PERCEPTION OF BIOLOGY LITERACY BY SENIOR SECONDARY SCHOOL STUDENTS IN EKITI STATE, NIGERIA

ORAL DEFFENCE

BY

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CERTIFICATION

This is to certify that this study was carried out by Durojaiye, Folake Felicia 08/68SC007, in partial fulfillment of the requirements for the award of Doctor of Philosophy (Ph.D.) Degree in Science Education in the Department of Science Education, Faculty of Education, University of Ilorin, Ilorin, Nigeria

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DEDICATION

This work is dedicated to God Almighty, who gives life and who granted the strength and health to complete this course of study.

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ABSTRACT

Problems of students' poor performance in biology and application of the knowledge, as revealed by researchers, may be due to the students' perception of biology literacy. Investigating students' perception of biology literacy should reveal information about their ideas of biology knowledge, skills, and attitudes. Therefore, the objectives of this study was to investigate the senior school students' perception of biology literacy, based on: (i) biology knowledge, skills, and attitudes; (ii) students' school location; (iii) class level; (iv) gender; (v) score level; (vi) preference for future career; and (vii) the school type.

A descriptive research design of the survey type was adopted for the study. The population for this study was all senior secondary school students in Ekiti State, Nigeria. Proportional random sampling technique was used to select 20% of schools in the State. Stratified random sampling technique was used to select 730 students who participated in the study. The instruments for the study were a questionnaire, entitled, "Students' Perception of Biology Literacy" and a proforma for collecting students' cumulative end-of-term results in biology to determine the students' score levels. Cronbach alpha was used to determine the reliability of the questionnaire, with a co-efficient of 0.84. Research questions were answered using the mean and the standard deviation. Six hypotheses were generated and *t*-test and ANOVA statistics were used to test the hypotheses at 0.05 alpha level of significance.

The findings of the study were that:

(i) the perception of biology literacy was high, in favour of knowledge [(X = *90.35)* > attitudes (X = 59.75) and > skills (X = 59.08)];

(ii) there was no significant difference in the perception of biology literacy by senior school students' based on school location;

(iii) there was a significant difference in the perception of biology literacy by senior school students' based on class level in favour of S.S. 2 ($F_{(2,728)}$ =15.25, $p < 0.05$);

(iv) there was a significant difference in the perception of biology literacy by senior school students' based on gender, in favour of male students ($t_{(728)}$ =12.*28*, $p < 0.05$);

(v) there was a significant difference in the perception of biology literacy by senior school, students' based on score level, in favour of high scorers ($F_{(2,728)} = 9.28$, $p < 0.05$);

(vi) there was a significant difference in the perception of biology literacy by senior school students' based on preference for future career, in favour of students who preferred biology- related careers ($t_{(728)} = 4.19$, $p < = 0.05$);

(vii) there was a significant difference in the perception of biology literacy by senior school students' based on school type, in favour of private school ($t_{(728)} = 2.27$, $p < 0.05$)

The study concluded that senior school students in Ekiti State had high perception of biology literacy in favour of biology knowledge. This implies that the students' perception was better in biology knowledge than skills and attitudes. It was therefore

recommended that biology teachers should endeavor to develop students' biology skills and attitudes through regular practical works to improve their overall biology literacy.

CHAPTER ONE

INTRODUCTION

Background to the Problem

The role of science in national development cannot be over-emphasized; the knowledge of science is used tremendously in solving diverse problems of humanity and providing solution to natural and artificial problems in the world at large. In considering the role of science and technology in national development in Nigerian context, it is necessary to identify the factors that would bring about national development. National development entails producing more and better food to eat, healthier and happier individuals, better living accommodation systems, sound education and enlightenment among populace

Science becomes relevant to development only when people realize its importance and develop positive attitude towards it as a developmental tool. Most civilizations and technological advancements in both developed and developing countries hinge on science. According to Abimbola and Omosewo (2006), "Science is a body of knowledge, a way of investigating or method, and a way of thinking in the pursuit of an understanding of nature." Soyibo, Ekpunobi, Akinade, Tureta (2013), define science as the systematic study of natural phenomena in our environment. It consists of the accumulated knowledge of subject areas and the methods by which discoveries are made. Olorundare (2014) define science as the quest for knowledge generally in the physical earth and biological disciplines.

Science and scientific method are significant instruments used in solving man's practical problems. According to Abimbola (2009) science is a human activity which people engage in daily. This is what could be termed as scientific literacy for all. According to Gormally, Brickman and Lutz (2012) the development of students' scientific literacy is very important in science education. Science is classified into two broad areas: the pure science and the applied science usually referred to as technology. Pure science includes Biology, chemistry and physics. The performances of students in these subjects are the major concern in science education as identified by many science educators among which are Abimbola, Olorundare, Omosewo, Ahmed, Upahi and Yahaya (2011)

If Nigerians are to develop and maintain a democratic republic where the citizens would be knowledgeable enough to intelligently participate in decision making on public issues, then they must be scientifically literate. This study focuses on biology literacy. Biology is taught in senior secondary schools in Nigeria. It deals directly with human being. It is the science subject that deals with the study of life. And everyone who needs life needs the knowledge of Biology that is, needs to be literate in Biology. Biology is made up of topics and concepts which would bring about human good health and happiness. Human beings need the knowledge of Biology to maintain good health, safe shelter and environment to pursue their goals in life. (Soyibo Ekpunobi, Akinade AkinadeTureta(2013). Coll and Taylor, (2009) opined that biology literacy is viewed as a primary goal of biology Education. This is in agreement with Abimbola and Abidoye(2013) who submitted that the goals of biology education are to:

1. Provide basic literacy in biology for functional living.

2. Acquire essential scientific skills and attitudes as a preparation for the technological application of biology.

3. Acquire basic concepts and principles of biology as a preparation for further studies

4. Stimulate and enhance creativity.

According to Miller (2011) biology literacy deals with acquisition of biological attitudes, skills and knowledge that allow people to participate in biological debates and develop problem-solving skill and decision making skills in their everyday lives. This definition is in line with the new senior secondary biology curriculum (2009) .Therefore the framework of working the concepts of biology literacy was based on this definition. The biological attitudes, skills and knowledge are imbedded in the new senior secondary biology curriculum (2009) where the aims and objectives are:

(1) To prepare students to acquire adequate laboratory and field skills in biology,

(2) Meaningful and relevant knowledge in biology

(3) Ability to apply scientific knowledge to everyday life in matter of personal and community health and agriculture

(4) Reasonable and functional scientific attitudes

In pursuance of the stated objectives, the contents and the context of the curriculum places emphasizes on fields studies, guided discovery, laboratory techniques and skills along with conceptual thinking. The curriculum intended to meet the needs of

the students and the society through relevant and functionality in its contents, methods, processes and applications. It covers the major themes of:

i. Organization of life
ii. Organisms at work
iii. The organisms and its environment
iv. Continuity of life.

The contents in each of these themes are spirally distributed from senior secondary 1 to senior secondary 3; these themes are of direct relevance to the learner and the society. The topics that are of direct relevance to the learners and the society are included under each of the themes such as recognizing living things, classification of living things, nutrition in plants and animals, basic ecological concepts, relevance of biology to agriculture, microorganisms around us, towards better health, reproduction in unicellular animals, invertebrates and vertebrates .The curriculum is based on conceptual approach each concept has its main objectives.

The concept of living is to allow the students to have correct conceptions of living things by studying the characteristics of living organism; in order to differentiate between living things and non-living things and to see themselves as part of the living world. In plants and animals' nutrition they are expected to see nutrition as requirement for life, in basic ecological concept students are to learn interaction among organisms in nature and problems that are ecological in nature should be identified and solved. The objectives of the concept of relevance of biology to agriculture is to allow the students to acquire the knowledge to ensure adequate growing of crops and keeping of animals in

agriculture ,the knowledge of microorganism around us and toward better health are to allow students to maintain good personal hygiene to avoid sicknesses and diseases. Practical works are involved under each of the theme to develop in students' adequate laboratory and field skills and to also help students to acquire reasonable and scientific attitudes as stipulated in the objectives of the senior secondary biology curriculum (2009)

These biological attitudes and skills are developed through practical work and acquisition of biological knowledge would be through proper teaching methods. In line with this, the knowledge to be taught, the performance objectives, the biological attitudes and skills to develop in students, the teaching and learning materials to be used and the evaluation guide are fully set out in the curriculum. From the contents in biology curriculum, one would conclude that if the students are properly taught and are motivated towards the acquisition of biology literacy all the students will be able to apply the biological knowledge to everyday life in matters of personal and community health, live effectively within one's immediate environment and the modern world and also apply biological knowledge to solve problems. This is in support of Abimbola (2009), Nwagbo and Adams (2012) who submitted that students should be able to make connections between what they learn at school and how it can be applied to their everyday life.

According to Celtin (2014) the purpose of biology course is not only to prepare students for the university entrance examination but also to provide them with biology literacy but it was discovered that biology students cannot make conceptual association between their knowledge of biology and their everyday life. This shows that the students are not literate in biology. They cannot turn their knowledge of biology into practical

knowledge (Kurt, Kaya, Ates & Kilic, 2009). The students' perception of biology literacy may be responsible for this. Perception according to Advanced Oxford English (2015) is define as an idea, a belief or an image you have as a result of how you see or understand something

There are many studies in science education that investigate into the problem of poor performance of students in science subjects and they found the following factors to be responsible: difficulties concepts (Ahmed, 2008; Olorundare, 2014), misunderstood word by both students and the teachers (Abimbola , 2013), lack of adequate laboratories materials, library and text books, time constraints in teaching science (Oyekan ,2011) teachers, students parents and school factor (Omosewo 2008, Edomwonyi – Out & Avaa 2011). But none of these studies specifically investigate into students' perception of biology literacy

According to Celtin (2014) for the knowledge of biology to be more effective and permanent, students' perception of biology and what their expectation are from the subject must be understood. There is need for students' proper perception of biology before they can become literate in the subject; this is in support of Uno (2009), Nwagbo and Adams (2012) who discovered that the majority of the students are not at the required level of biology literacy. The perception of students on biology literacy may also be responsible for not attaining the higher level of biology literacy.

According to Njoku (2011) there is a connection between a biologically literate citizenry and strong economic productivity in wealthy nations where biological and biotechnical advancements has led directly to increase economic developments. Biology

literacy is important in the area of personal and community health. According to Soyibo, Ekpunobi, Akinade, Tureta (2013) biology addressed all what would bring about human good health, happiness and survival. Despite all these benefits, biology was removed as one of the core science subjects to be offered by all senior secondary school students in Nigerian new curriculum as identified by Abimbola (2013) that science subjects have lost out in the new senior secondary school curriculum because it is no longer a requirement for all the senior secondary school students to offer one science subject as part of the core subjects. The new core subjects are English language, General Mathematics, Civic Education and one trade or entrepreneurship subject. This may not help in the development of a scientifically literate society devoid of ignorance and diseases.

