Proper Implementation of the Biology Curriculum.

S/No	Item	Rating Response (effective implementation	Percentage response	Rating Response (weak implementation)	Rating response
1.	Teachers with BSC/ed teach Biology better than those with BSC.				
2.	Those who read general education are not suitable for teaching in secondary schools.				
3.	PGDE should be discouraged, education should be provided in all subjects from the undergraduate level only.				
4.	Un qualified Biology teachers are contributing to the problems of poor Biology implementation				
5.	Government should stop recruiting candidate with BSC to teach Biology in our schools				

APPENDIX C

ZAINAB ZUBAIRU

Department of Education
Ahmadu Bello University
Zaria

BIOLOGY STUDENTS QUESTIONNAIRE

Dear Biology Students

Iam conducting a study evaluating how Biology Curriculum is being implemented in public secondary schools within Kaduna metropolis. It is hoped that the findings of the study will help to improve the quality of Biology teaching and learning. You have been identified as a source of data for the study.

You are therefore kindly requested to respond to the item of this questionnaire as it applies to you. Needless to say all responses will be treated confidentially and use only for the purpose of this study.

Thanks for your co operation.

SECTION A BIO-DATA OF RESPONDENTS

INSTRUCTIONS.: For item 1-5 in this section, statements are made against each item. For each item, tick the response that best applies to you.

1. Name of School
2. Class
3. Sex
   (a) Male ( )
   (b) Female ( )

4. Age
   (a) 15 – 18 years ( )
   (b) 19 – 20years ( )
   © 23 – 25years ( )
   (d) 26 – 29years ( )
   (e) Over 30years ( )

5. Course Offered ( )
   (a) Science ( )
   (b) Arts ( )
   © Commerc e ( )

SECTION B

INSTRUCTIONS: For item 1 – 10, statements are made against to measure the extent of your agreement or otherwise, tick the response that best applies to you

S/No	item	Rating Response (Effective Implementation)	Percentage Response	Rating Response(Weak Implementation	Percentage Response
1.	I enjoy Biology Lesson				
2.	I am studying Biology to meet the SSCE requirement				
3.	Biology text books are too difficult to read and understand				
4.	Biology is too wide and un precise				
5.	Iam going for science related career.				
6.	There are enough Biology teachers in my school				
7.	Most health problems could be solved through using Biological sciences.				
8.	I like laboratory experiments				
9.	The laboratory in my school is well equipped.				
10.	All practical materials are provided by the school.				

APPENDIX D

OBSERVATION SCORE SHEET

Observation Schedule on the Effect of Class Size on Implementation of Biology Curriculum.

S/No	Item/description	Large class rating		Moderate class rating		Small class rating	
		scores	%	scores	%	scores	%
1.	Class organization						
2.	Students attention and interest						
3.	Visibility of instructional materials						
4.	Active participation of students						
5.	Frequency of the students asking questions						

APPENDIX E

Guttman Half-Split Method For the Achievement Test Reliability Test

$$Rtt = \frac{2\ ½\ ½}{1+ r\ ½\ ½}$$

Where rtt – estimate reliability for the whole test
r ½ ½ - reliability of the half test

$$rtt – \frac{2(0.4)}{1 + 0.4 = 0.6466}$$

rtt - = 0.65

T –TEST OF INDEPENDENT VARIABLES USED FOR THE NULL HYPOTHESES

Formula used:

$$t = \frac{x - \mu}{SEC\ X}$$

t =