In Nigeria, it was discovered that there was lack of public understanding about major health issues, this was observed during the period of Ebola in 2014 when some people were eating bitter kola, taking potash alum, drinking palm wine and table salt solution to prevent infection from Ebola virus. Nigeria being one of the developing nations of the world needs the knowledge of biology to avert some of the biological related problems such as air, water, land pollutions, over population, infectious diseases, cholera outbreak and common malaria that are claiming the lives of many people. A proper perception of biology as the subject which deals directly with human life, improves all aspects of life on earth would help to improve students' performance.

Students learning is influenced by many factors such as students' gender (John, 2007; Durojaiye, 2012; Baanu, 2014) school location (Maliki, Ngban and Ibu, 2009 ; Okereke & Onwukwe, 2011) school type (Malic, Ngban and Ibu 2009, Familola, 2011) class level (Cheung 2007, Afuye 2008,) the students' academic ability level(Onijamowo,

2010; Balogun 2010), and students' preference on a career (Kanan and Baker, 2006; Juma , 2015) it was discovered that there have been some significant differences in favour of each end of the dimension of these variables but in some cases there was no significant difference, the inconclusive nature of the above learners' factors made the researcher to include them in this study as variables to be investigated. To find out the possible influence they may have on this study.

This study investigates the students' perception of biology literacy in order to enhance their better performance in biology.

Statement of the Problem

There have been various studies on the poor performance of students in science subjects among which biology is one and the factors influencing the poor performance ranging from non-human factors such as difficult concepts, lack of adequate laboratories materials, library and text books, time constraints in teaching science (Ahmed, 2008; Oyekan, 2011; Olorundare, 2014) and the human factors such as teachers, students parents , school factor and misunderstood words by both biology students and teachers; as identified by (Omosewo, 2008; Edomwonyi – Out& Avaa 2011; Abimbola, 2013).

To the best of researcher's knowledge as at the time of this study no study has been carried out on students' perception of biology literacy as the researcher could not lay hand on such study. This study therefore hopes to fill the gap in the area of students' perception of biology literacy. According to Celtin (2014) for the knowledge of biology to be more effective and permanent, students' perception of biology and what their expectation are from the subject must be understood. Perception of students on teaching

and learning is very crucial for a meaningful learning as it influences the individual's actions and behavior toward the learning task. According to Nauert (2015) an individual's perception of learning influences one's motivation to learn. The findings of many researchers showed that perceptions influences learning. Some of these studies include that of Centra & Gaubatz (2005); Luketic & Dolan (2013) and Olibie, Anyikwa, & Okoli (2014)

Centra and Gaubatz (2005) worked on validity of students ratings of instruction using students perceptions of learning as criterion, it was discovered that, when a student rates overall instruction as effective, there was a correspondingly high perception of learning. Luketic & Dolan (2013) investigated factors influencing students' perception of high-school science laboratory environment and the study found that students' perception of their laboratory could be influenced by the extent of students' experience in learning science. Olibie, Anyikwa & Okoli (2014) found that teachers perceived that instructional media have positive and beneficial effects on teaching and on pupils' learning interest and participation in BST (Basic Science and Technology).This study therefore sought to investigate students' perception of biology literacy in order to assist them in having the proper perception of biology for functional living.

However, the Senior Secondary Education Curriculum: Biology for senior secondary Schools 1-3 provided all what will bring about students acquisition of biology literacy. But students always have the least percentage of credit pass in biology among the three science subjects as identified by Olorundare (2014). Students' perception of biology literacy may be responsible for this. Hence the need to investigate students'

perception of biology literacy to gear students' towards the proper perception of biology literacy in order to improve their performance in biology

Purpose of the Study

The purpose of this study is to investigate the biology literacy perception of senior secondary school students and the factors that influence its use to enhance living situation and performance in Ekiti State, Nigeria

Specifically, attempts was made in the study to investigate:

1. Perception of senior secondary school students on biology literacy based on knowledge, skills and attitudes

2. Perception of biology literacy in Ekiti State, Nigeria based on the senior secondary school students' school location

3. Perception of senior secondary school students on biology literacy based on their class level

4. Influence of senior secondary school students' gender on the perception of biology literacy

5. Perception of biology literacy based on the senior secondary school students' score levels.

6. Perception of biology literacy based on senior secondary school students' preference on future career

7. Perception of biology literacy based on the senior secondary school students' school type

Research Questions

In this study answers were sought to the following questions:

1. What is the perception of senior secondary school students on Biology literacy?

2. What is the influence of school location on the perception of senior secondary school students' on biology literacy?

3. What is the influence of class level on the senior secondary school students' perception of biology literacy?

4. Would gender have influence on the senior secondary school students' perception of biology literacy?

5. Is there any difference in the perception of senior secondary school students based on their score levels?

6. Does career choice influence the senior secondary school students' perception of biology literacy?

7. Is there any difference in the perception of senior secondary school students on Biology literacy based on the school type?

Research Hypotheses

The following research hypotheses were tested:

HO_1: There is no significant difference in the perception of senior secondary school students on Biology literacy based on the school location

HO_2: There is no significant difference in the perception of senior secondary school students on biology literacy based on the class level.

HO_3: There is no significant difference in the perception of senior secondary school students on Biology literacy based on gender.

HO_4: There is no significant difference in the perception of senior secondary school students on biology literacy based on their score levels

HO_5: There is no significant difference in the perception of senior secondary school based on their preference on the choice of future career

HO_6: There is no significant difference in the perception of senior secondary school students on biology literacy based on the students school type

Scope of the Study

This study focuses on senior secondary school students' perception of biology literacy among the senior secondary school students in Ekiti State. The students who were involved in this study were selected among the senior secondary schools in the three senatorial districts of the State. Questionnaire was given to the students in SS 1 to SS 3.

Students' variables such as the school location, the class levels, gender, score levels, choice of career and the school type, were considered

The content areas for the treatment was drawn from the new biology curriculum for Senior Secondary Schools 1-3 (2009)

Significance of the Study

This study would show the perception of students on biology literacy. The findings of this study would be significant to educational policy makers, educational researcher, curriculum development, textbook writer, biology teachers, students and other researchers in biology.

The finding of this study would expose the policy makers to the perception of students on biology; it would also expose them to the importance of biology to everyday life of an individual and to the society at large. This would help them to develop a policy or include in the policy to educate the masses about the importance of biology literacy. This would be done by organizing public enlightenment in different languages, workshops, books and journals, especially for those who will not pass through formal education.

Educational research would also find this study to be of great assistance in the field of Biology researches as this would expose them to carry out further research in the field of biology that would help the senior secondary school biology students to improve on their performance in biology.

This study would help in curriculum development as it could provide necessary information to curriculum planners to guide them on how to improve the existing Biology curriculum at the senior secondary school level. Curriculum materials would be designed to include such learning experience that would help to develop students' literacy in biology.

The outcome of this study may provide insight for textbook writers and publishers on the need to produce textbooks that will develop students literacy by relating the content of the subject matter with what is happening in the students' immediate environment and the society at large.

This study would be significant to the teachers in Nigeria because teachers are very important in the overall development of any nation through their impact on educational system; teachers determine the quality of education and its contribution to national development. This study would therefore expose the teacher in Nigeria to the necessity of equipping and updating their knowledge and skills in Biology. The findings of this study would also help in teaching and learning processes in that, it would reveal to the teachers how the students perceive biology literacy and this would allow them to develop in students the biology literacy that would allow them to gain maximally from Biology. It would also help the teachers to improve their methods of teaching and to make sure that everything taught in biology is given practical example and relating it to the society.

This study would be useful to students as it would expose them to the hidden facts and benefits of biology literacy which they may not likely take cognizance of in the classroom. It would also allow the students to adjust their own perception to conform to

the scientific views and arouse their interest in study biology thereby improving their performance in the subject. Lastly, the findings would be useful for further research on biology literacy at higher education level and among the masses themselves at all levels of the social, educational and political strata.

Clarification of Major Terms and Variable

In order to avoid misinterpretation of terms by any individual who would be opportune to read this study, the following terms are clarified as used in the study.

Perception -: For the purpose of this study, perception is students' view about biology literacy

Science literacy-science literacy is the knowledge and understanding of scientific concepts, skills and attitudes required for personal decision making, participation in civic and cultural affairs, and economic productivity

Biology literacy –is the acquisition of biological attitudes, skills and knowledge that allow people to participate in biological related issues, develop problem-solving skill and decision making skills in everyday life.

Career – is ones chosen profession

Gender – the biological sex of an individual usually male or female

School location – this is either rural or urban areas.

Rural school –These are small communities such as the villages and hamlet where there are no basic facilities such as good roads, electricity, access to library, pipe borne water e t c.

Urban school– are the towns and cities where all the basic facilities are present.

School type-this is either public or private school

Public schools-these are the schools owned by government

Private schools –these are the schools owned by an individuals or religion organizations.

Literacy-for the purpose of this study, literacy was defined as acquisition of knowledge, skills and attitudes needed for survival and functioning in the society

Score levels-this refers to the academic achievement levels to which students can be grouped as high, medium or low scorers based on their achievement in an examination or test.

CHAPTER TWO

LITERATURE REVIEW

The review of the literature was done under the following sub-headings:

Theoretical Framework

The concepts of science literacy and biology literacy

Perception of biology literacy based on the students' school location

Influence of students' class level on the perception of biology literacy

Influence of students' gender on the perception of biology literacy

Influence of students' score levels on perception of biology literacy

Influence of the students' choice of career on the perception of biology literacy

Perception of biology literacy based on the students' school type

Appraisal of the reviewed literature

Theoretical Framework

The theoretical framework that guides this study is the theory of perception. Perception is one of the concepts that are critically studied in psychology. Psychologist is more interested in what, when and how people perceive things and possible effects it has on their behaviors. Oxford Advanced Learners Dictionary (2015) defined perception as an idea, a belief or an image you have as a result of how you see or understand something.

Many scholars and psychologists have worked on the theories of perception. Some proposed a direct theory of perception which is a bottom-up theory. Some argued that perceptional processes are not direct, but depend on the perceiver's expectations and previous knowledge as well as the information available in the stimuli itself. These

theories are relevant in this study because of the students' individual differences and intelligent quotients.

Gibson's (1966) direct theory of perceptions known as bottom-up theory, proposes that perception is direct. The process of visual perception starts by analyzing the basic features of sensory input and then gradually works up to more complex processing. Gregory (1970) proposed perception as hypothesis; he submitted that perception involves making inferences about what we see and trying to make a best guess. And that prior knowledge and past experience are crucial in perception.

Gibson's (1987) theory of perception-in-action shows relationship between perception, experience and action. The simple explanation is that the issue perceived is interpreted by the brain (processing) based on experience in which the resultant effect is the action taken based on the opinion formed through the chain of activities. Perception, experience and action can be classified as birds of the same feathers that always move towards the same direction. So it is expected of the students of biology who have the right perception of what biology literacy is all about to be able to put into action all the learning experience gained in biology This is in support of Gregory's (1988a) theory who was of the opinion that we receive information from the environment via our senses, and that the information need to be processed and organized by the brain so that we can make sense out of it. This is a top-down theory which is a constructivist (indirect) theory of perception.

Gregory (1988a) indirect theory of perception known as top-down theories propose that information and knowledge stored in the brain works downwards, helping us to interpret the basic sensory input, which are normally unclear, so we interpret it by

dealing with it as a problem-solving tasks. We need knowledge stored in the brain to do this. (Gibson, 1988b) submitted that perception functions to gather information about objects, events and places and what the perceiver can do about these things. This is in support of Gibson (1997) who proposed that perception guides action in a changeable environment. Thus, perception and action operates as a continuous cycle, whereby "perception obtains information for action, and action has consequences that inform perception about both the organism itself and the events that it perpetrates", p .25

Glaserfeld (1995) theory of social constructionism maintains that continual adjustment of perception and action to the external input is what constitutes the entity. By implication, there should be constant review of people's perception as nothing in life is permanent. This is the more reason for this study. Perception of biology literacy by the Senior Secondary School Students in Ekiti -State, Nigeria to probe into the students' perception of biology literacy in order to adjust students' perception to suit the purpose of biology education in Nigeria.

Mcleod (2007) is of the view that in the process of perceiving a physical object or an issue surrounding, input processing and output which are the key elements in perception are to be involved. The surrounding here refers to both physical objects and an issue perceived. Input refers to senses, processing is the brain while output refers to the reactions. The object or issue which a perceiver perceives was registered in his senses. This could be through sight for vision, hearing for audio or audiovisual when the two sense organs are combined for proper perception, it could be by feelings something or tasting.

Biology emphasizes practical which would allow the students to involve all their sense organs in learning processes for proper understanding as to aid the students' proper perception of the learning task. Mcleod (2008) further submitted that, whatever may be the case, the perceived object (material or immaterial) was first of all register in the sense(s) as the case may be. The stimuli are processed in the brain where most of the incoming stimuli are selected while others are rejected. This process leads to output which is the reaction or change in behaviors as a result of the opinions formed based on the stimuli that are stored in the brain.

The combinations of the four major factors mentioned above that work together in the process of perception are as follows:

Surrounding (object or issue)⟶input (senses) ⟶ processing (brain) ⟶ output (reaction). This study, perception of biology literacy by Senior Secondary School students in Ekiti state is being carried out to bring about changes in behaviors of the senior secondary school students which will enhance their performances in biology.

McLeod, (2007) visual perception theory made it clear that in order to receive information from the environment we are equipped with sense organs e.g. eye, ear, nose. And each sense organ is part of a sensory system which receives sensory inputs and transmits sensory information to the brain. He submitted that when one thinks, then he understands, without having thought, one does not know; it is only after thought that one understands. He conceived the mind as having too compartments via, the thinking portion and the perceiving portion and that it is easy to stop the thinking portion but it is extremely difficult to stop the function of the perceiving portion. According to Egwu (2009) the current senior secondary school science curriculum has been synergized to

attain educational goals in line with the Millennium Development Goals (MDGs) the National Economic Empowerment and Development Strategies (NEEDS) to ensure the attainment of the goals of MDGs and NEEDS which can be summarized as: value - reorientation, poverty eradication, job creation, wealth generation and using education to empower the people. The students therefore need to have the proper perception of biology literacy in order for them to attain these goals for the betterment of an individual and the society at large.

Herz (2010) worked on associative learning showed the extent to which experience plays a vital role in perception. Associative learning is the process by which one event or item comes to be linked to another through experience. According to Torpev (2010), experience plays a vital role in perception. What people perceive that eventually lead to formulation of opinion and behavioral patter is mostly the bi-product of previous experience. If the issue perceived has not been previously registered in the sub-conscious part of the perceiver's brain, such perception will hardly result to objective formulation of opinion and change in behavior. The students are exposed to the contents of the biology curriculum in the Senior Secondary Schools; the learning experience of students in biology is to bring about change in their behavior.

In order to have a clear basis in which perception could be rooted on, the Gestalt psychologist came out with five basic laws of perceptional organization. These laws of perceptional organization were developed based on series of experiments in the field of perception. The basic laws are described below:

Law of Figure-Ground: this law states that everything we perceived stands against a background. There is a close relationship between figure and ground. The

national objectives of any society which are endorsed as necessary foundation for national policy on education are based on the people culture, needs and aspirations, etc. just as a figure cannot be recognized if it is not against a background, any educational programme that does not meet the public desires and expectation will not stand the taste of time.

Principle of Pragnanz: The principle states that our perceptional pattern always tends to be simple, regular and complete with no loose ends. The gaps are closed by the perceiver. This law of closure operates with the principle of pragnanz in all sensory modalities. This principle goes in line with perception sequences of events in perception process as mentioned earlier. This means that perception can only effectively take place when the sense organs are able to properly decode what is perceived which will in turn be interpreted by the brain. It is at this point that selection is done based on the experience of the perceiver. For instance, a student may choose a career in biology due to his/her experience:

The law of Transposition: The principle states that because Gestalten are isomorphic to stimulus patter, they may undergo extensive changes without losing their identity. Changes are inevitable but once an issue is rooted on a background, no matter how it was altered, it will still maintain its identity. For instance, no matter how objective of an educational programme e.g. biology education are altered, it may not lose its identity because it is rooted on national objectives which are expression of people's need and aspiration putting their culture into consideration.

Law of Similarity: The law maintains that similar words, numbers and objects that tend to associate in a group are easy to recall than dissimilar ones. In a classroom

setting, concepts, theories and principles which have similar characteristics could be easily understood by learners. For instance, classifications of living things, living organism are grouped according to their characteristics to be easily understood. According to Soyibo etal (2013), classification simply means arrangement into groups. Visually, things which share visual characteristics such as shape, size, colour, texture, value or orientation was seen as belonging together and could be easily understood.

The Law of proximity or Contiguity: The law states that things which are closer in time and space tend to form a Gestalt. This law explains the reason why students tend to perceive current educational issues particularly those that take place in their immediate environment. Biology is a natural science that is taught in a school environment to the Senior Secondary School science students who also live in a natural environment within the society which could aid their better perception of biology literacy and the utilization of the literacy experience to better their lives and society with which they find themselves.

According to Gestalt psychology perception deserves attention.

Perception of Educational Objectives: For instance the objective of the biology curriculum could be achieved if it is given attention. Attention according to Oxford Advanced Learner's Dictionary (2015), is defined as the act of listening to, looking at or thinking about something. The contents of biology curriculum are taught to the Senior Secondary School science students in order for them to listen to, look at and think of what could be benefited from it. The topics of perception and attention merge into each other since both are concerned with the question of what we become aware of in our

environment. We can only perceive things we are attending to, we can only attend to things we perceive.

Aristotle's theory of perception explains the significant role attention plays in perception. According to the theory, perception occurs when the relevant sensory faculties become like the object it perceives. This is a clear indication that perception is not an issue that could be haphazardly handled by the perceiver. This has to be total commitment of his faculties that was involved in perception. More so, he has to be practically involved directly or indirectly in the issue he perceives. This is the more reason why it was stated in the general objective of the biology curriculum as provided in the National Policy of Education (2004) to equip the learners with adequate laboratory and field skills in biology. The students of biology are therefore expected to be totally committed to practical work in order to have clear perception of biology with a view of forming opinion, attitude and behavioral patterns that are acceptable in the society.

The Concepts of Science Literacy and Biology Literacy

Science holds a unique position among all aspects of a school curriculum because it offers countless opportunities for the students. It also help in nations' development. The aim of science education is to bring about more scientifically literate citizenry and to develop more man power to meet up with the world advancement in science and in technology. According to Nelson (1998) a special government committee called National Commission on Excellence in Education in the 1980's in the U.S. reported about America's seeming economic decline, particularly in areas dependent on scientific and technical know-how and also on public education poor test scores, low enrollment in

science and Mathematics courses and poor performance of U.S. students in the Third International Mathematics and Science Study (TIMSS) prompted them to emphasize the need for change and in 1985, the American Association for the Advancement of Science (AAAS) launched a long-term effort to reform science mathematics and technology education called project 2061.

This project emphasize the knowledge and skills that today's students will need as adults in the 21st century with the ultimate aim of helping all Americans to become literate in Science, Mathematics and Technology, because what future holds in store for individual human beings, the nation, and the world depends largely on the wisdom with which human use science and technology. And that, in turn, depends on the character, distribution effectiveness of education that people receive. According to Carrier (2001) ignorance of science is a leading cause of support for superstitions, cults and those religion that shackle the mind, or foster bigotry or worse and it is the nature of science that sets it apart from all other sources of authority and which is most helpful in instructing our own lives and our own personal pursuit of the truth and that we can know all sorts of facts about geology, astronomy or biology, but if we don't understand how those facts were ascertained and demonstrated, our minds will remain linked with those of our primitive ancestors who let themselves be led by common sense into all manner of errors and superstitions.

Carrier (2001) submitted the following seven factors to be the nature of science;

Science is a tentative enterprise

Science is empirical

Science is not a single method

Experiments are a goal-oriented form of scientific observation

Scientific theories are explanations of scientific facts

Scientific laws are descriptions of nature's behavior

Science is a creative enterprise

Schwartz, Ben-Zvi, Hofstein (2006) discovered that scientific literacy is a broad term that encompasses a range of scientific views and perceptions within and across scientific disciplines and practices. According to Abimbola (2009), a scientifically literate person should possess a body of scientific knowledge, a set of scientific skills and behave scientifically in his or her day-to-day activities.

Abimbola (2009) opined that scientific literacy is expected to be the possession of the scientific world view. This scientific world view is seen in making use of the scientific knowledge, in the real world issues. AAAS-Project 2061 and the programme for international study Assessment describe scientific literacy as the capacity to use scientific knowledge to identify question and to draw evidence–based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity.

The American Association for the Advancement of Science (AAAS, 2009) submitted that scientific literacy involves three principal components of nature of science. Which are the scientific worldview, the scientific methods of inquiry, and the nature of scientific enterprise. All these emphasize students' abilities to make use of scientific knowledge, skills and ethics or attitudes in real world situation. Scientific literacy is taken to mean that everyone should have a working knowledge of science and its role in society. Science literacy will make a society to be scientifically cultured hence such

problems associated with low science culture such as poverty, low technology, pollution, population problem, environmental problem, management of resources and a host of others would be reduced to minimum.

The knowledge of science contributed to the development of many nations if Nigerians are to develop and maintain a democratic republic where the citizens would be knowledgeable enough to intelligently participate in decision making on a public issues, then they must be scientifically literate. Science helps in development. And for any nation to develop, they must be scientifically literate. According to Abimbola (2009) Science can be defined in terms of its products which is the body of knowledge inform of Concepts, facts, laws and theories. Concepts and facts form the foundation that enables scientist to construct broad conceptual schemes, i.e. laws and theories. These are used to describe, explain and predict experimental finding and observations in the simplest and most efficient ways and that science can also be defined with its processes or method or skills that scientists employ in their work, they are the scientific activities which include: designing of investigations mainly through experiment, observing, classifying, measuring, communicating, interpreting data, making operational definitions, hypothesizing or predicting insightful questions about nature and formulating questions. Science can also be defined ethically, as the ethical standards of the discipline of science that guides the actions of the scientists which are curiosity, open mindedness, positive approach to failure, objectivity in science, respects for the opinions of others, willingness to accept criticism, unwillingness to believe in superstitions, accuracy of observations and reports, cooperation among scientists, morality, orderliness of nature and natural laws, beauty in nature and universality in science.

This is in agreement with the submission of Rustaman and Haliu (2012) that learning science means learning the scientific product (knowledge), process and attitude and that teaching only one aspects of the three components of science means teaching part of science and not science. From the foregoing, it means teaching the three aspects of science all together is what will help in developing students' literacy in science. Oxford Advanced Dictionary (2015) defines literacy as quality of being literate and literate means having knowledge or competence of something. The concept of scientific literacy has been defined in different ways by different scholars and educationist. Pinto, Lope, Silva and Santos (2014) discovered that the scientific literacy is the type of literacy that includes science; content (scientific knowledge and its use) scientific inquiry and willingness to engage in issues related to science; and science as a social enterprise (characteristic of science, awareness of how science and technology shape the world). Wilms (2014) explained that the nature of science encapsulates the characteristics of science that make people understand scientific endeavors with less acquisition of cumbersome scientific knowledge.

There are now various literacy projects in science such as chemistry literacy, ecology literacy, botany literacy these entire literacy programme emphasize acquisition of skills, attitudes and application of knowledge in everyday life. The focus of this study is on the perception of biology literacy. Biological Science Curriculum Study (BSCS, 1993) submitted that biology literacy is a lifelong, continuous endeavor. People do not attain literacy in biology or any other subject and then stop learning; rather, we continue building upon the knowledge understanding and skills we acquire through time. Thus, they hope that students will use the knowledge and skills they obtain in biology classes to

develop their literacy throughout their lives. Biological Science Curriculum Study (BSCS, 1993) proposed, model that includes four district levels of biology literacy which are; Nominal, functional, structural and multidimensional. At nominal level, students are literate in name only, that is, they recognize the domain of biology and certain words as belonging to the realm of biology but they are not able to define or describe the word. At functional level, students are able to define certain biological terms or concepts but have limited understanding of or personal experience with them.

At structural level, students understand the subject well enough to explain it to another person in his or her own words. Understand how the information was obtained, is able to apply information about the subject to novel situations, knows and appreciates the significance of the information to biology and to him. At multidimensional level, students reach a fuller understanding of biological subject and its collections to other subjects and disciplines; know the history and the nature of biology, and understand the interaction between biology and society.

The focus of this study is on students' perception of biology literacy. The BSCS (1993) submitted the following nature of biology knowledge as shared from the nature of science;

1. Biological knowledge is tentative;

2. Biology knowledge is public;

3. Biological knowledge is empirical;

4. Biological knowledge is replicable;

5. Biological knowledge is historic;

Uno and Bybee (1994) in understanding the dimension of biology literacy opined that it is essential for biologically literate students to know and understand the characteristics of scientific knowledge, the values of science and the methods and processes of scientific inquiry and then defined scientific literacy as acquisition of skills and knowledge that are useful for everyday life situations. Mayr (2004) identified the following as autonomous characteristics of biology

1. The complexity of living system-living things are unpredictable and may be difficult to study under ideal scientific conditions

2. Evolutionary biology is historical science-the concepts of evolution may give rise to certain unpredictable variations that serve as threats to certain scientific theories and laws.

3. Chance is important in biology, for example, the concepts of genetics and cell division rely on the phenomenon of chance. This explains the fact that no two individuals are exactly genetically the same. Unlike other fields of science, physics, and chemistry

4. Biology is concerned with the living world

According to Abimbola and Omosewo (2006) Biology is a nature science which is composed of three components, namely: products, process and ethics .The products components is made of scientific knowledge inform of concepts, facts, principles, laws, rules and theories. The process constitutes the various methods employed by scientists to investigate natural phenomena and events the ethical component of sciences refers to the

moral rules, attitudes and principles of behavior that regulate the activities of the scientific community. A biology literate individual should understand biological principles and the major concepts of biology, the impact of humans on the biosphere, the processes of scientific inquiry and the historical development of biological concepts. He or she should develop personal values regarding scientific investigations biodiversity and cultural diversity, the impact of biology and biotechnology and society and the importance of biology to the individual. He or she should be able to think creatively, formulate questions about nature, reason logically and critically, evaluate information, use biological technologies appropriately, make personal and ethical decisions related to biological issues and apply biological knowledge to solve problems.

Biology literacy is needed in Nigeria being one of the developing countries of the world where citizens are called upon to make decisions involving curriculum development and implementation, the environment, society, the economy, national defense and population control. International Council for Science (2011) submitted that biology knowledge can lead to improvement in many spheres of society including social, economic, political and cultural life. As a result of this, the importance of biology literacy cannot be ruled out. Nwagbo and Adam (2012) submitted that a biology literate person should regard controversies in areas such as agriculture, pollution, conservation or medicine as something one need to sufficiently understand in order to make informed decisions about such as: whether to apply fertilizers to crops whether to site industries near residential areas and whether to support abortion or mercy killing. Biology is one of the science subjects taught in senior secondary schools in Nigeria. It is the science subject

that deals with the study of life. And everyone who needs life needs the knowledge of Biology that is, needs to be literate in Biology.

Biology is made up of topics and concepts which would bring about human good health and happiness. Human beings need the knowledge of Biology to maintain good health, safe shelter and environment to be able to pursue their goals in life. (Soyibo, Ekpunobi, Akinade, Tureta 2013). This is in agreement with Akintola (2017) who submitted that biology as the study of living things is a subject that provides part of the literacy needed for national development. Biology deals with the study of living things, while chemistry and physics deals with the nature and properties of energy and non-living matter. A biology literate person should understand the nature of biology shared from other sciences and its characteristics which distinguishes it from other physical sciences.

Biology is a scientific discipline and biology literacy is a sub-set of scientific literacy. Biology being a scientific discipline has its own nature share in the nature of science which is characterizes by its product, process and ethics of science. This is in line with Wilms (2014) that the nature of science encapsulates in its characteristics. Coll and Taylor (2009) opined that biology literacy is viewed as a primary goal of biology Education. This is in agreement with Abimbola and Abidoye(2013) who submitted that the goals of biology education are to :

1. Provide basic literacy in biology for functional living.

2. Acquire essential scientific skills and attitudes as a preparation for the technological application of biology.

3. Acquire basic concepts and principles of biology as a preparation for further studies

4. Stimulate and enhance creativity.

According to Miller (2011) biology literacy deals with acquisition of biological attitudes, skills and knowledge that allow people to participate in biological debates and develop problem-solving skill and decision making skills in their everyday lives. This definition is in line with the aims and objectives of the new senior secondary school biology curriculum (2009), because its emphasis is on acquisition of biological knowledge, skills and attitudes for functional living in the society. Therefore the framework of working the concepts of biology literacy was based on this definition. The aims and objectives of the new Senior Secondary School biology curriculum (2009) are:

(1) To prepare students to acquire adequate laboratory and field skills in biology,

(2) Meaningful and relevant knowledge in biology

(3) Ability to apply scientific knowledge to everyday life in matter of personal and community health and agriculture

(4) Reasonable and functional scientific attitudes

These biological attitudes and skills can be developed through adequate laboratory and field skills i.e. through practical work and acquisition of meaningful and relevant knowledge was through proper teaching methods. It is expected that students should be able to make connections between what they learn at school and how it can be applied to their everyday life. In line with this, the knowledge to be taught, the performance objectives, the skills and attitudes to develop in students, the teaching and

learning materials to be used and the evaluation guide are fully set out in the curriculum for the student to acquire biology literacy for functional living in the society.

This is in support of Kwesigabo, Mwangu, Kakoko and Killewo (2012) that prevention and control of health problems sometimes requires interventions beyond health sector programme and initiatives. They submitted that public education is needed and that schools need to play a role in educating young people about human biology so that a greater understanding of individual and community health can be fostered. According to (Soyibo, Ekpunobi, Akinade, Tureta 2013), infectious diseases contribute greatly towards the poor health of people the world over particularly in developing countries and to move towards better health, the disease- causing microorganisms have to be controlled the control of these harmful micro-organisms, vectors and the maintenance of good health are exposed to students under one of the topics taught in Biology titled "Towards Better Health right from the Senior Secondary School One (S.S.1)".

Under the control of harmful micro-organisms students are exposed to the various methods of preventing and controlling the spread of the micro-organisms such as sterilization, use of antibiotics, high salinity and dehydration methods, sterilization method kills or removes all micro-organism, the application of high temperature destroy pathogenic micro-organisms in food by cooking the food properly, Antiseptics such as alcohol(70%) boric acid, hydrogen peroxide (H_2O_2), potassium tetra-oxo-manganate VII ($KMnO_4$) are used on cuts, abrasions and wounds on our skins to prevent infection by inhibiting microbial growth. Antibiotics such as penicillin are used to control diseases caused by pathogenic bacteria.

High salinity inhibits the growth of the microbial cell and so prevents its multiplication. Therefore washing cuts and wounds with salt solution prevent them from becoming infected. Foods are preserved by dehydration methods such as drying, drying in the sun prevents microbial growth and subsequently kills disease-causing micro-organism. The knowledge of the habit and life cycle of vectors taught in Biology help us to control their activities. Vectors are insects or animals such as houseflies, mosquitoes, lice, rodents' e.g. rats and mice that transmit disease-causing organisms or carry a particular disease from one living thing to another. According to Olufemi (2016) as reported in the daily newspaper Punch Friday, January15, 2016 Lassa fever is ravaging in Nigeria again.

According to the report, the affected states cut across the Northern and southern parts of the country and as the time of this report 41 people have reported dead of the Lassa fever out of 86 cases of infection in the ten states across the country. The virus that causes Lassa fever was identified in 1969 in a town called Lassa in the present day Borno-state. Since then the disease, is seen as endemic in West Africa, has been killing thousands of people every year. World Health Organization reported that between 300,000 and 500,000persons' come down with Lassa fever annually, out of which 5,000 death are recorded. It was then submitted that with adequate awareness of the causes of the disease, it is easy to reduce the rate of infection and that what is needed is personal hygiene and proper sanitation around the home environment to combat the infection from the vector of the Lassa fever which are the rodents such as rat .

Houseflies spread the micro-organisms that cause diseases like typhoid, cholera, dysentery and poliomyelitis. Mosquitoes spread diseases like malaria, yellow fever,

dengue, encephalitis and filariasis. Rat, fleas and lice transmit diseases such as plague and typhus the knowledge of various diseases transmit by these vectors will help in preventing them from having contact with people in order to maintain good health. Good health, according to the World Health Organization is defined as a state of physical, mental and social well-being and not merely the absence of diseases or infirmity and to maintain good health the following must be taking into practice:

(a) Eating of a balanced diet.

(b) Exercising the body

(c) Resting

(d) Avoiding smoking, drinking of alcohol, eating of junk foods and drug addiction.

(e) Taking of preventive measures through vaccination against diseases.

(f) Cleanliness and care of the body

Eating of a balanced diet- Balance diet, according to Soyibo, Ekpunobi, Akinade,Tureta (2013) is the appropriate types and amounts of food substances the human body needs to perform optimally. It is what the body needs for the supply of nutrition and energy for maintaining body cells, tissues and organs and for supporting proper growth and development. In line with this, Extension America's Research-based Learning Network (2014) submitted that: with better nutrition students are better able to learn, students have fewer absences, and students' behavior improves, causing fewer disruptions in the classroom. Awareness of the above facts would make the students and parents cultivate the habit of good feeding. Juma (2015) discovered that the food taboo practices mentioned by both teachers and students indicated that education about the importance of eating a balanced diet is needed in some communities as it was found out

that some participants mentioned food taboos such as pregnant women do not eat nutritious food like eggs for fear of delivering babies without hair.

Under the cleanliness and care of the body taught in Senior School biology curriculum, students are exposed to the precautions to be taken to avoid being infected such as: - keeping oneself and belongings clean.

1. Washing of hands before eating and after eating and using of the toilet

2. Covering of food.

3. Drinking of clean water regularly

4. Wearing of shoes and washing of stockings after use.

5. Staying away from people with infectious disease.

6. Sleeping under a mosquito-treated net.

7. Keeping the house and surrounding clean.

According to World Health Organization, WHO, (2013) lack of awareness of personal hygiene leads to health problems in order to prevent health problems, students are taught the precautions to prevent the spread of infection such as: (a) Washing of hands before preparing or serving food.

(b) Washing of used plates always.

(c) Always cough, sneeze and blow your nose into a handkerchief or tissue.

(d) Do not spit on the floor but into a handkerchief, tissue or wash basin.

(e) Always use a latrine when urinating or defecating and wash your hands afterwards.

(f) Throw all rubbish into covered bins for disposal.

(g) Stay away from public places when you have an infectious disease.

From the above points of view, it is clearly seen that everyone needs the knowledge of Biology to maintain good health, happiness and survival.

Moreover, Ingraham (2004) submitted that people generally don't know even what they are made of or the basic conditions that need to exist for healing. He emphasized the power of Biology literacy as it helps to know how our body works. He further stressed that biology literacy is as important as other basic academic needs. It will help people to learn, remember and make use of other information about their body from any other source for the rest of their lives. In Nigeria, Senior Secondary Biology curriculum especially at the S.S 2 class exposes students to the various systems of the body such as Reproductive system, Digestive system, circulatory system, excretory system, Nervous system, Respiratory system and skeletal system. All these will help people to know everything about how their bodies work. For an example the knowledge of people in reproductive system helps in family planning to have the number of the children they can care for. It also helps in controlling the human population thereby preventing overcrowding which may result in food shortage, limited space, health problems and environmental degradation. People can achieve social –well-being through a well-balanced family and community life

In counseling, genetics counseling is now available in marriage, the blood of prospective couples is analyzed to detect those who have genes of certain hereditary

diseases and advise them on the chances of their children having such diseases such as haemophilia, Rhesus factor and sickle-cell anaemia. This is aimed at reducing incidence of these sex-linked hereditary diseases (Ramalingam, 2011). This is also one of the vital points why every student must be literate in Biology at the Senior Secondary Schools; all the students of Biology are exposed to all these facts that will make them to make a right choice in marriage and to live a happy life for the rest of their lives.

Through practical biology certain scientific attitude which are vital to life are build up in students such as the power of careful observation, perseverance, carefulness, honesty, open-mindedness etc. which would help student to live successfully in life. This biology literacy is reviewed to expose the importance of Biology to every human being to educate the populace the significant of biology literacy and to improve student knowledge of biology and enhance their better performance.

Perception of Biology Literacy based on the Students' School Location

There are many research works which have been carried out on the influence of school location on teaching and learning and it was discovered that students learning may be influenced by the environment in which they find themselves.

Agbonna (2006) carried out a study on influence of school location on students' academic achievement in private and public secondary schools in Ilorin, Nigeria. He found out that there was significant difference in the academic achievement of secondary school students across academic and non-academic school locations in Ilorin. According to Erin, Travis and Michele (2009) the environments of urban and rural communities are dissimilar as a result of differences in the residents ethnicity average income, average education level attained, employment opportunities, etc. and that a student will therefore

encounter slightly different interactions in each setting. Maliki, Ngban and Ibu (2009) carried out a study among the Junior Secondary School students in Bayelsa State of Nigeria, the study involved 200 final year secondary school students from rural and urban areas of Oshogbo, Boripe, Ifelodun and Olorunda Local Government Areas of Osun State. It was discovered that students performed better in rural area than in the urban area.

According to Erin, Travis and Michele (2009) on the study carried out on high school students' perceptions and knowledge about agriculture based upon location of the high school. It was discovered that students in urban High generally disagree that farmers make a lot of money while 41.7% of students in rural area disagreed with the statement. On average students at Rural Ag high disagreed that most farms are small famously farms while more students in urban High (31.0%) and Rural Non-Ag High 43.7% agreed with the statement. Urban High had the highest rate of agreement (78.7%) with the statement "Farming is very difficult" urban High students agreement was 10.5% higher than the average agreement of the survey population. Rural Ag High was in highest agreement with the notion that you can tell a farmer just by looking at them; 34.2% of the population agreed with this statement of particular note is that the majority of students at urban High disagreed that you could tell a farmer just by looking at him/her.

In a research carried out by Okereke and Onwukwe (2011) on the influence of school location on school achievement in chemistry, it was discovered that the students from urban schools achieved significantly better than students from rural schools. Thomas and Ikuyero (2013) carried out a study on influence of school location and achievement level on integrated science students' perception of their classroom

environment. The result showed that school location (urban or rural) did not significantly influence the students' perception of their classroom environment {F (1,639)} = 0.50, P>0.05.

Lawal (2013) investigated the levels of scientific literacy among Senior Secondary School students in Oyun Local Government Area of Kwara State, Nigeria found out that there was no significant difference in the levels of scientific literacy between students in rural and urban areas in Oyun Local Government as revealed in the study. There was no significant difference in the levels of scientific literacy of students' school location based on their knowledge, skills and attitude having X^2 value of 12.95 which is lower than the table-value (15.51), X^2 value (7.87) also lower than the table-value of (14.07) and X^2 value of 7.20, which is also lower than the table-value of 14.07 respectively. This implies that the urban secondary schools have benefit in terms of science equipment in the laboratory and science teachers to teach the subjects effectively but the equipment are not frequently used by the teacher

Juma (2015) carried out a study on exploring the development of biology literacy in Tanzanian Junior Secondary School Students, the finding revealed that students in rural areas did not feel that what they learn in biology classes at school is useful or relevant to them, this is in contrast with the responses of urban students. It was seen in this study that urban participants are less interested in pursuing biology or science related career compared with their peers in rural schools. The percentage of both rural and urban participants interested in a biological related career were 72% and39% respectively and of those who were not interested in pursuing a career in biology,61% were located in urban schools and 28% were based in rural schools.

It was then submitted that rural students have fewer career role models to learn from than their peers in the cities and that most of the potential role models in rural areas are nurses and doctors who are highly respected in rural communities, but urban students have a wider range of career role models to learn from. They are having more choices available for them. It was also seen that the rural students did not know how to apply the knowledge of biology taught in school to their day to day activities but could only be used in chosen career.Akintola (2017) assessed the knowledge of biological drawings possessed by the senior school students in Oyo State Nigeria. Students' biological drawings achievement test was used to collect data from the students. The study found that there was a significant difference in the knowledge of biology drawings possessed by senior school students based on their school location in favour of the students from urban schools.

Influence of Students' Class Level on the Perception of Biology Literacy

Students are grouped into various class levels based on the school curriculum to ensure that the curriculum expectations are addressed in an appropriate sequence and that meaningful connections are made for students throughout their studies. Oxford Advanced Learner Dictionary (2010) defines class as a group of students who are taught together. And Level as the amount of something that exists in a particular situation at a particular time. For instance, in Nigeria secondary schools students are classified into the following classes:

Junior Secondary School one (J. S. S. 1)

Junior Secondary School two (J. S. S. 2)

Junior Secondary School three (J. S. S .3)

Senior Secondary School one (S. S. S. 1)

Senior Secondary School two (S. S. S .2)

Senior Secondary School three (S. S. S. 3)

The students in each of this class are exposed to the same curriculum at a particular time. The curriculum, according to Olorundare (2014) is a plan for learning and such plan encompasses the framework for what to learn and how it is to be learned. It also includes the strategies and materials designed to support and give direction to the teaching/learning transaction. Students are promoted from one class to another to ensure that the curriculum expectations are addressed in an appropriate sequence and that meaningful connections are made for students throughout their studies. Biology curriculum is organized into four themes each of the theme runs through the three years with a higher level of complexity.

Afuye (2008) carried out a cross- sectional study of Secondary School students' performance in mathematics in Ifelodun local government area kwara State, test were conducted for S. S.1, 2 & 3 students in 2006/2007 academic section, those tests covered the five content areas of mathematics includes Algebra, Geometry, Trigonometry, Statistics and Probability. Scores of students were transformed to the same scale, T-scores, these were used for computation of statistical packaged for mathematics (SPM) The result showed that the calculated F-value is 5.05 at 0.05level of significance. The F-value calculated is greater than the table value, thus the null hypothesis was rejected .This

means that there is significant difference between the performance of students in S. S.1, 2 & 3.

In a study carried out by Bernardo, Limjap, Prudente & Roleda (2008) on students' perceptions of science classes in the Philippines Asia Pacific, it was discovered that there was a main effect of grade level on the students' perception of the learning activities in their science classes [F(5,7873)=14.22,P <0001]. The scheffe's test for post hoc comparisons indicated that the students from grade 5 perceived the highest level of inquiry activities compared to those in grades 6, 8, 9 and 10. Those in grade 7 also had higher reports compared to those in grade 9 .The students in the higher grades also reported lower perceptions of their grades as appropriate reflections or feedback on their learning and performance which shows light on the reason for low achievement levels of Pilipino students .

Jannah, Halim, Meerah and Fairuz(2013) carried out a study on the impact of environmental education kits on students' environmental literacy in Malaysia, 345 secondary school students age 14 and16years old participated in the study and 10 students were interviewed . And Environmental Education teaching kit was used to teach the students using descriptive and inferential statistics it was determined that there was no significant difference in the level of environmental literacy based on the class stream and that the class stream are still at the moderate and low level of environmental literacy.

In a study carried out by Luketic & Dolan (2013) on factors influencing students perception of high school science laboratory environment, grade level was used as a proxy for experience with 9th graders having the least experience and 12th graders having the most. It was discovered that grade level differences in students perception were

statistically significant ($p<0.001$) across all five factors of the laboratory environment and the analysis is showed that 9th graders tended to be more negative than students in other grades. The10th graders reported the most positive perception of all the students. Eleventh graders were more positive than 12th graders with the effect sizes ranged from 0.039 to 0.074.

Grenci (2015) investigated the effect of scientific studies on students' scientific literacy and attitudes towards science course. For the study, thirty students from the 6th, 7th, and 8th grades were randomly selected and were given in formation about the programme .Students worked regularly for 12 weeks on topics of scientific research and held discussions on them before the application, the students in the program were given a test which incorporated scientific literacy and attitudes towards science course, twelve weeks after the application, the students were given the same questionnaire and test again, the data obtained were analyzed using an SPSS program. Statistical results indicated that the students' scientific literacy had increased significantly and their attitudes toward science were more positive and in term of class level of students, a significant difference emerged after the application when compared to before the application.

Influence of Students' Gender on the Perception of Biology Literacy

There are many research works which have been carried out on gender studies and it has been discovered that the influence of gender on students' academic

performance and achievement differs. And this has been very controversial. Many researchers established significant gender differences in science education.

Hacer (2006) investigated the effect of gender and reasoning ability on the students' understanding of ecological concepts and attitude towards science. All 8th grade students from public elementary school in Tosya participated in the study. Students' understanding, attitude toward science and reasoning ability were also measured by means of the Test of Ecology Concept (TEC), the Attitude Scale Toward Science (ASTS) and the Test of Logical Thinking (TOLT) respectively. Multivariate Analysis of Covariance (MANCOVA) conducted to determine the effect of gender on students' understanding of ecological concepts and attitude towards science when reasoning ability was controlled. The results indicated that there was a significant gender difference in favor of girls with respect to students' understanding in ecological concepts and attitude towards science when reasoning ability was controlled. John (2007) found out that there was no significant difference in the problems of learning biology in Kaduna metropolis as perceived by male and female students.

Ayodele (2009) examined gender differences in mathematics and integrated science achievement among the Junior Secondary School students with particular interest on the interaction effect of gender and school type on students' achievement. The student adopted an ex-post facts research design. The population was made up of all the junior secondary school students in Ekiti State, Nigeria, while a sample of 840 students of both sexes were drawn from 2006 and 2007 Junior Secondary School Certificate Examination (JSSCE) in Ekiti State, Nigeria .The selection was done using stratified random sampling techniques, taking into consideration, the gender of the students and the type of school

attended (private or public) from 20 Junior Secondary Schools. The sample was made in such a way that it cut across all the three senatorial districts in Ekiti State. In all, 280 students were purposively selected from each of the three senatorial districts. The instrument used was an inventory from the statistics unit, Ministry of Education, Ado Ekiti, State, Nigeria.

The inventories requested among other things are data on students' results in mathematics and integrated science for the year 2005/2006 and 2006/2007 academic sessions. The data collected were analyzed with the use of ANCOVA using SPSS version 15.0 package at 0.05 alpha level of significance. The findings from the study revealed that female students out performed male students in science and when the interaction effects of gender and school type on students' achievement were considered, significant effects were detected. Malic, Ngban and Ibu (2009) carried out a study on analysis of students' performance in junior secondary school mathematics examination in Bayelsa State of Nigeria, their study revealed that male students performed better than their female counterparts in the examination.

Naugah (2011) carried out a study on factors affecting the choice of science subjects among secondary school level in Mauritius, the findings revealed that both male and female students prefer hands-on-activities and contextual examples reflecting real-life situation as against the traditional method of teaching. It was also discovered that majority of the girls' experiences of science were negative and this deterred them from taking science beyond the compulsory level though they were aware of its importance. Oyekan (2011) carried out a study on influence of secondary school laboratories on the performance of physics students in Kwara State, the study revealed that there was a

significant difference in the performance of male and female students taught physics in adequately equipped schools and that male students performed better than female students in schools with adequately equipped laboratories.

This is also in support of a study carried out by Edmore, Maropeng and Cosma (2012) on Female students' perceptions of gender and academic achievement: A case of sixth form girls in Zimbabwean school. The study adopted a qualitative approach in which focus interviews with female high school learners were conducted, the study found that female students believe that they were not in par with boys in terms of treatment. Their treatment in schools, at home and in society led to under – development and it was concluded that female high school students held certain perceptions which they believed negatively affected their academic achievement.

In a study carried out by Himschoot (2012) on student perception of relevance of biology content to everyday life to determine the relationship between changes in perception of relevance and gender using three topics which are: cell-to-cell, genes and protein, and patterns of inheritance using ANOVA and *t*-test statistics. The results from the two-way ANOVA showed that, there was no significant relationship for the pre and post survey score by gender. So also the t-test statistic showed that after participating in a higher education non-biology major's course, there was no significant relationship between changes in students' perception of relevance of biology content to everyday life and gender for cell-to-cell communication (F,1(192)= .130, p =.719) and in addition, there was no significant relationship between changes in students' perception of relevance of biology content to everyday life and gender for relationship between changes in perception of relevance and gender for genes and proteins (F(1,190) =.249, P

=.618).Similarly, there was no significant relationship between changes in students' perception of relevance of biology contents to everyday life and gender for patterns of inheritance (F(1,(178) = .151, P =.698)

Oludipe (2012) carried out a study on Gender Difference in Nigeria Junior Secondary Students' Academic Achievement in Basic Science using a total number of one hundred and twenty (120) students obtained from the intact classes of the three selected junior secondary schools in the three selected Local Government Areas of Ogun state, South-West, Nigeria. He employed a quasi-experimental design and Achievement Test for Basic Science Students (ATBSS) were the instruments used to collect the relevant data. The data collected was analyzed using descriptive and independent samples t-test statistical methods. Findings from the study revealed that there was no significant gender difference in students' academic achievement and retention in Basic Science, which implies that there are no longer distinguishing differences in the cognitive, affective and psychomotor skill achievements of students in respect of gender.

Adodo &, Oyeniyi (2013) examined student variable as correlates of secondary school students' academic performance in biology in Ekiti State, Nigeria., using a descriptive survey type The study comprised 400 biology students selected using stratified and simple random sampling technique and a researchers designed questionnaire and biology achievement test to elicit response from the students. The data collected were analyzed using Pearson's Product Moment Correlation and multiple regression analysis, the study found that there was no significant difference between male and female students in their academic performance in biology in secondary the schools.

Lawal (2013) carried out a study on levels of scientific literacy among Senior Secondary School students in Oyun Local Government Area, Kwara State, Nigeria, the study revealed that there was a significant difference in the levels of scientific literacy of male and female students in Oyun Local Government Area in favour of male students concerning their knowledge, skills and attitudes. In a study carried out by Bernard (2013) on secondary school students' perceptions of mathematics formative evaluation and the perceptions' relationship to their motivation to learn the subject by gender in Nairobi and Rift Valley provinces, Kenya. It was discovered that some aspects of students' perception of mathematics formative evaluation had gender differences significant at 0.05 level of significance.

Bannu (2014) in her study found out that there was no significant difference in the academic achievement of Senior Secondary School chemistry students in North-Central, Nigeria based on gender. She also discovered that there was no significant difference among the selected personality factors of senior school chemistry students based on gender. But there was significant difference on students' chemistry anxiety and gender, in favor of male which means that male chemistry students are more anxious to achieve in chemistry than their female counterparts. Oliver (2014) comparing boarding and day senior secondary students' performance in biology discovered that significant difference does exists between the biology performance of male and female students in boarding and day secondary schools.

In a study carried out by Gbigbadua (2014) on the effects of pre- instructional word-clearing strategy on the achievement of senior secondary school biology students in ilorin Nigeria using the quasi- experimental design, non-randomized and non-equivalent

pre-test and post- test control group design the data obtained were analyzed using t-test and Analysis of Covariance (ANCOVA) using the pretest and post test scores as covariates tested at 0.05 level of significance. The findings revealed that there was no significant difference in the performance of male and female students taught using the pre-instructional word clearing strategy. This implies that gender has no significant effect on the achievement of the students taught using the pre instructional word clearing strategy. It was shown that the covariance between gender and group (Gender*Group) yielded F=1.26 and p = 029, which was not significant; since $p > 0.05$.

Zeidan, & Jayosi (2014) investigated the relationship between the Palestinian secondary school students' knowledge level of science process skills and their attitudes toward science and the effect of gender and residence of these students on their knowledge level of science process skills and on their attitudes towards science. The results of the study indicated that there was significant difference in science process skills due to gender in favour of females. In a study carried out by olasehinde and olatoye (2014) on a comparative study of public and private senior secondary school students' science achievement in Katsina, Ngeria. It was revealed that there was no significant difference between male and female students in science achievement in public ($t = -0.124$, $p > 0.05$) and private schools (-0.158, $p>0.05$) respectively.

In a study carried out by Nyambura (2015) on influence of students' self-perception on biology achievement among secondary school students in Nakuru county Kenya the study revealed that there was no significant difference in self-perception among male and female secondary schools students it was also shown that there was no statistical gender difference in biology achievement among the student. According to the

results of the study, there was a significant gender difference as regards science experiences, attitudes, perceptions of science courses, and careers. It was also reported that female students found science more difficult than males, while more males reported that science was destructive and dangerous, as well as more suitable for boys and girls.

Influence of Score Levels on Students' Perception of Biology Literacy

Students' academic ability level has been discovered as important factors influencing students' achievement in science. Many studies have been carried out to determine how the differences in scoring level and academic ability can affect students' knowledge of science concepts.

Afolabi (2006) investigated the effects of computer-assisted instructional package on secondary school students' performance in biology. It was discovered that students' scoring ability influence their performance in biology. However, the low ability group of students gained most followed by the high ability group. According to Idowu (2008) studies involving students of similar or mixed ability groups had led to several fascinating but divergent results on her study carried out on the effects of content structures on the performance of College of Education biology students in South-West, Nigeria. It was discovered that there was a significant difference on students' performance based on their academic ability denoted by their CPGA in NCE 1 at low level. The study indicated that the high academic ability students were most favored while the low academic level students were least favored.

Jimoh (2009) opined that sometimes students do not have enough knowledge to understand a text, they may have knowledge that they do not use fully. Variations in interpretations often arise because students have different constructive and creative strengths about a topic that have been taught. This sample was subjected to one of

competitive cooperative or conventional instructional strategy. The result submitted that there were no significant difference in the performance of high, medium and low scoring students when they were taught by cooperative strategy but there were significant differences in the performance of different scoring ability groups of students when taught via the competitive instructional strategy. This implied that cooperative instructional strategies may level out the differences in the scoring abilities of students as they share knowledge among themselves.

In a study carried out by Onijamowo (2010) on senior school chemistry students' misconceptions and alternative conceptions of selected chemistry concepts in Kogi State, Nigeria. It was discovered that the scoring level of students does not actually influence the number of misconceptions and alternative conceptions students hold. High scorers held the least number of misconceptions and alternative conceptions. In a study carried out by Balogun (2010) on conceptions of thermodynamics held by chemistry students in Kwara State College of Education, Nigeria. It was discovered that the ability level of the students did not significantly influence the number of alternative conceptions held by students. On the other hand, most of the sub-concepts, the ability levels influenced the number of misconceptions held by the students.

Gbigbadua (2014) on the effects of pre- instructional word-clearing strategy on the achievement of senior secondary school biology students in ilorin Nigeria using the quasi- experimental design, non-randomized and non-equivalent pre-test and posttest control group design the data obtained were analysed using t-test and Analysis of Coverance (ANCOVA) using the pretest and post test scores as covariates tested at 0.05 level of significance. The result showed that the covariance between scoring level and

group(scoring level*Group)yielded F=10.44and *p*= 0.00 was found to be statistically significant since p<0.05.This implies that, scoring level of students played a significant role on the achievement of students when using the pre-instructional word clearing strategy. Specifically, the pre- instructional word clearing strategy was statistically significant for moderate scoring students, yet it was not statistically significant for both low and high scoring students.

Ayanda (2016) carried out a study on the effects of analogies and concept maps on senior school students' achievement in ecological concepts in kwara south, Nigeria. It was discovered that there was no statistically significant difference in the achievement of low medium and high scoring students when taught using analogy. Their mean gain scores were relatively close (6.15 for low scorers, 7.68 for medium scorers and 8.00 for high scorers) which indicates that students in the three categories benefited almost equally from the study. Jiyah (2016) carried out a study on the effects of hands –on with minds- on instructional strategy on senior school students' achievement in cell-division in Lafiagi, Nigeria the study revealed that all the students benefited at the same level but low scorers benefited most compared to medium and high scorers when they learned cell division using hands-on with mind-on strategy.

In a study carried out by Alabi (2016) on comparative effects of text structure on the achievement in genetics of senior secondary school students in Ilorin, Nigeria, it was revealed that there was no statistically significant difference in the achievement of low, medium and high-scoring students in genetics taught using text structure but the descriptive statistics of the score level showed that logical structure content was very efficient for the low-scoring students because they benefited most followed by the

medium-scoring students while the high-scoring students had the least mean score. Using a concept map, it was also discovered that concept map as a form of structuring did not have a good leavening effect that can bridge the existing gap in senior secondary school students' achievement in genetics.

Influence of Students' Choice of Future Career on the Perception of Biology Literacy

The choice of future career is very important in the life of every student who wants to achieve success in life. It is expedient for every serious student to have a goal or pursuit in life inform of career choice. According to Oxford Advanced Learner Dictionary (2010) career is the series of jobs that a person has in a particular area of work, usually involving more responsibility. Career can also be defined as a chosen pursuit or course of business activity or enterprise especially one's professional life or employment that offers advancement and honor

Obura and Ajowi(2012) carried out a study on students' perceptions of career: the influence of academic performance and self-efficacy in Kisumu municipality. Stratified random sampling technique was used to select a representative of 237 male and 238 female students and 8 teachers heading guidance departments in the selected schools. Data were collected using students and teachers questionnaires and interview schedules. Descriptive and chi-square statistics were used to analyze the relationships between students' career aspirations and performance in examination and level of self-efficacy were found to be statistically significant.

Faitar& Faitar (2013) carried out a study on teachers' influence of students' science career choices in NewYork, the result clearly showed that an early attention to students' skills and aptitudes especially when dealing with minority and/ or

underprivileged ones is crucial in encouraging them to follow future Science ,Technology Mathematics and Engineering(STEM) careers. Kinyota (2013) carried out a study on students' perceptions of factors influencing choice of science streams in Tanzania secondary schools, the finding of the study indicate that factors such as students' examination, scores self-efficacy in science, knowledge of available careers, gender and school resource contexts affect students' choice of science streams, the results also revealed that a majority of students had relatively little knowledge of available careers and how they are related to subject choices. Students perceived performance as a main factor that is influencing their choice of science

In a study carried out by Ogweno, Kathuri and Obara (2014) on the influence of students' characteristics on academic performance in secondary school Agriculture, in Rachuonyo North Sub County, Kenya, it was discovered that students', age, career choice, gender, study times and class attendance positively influenced students' performance in secondary school Agriculture. In this study, the comparison between students' performance in agriculture mock examination and career choice revealed that the students who prefer a future career in agriculture related disciplines had a higher mean(51.25) followed by those who indicated that they would prefer medical related careers(50.13) as compared to those who wish to pursue engineering, teaching and business career, it was observed in the study that the choice of career one prefers to pursue in future influences performance.

In a study carried out by Juma (2015)on the development of biology literacy in Tanzanian junior secondary schools, it was discovered that some participants believed that they can use the knowledge they learn at school in their future career so also a small

number of students recognized that a knowledge of biology can be of value in careers that are not directly related to the biological sciences, for instance one of the participant said "I want to be a journalist, as a journalist I will sometimes need biological knowledge to report on biological or health related issues". So also another participant commented that he hopes to be a lawyer but he expects that he will sometimes use biological knowledge in his legal duties.

Nyamwange (2016) submitted that, career choice has lately become a very complicated science and yet, choosing the right career is important in ensuring remarkable productivity and sustainability and that the significance of career choice can be influenced by an individual's income, standard of living, status in society, social contacts as well as emotional health and feelings of self-worth. In a study carried out by Nyamwange2016 on influence of students' interest on career choice among first year university students in public and private university in Kisii county, Kenya. It was revealed that students' interest is significant in determine career choice decisions for an individual's career.

Perception of Biology Literacy based on the Students School Type

A number of different studies have been carried out on public and private schools and there have been some significant differences in favour of each end of the dimension but in some cases there have been no any significant difference in both the public and in the private schools.

Orederin and Oloyede (2006) on supervision and quality of teaching personnel's effect on students' academic performance, reveals that in both 2003/2004 and 2004/2005 sessions public schools had the higher number of qualified teachers of about 75% while

private schools had just 25% of competent and qualified teachers. They further said that public schools have better opportunity to produce good quality of students since the quality of teaching personnel can mar or build a child destiny. Rennalls (2006) carried out a study to determine black middle school students' perceptions of success and their influence on academic performance in Miami-dade country public school. The study sought to determine if difference exist among African-American, Haitan-American and Haitan Immigrant subgroups of the Black students population. The study combined qualitative and quantitative methodology in data collection and analysis. Her result shows no statistically significant differences among African-American, Haitan-American and Haitan students in their mastery, performance or social goal orientation. All students indicated hard work, persistence and goal setting through completion as important to achieving success.

Kanan and Baker (2006) carried out a study to examine the influence internationals schools have on adolescent local students in terms of individual and collective identity, career aspiration, type and location of the university they wish to attend. A random cluster sample of 270 students attending international, Magret and public schools in Qatar were administered a questionnaire designed to tap their perceived identities, professional and educational aspirations and it was discovered that there was a difference among the students who attended international school and their counterparts who attended public or Margret schools in the way they perceived themselves and their career choices. Ibitomi (2006) carried out a study on integrated science topics perceived difficult by junior secondary school students in Offa Local Government area of Kwara State, Nigeria. She found that there was significant difference in the number of

integrated science topics perceived difficult by private and public schools. The private schools perceived nine (9) topics difficult while the public schools perceived fourteen (14) topics out of the twenty five (25) to be difficult.

John, (2007) carried out a study on analysis of problems of learning biology as perceived by Senior Secondary School students in Kaduna metropolis the influence of school type on the problems of learning was examined, the result revealed that there was a significant difference in the responses to the problems of learning biology in Kaduna metropolis by the Senior Secondary School students in private and public schools. Most of the students in schools lacked facilities such as well-equipped laboratory and library. They also agreed that they never conducted biology practical unless at the onset of external examinations. The reverse was the case with private schools. The private schools are more equipped and practical are conducted regularly. Most students in private schools have biology textbooks of their own and are prone to doing their homework than those in public schools. Also the class size of students in public school is larger and more congested than the private schools.

Lubienski, Lubienski and Crane (2008) found that small classes were more common in private schools and this was positively connected with students' achievement and in 2009 they submitted the following to be the advantages of private schools over the public schools: private schools

Mostly have small class size

Lack accountability to the public

It is autonomous

Ignore recent curricular trends in education

Most have religion inclination

Set attraction to parents to show safe, neat and welcoming environment

So also in a study carried out by Maliki, Naban and Ibu (2009) among the junior secondary schools in Bayelsa State, it was revealed that students from private schools performed better than those from public schools. According to Ajaja (2009) in a study carried out on evaluation of science teaching in secondary schools in Delta state the findings revealed that science practical lessons are organized only during the preparation for external examinations for final year students in public schools and that private schools organized practical lessons for biology once in a month, once a term for chemistry and when preparing for external examinations for all science subjects.

In a study carried out by Malic, Ngban and Ibu (2009) on analysis of students' performance in junior secondary school mathematics examination in Bayelsa State of Nigeria found out that students from private schools performed better than those from public schools. Familola, (2011) carried out a study on the effect of mathematical language as pre-instructional strategy on junior secondary students' performance in mathematics in Ilorin, Nigeria. She found out that there was a significance difference in the performance of the J.S.S. students from private schools and that of public schools when taught statistical graphs using mathematical language as the treatment because the students from the private school performed better than that of public schools.

Iyekolo (2013) observed that private school students have better academic achievement than the public school students. This can be attributed to the commitment of private school teachers and high level of discipline. It was observed that students of private schools are more disciplined and have better conduct compare to their

counterparts in public schools. This could be accounted for their better performance as well as better career aspirations and achievements. In a study carried out by olasehinde and olatoye (2014) on a comparative study of public and private senior secondary school students' science achievement in Katsina state, Nigeria. It was found that there was a significant difference between public and private senior secondary school students' science achievement t = -3.537, p< 0.05 private schools students' performance significantly better than their public school counterparts.

Rong'uno (2017) compared academic performance between public and private secondary schools in Wareng Districts, Kenya. The study covered a total of 55 public and 17 private schools distributed evenly among the five educations zones in the district representing 52% and 68% schools respectively. The findings of the study revealed that despite government investing generously in public schools, private schools still performed better than the students in public schools.

Appraisal of the Reviewed Literature

This study was designed to investigate the perception of senior secondary school students on biology literacy in Ekiti state Nigeria. The literature reviewed on this study showed the role of students' perception in solving educational problems. Many studies have been carried out on perception. Some of these studies include that of John (2007), Olibie, Anyikwa, and Okoli (2014) and these studies revealed that perceptions of students on a subject will determine their benefits from the subject. There are also studies on the levels of students' biology literacy (Uno & Bybee, 1994, Kurt et al 2009, Adams & Nwagbo 2012) and all these studies found that students are at low level of biology literacy. However, studies on the perception of students on biology literacy as a whole

have not been found as the researcher could not lay hand on such study. This study, therefore hopes to fill the gap in the area of students' perception of biology literacy in Ekiti State, Nigeria.

Juma (2015) carried out a research on the development of biology literacy and it was discovered that the biology curriculum in Tanzania did not encourage the development of students on biology literacy as against what we have in Nigeria where the new Senior Secondary biology curriculum (2009) lay emphasis on acquisition of biological knowledge, skills and attitudes for functional living in the society. There are also studies on factors influencing students' performance in science, such as lack of adequate laboratories materials, library and text books, time constraints in teaching science Oyekan (2011) and the human factors such as teachers, students parents and school factor as identified by Omosewo (2008) and Edomwonyi – Otu & Avaa (2011). But none of these studies was on the perception of biology literacy.

The concept of perception arises from attempt to account for deserved regularities in the behavior of individual persons. Students as individual person carry their own perception to the class and this may or may not enhance learning depending on whether such perceptions are positive or otherwise. The students' perception of biology may be responsible for their poor performance in the subject among the three science subjects.

Perception is one of the concepts that are critically studied in psychology. Psychologists are more interested in what, when and how people perceived things and possible effects it has on their behavior. As a result of this, the researcher involves the theoretical framework based on the theories of perception of Gibson's (1987) theory,

Glaserfeld (1995), Herz (2010) and Gestalt psychology. Gibson's (1987) theory of perception-in-action showed relationship between perception, experience and action. This implies that if students have the right perception of biology literacy it would evoke favorable stimuli on the other hand improve their performance in the subject. Herz (2010) showed the extent to which experience plays a vital role in perception.

The perception of students in learning is influenced by many factors as reviewed in the related literature. Some of the factors adopted to the present study are :(i) students' class levels, as identified by Afuye (2008), Jannah, Halim, Meerah and Fairuz (2013)(ii)students' gender, John (2007) Oludipe (2012), Adeniyi (2012) (iii)students' school location, Erin, Travis and Michele Sutton (2009), Maliki, Ngban and Ibu (2009), Okereke & Onwukwe, (2011) ,(iv) students' School type, (Rennalls ,2006; Kanan and Baker 2006; Malic, Ngban and Ibu; Familola ,2011) (v) students' score levels (Akanmu 2013)(vi) students' choice of career. (Obura and Ajowi 2012; Juma ,2015) but none of these variables was on the perception of biology literacy and the inconclusive nature of the above learners' factors prompted the researcher to include them in this study as variables to be investigated to see the possible influence they may have on this study.

It was also discovered that there have been some significant differences in favor of each end of the dimension but in some cases there have been no significant difference. More so none of this study was carried out in Ekiti state, some of the related studies that were carried out within the country were done at the tertiary institution in Nigeria (Adams & Nwagbo 2012) while some of these study were conducted outside the country (Kurt ,Kaya, Ates, & Kilic 2009; Celtin,2014; Juma, 2015) from the foregoing, it is evident that there is need to investigate the perception of the senior secondary school

students on biology literacy in Ekiti State, Nigeria in order to improve the students' performance in biology.

The similarities between this study and the reviewed literature so far is that they are both descriptive research of the survey type, some of the studies are on perception and some are on biology literacy but this study is special in that, it investigated generally, the perception of the Senior Secondary Schools students on biology literacy in Ekiti State, Nigeria to enhance students better performance in biology and to reveal the importance of biology to the individual students and the society at large.

CHAPTER THREE

RESEARCH METHOD

This chapter deals with the methodology that was used in the course of this study and this was discussed under the following sub headings: Research Type, Sample and Sampling Techniques, Research Instrument, Validation of research Instrument, Procedure for Data collection and Data Analysis Techniques.

Research Type

The study was a descriptive research of survey type. Descriptive research enabled information to be obtained from the representative sample of the population and describes situation as they exist. Akweziulo and Agu (2004) defined survey research as one in which a group of people or items is studied by collecting and analyzing data from only a few people or items considered to be the representative of the entire group. Descriptive research of the survey type was therefore considered appropriate for this study as data were collected, analyzed and report as they exist.

Population, Sample and Sampling Techniques

The population for this study was all the senior secondary school students in Ekiti State. Cluster random sampling technique was used to divide the state along the three senatorial district which are Ekiti North Senatorial Districts, Ekiti Central Senatorial District and Ekiti South Senatorial District.

There are 186 public secondary schools and 168 private schools in Ekiti State .Proportional random sampling technique was used to select 20% of the total schools

(10% from the public schools and 10% from the private schools) from the three senatorial districts of the state due to the differences in the number of the schools in each of the senatorial districts. Stratified random sampling techniques was employed to select students for this study. The population of students was stratified in terms of students' school location, gender, and school type to ensure a true representative of the entire population was drawn. Simple random sampling technique was used to select 730 students who participated in the study.

The number of schools that was sampled and the distribution of biology students that was used are shown in the table 1 and 2

Table 1

The Number of Sampled Public Senior Secondary Schools and the Distribution of Students for the Study

Senatorial Districts	**No of Public Schools**	**No of Schools Sampled**	**No of Students Sampled**
Ekiti North	65	7	160
Central	64	7	162
Ekiti South	57	6	138
Total	186	19	460

Table 2

The Number of Sampled Private Senior Secondary Schools and the Distribution of Students for the Study

Senatorial Districts	**No of Private Schools**	No of Schools Sampled	**No of Students Sampled**
Ekiti North	38	4	70
Central	66	7	120
Ekiti South	64	6	80
Total	168	17	270

Source: Ekiti State Ministry of Education

Research Instruments

The instruments used for this study was a developed questionnaire adapted from Abimbola (2016) entitled, students' perception of biology literacy". Section A was made up of students' personal data which are the name of the school, the school location, and the students' sex, the students' choice of future career and class levels. Section B was made up of statements to measure students' biology literacy perception based on the nature of science which is seen in its characteristics comprising of knowledge, skills and attitudes of science. The students were made to indicate in the questionnaire the extent to which they agree on the statements on perception of biology literacy. The researcher also make use of the students' cumulative end- of- term results to determine the students' score levels.

Validation of Research Instruments

The instruments which are researcher designed questionnaire entitled: ''Students' Perception of Biology literacy'' was subjected to face and content validity by giving it to the researchers supervisors, two other science education experts from the Department of Science Education, University of Ilorin and two other Heads of Science Department among the selected Senior Secondary Schools in Ekiti state.

For reliability test, the instrument was administered on few samples of the Senior Secondary biology students who would not take part in the final research but have similar characteristics. Cronbach alpha in SPSS statistics was used to determine the reliability of the instrument and the reliability coefficient obtained was 0.84 (See Appendix D for the instruments)

Procedures for Data Collection

A letter of introduction of the researcher seeking permission to administer the questionnaire was collected from the Department of Science Education Faculty of Education University of Ilorin to the principal and the Heads of Science Department of the selected Secondary Schools prior to the administration of the questionnaire. The researcher through the consent forms wrote letter to seek permission from the parents, principals, students and the Heads of Science Department of each selected schools to administer the questionnaire.

The questionnaire was distributed to the students with the help of research assistants. The researcher trained the research assistants on the aim and objectives of the research as well as how the respondents were expected to respond to the questions they were trained on how to relate with the respondents in order to have their full cooperation they were also trained on how to carefully share and retrieve the copies of the questionnaire from the respondents and was given adequate instruction on how to complete the questionnaire. The completed questionnaire were collected for collation and subsequent analysis. Out of the 850 questionnaire administered, 730 were properly filled and returned, giving a completion rate of 86%

Data Analysis Techniques

To analyze the data collected, the descriptive statistics of the percentage, frequency and pie chart were employed for the personal information section of the questionnaire and the research questions were answered using percentages, frequency and mean scores while the inferential statistics of t-test and Analysis Of Variance (ANOVA) were used to test

the hypotheses. Hypotheses 1, 3, 5 and 6 were tested using t-test statistic while ANOVA statistic was used to test hypotheses 3 and 5 at 0.05 alpha level of significance and Scheffe post-hoc analysis was done where necessary to locate the sources of significant difference among the groups. Four points scale was used as rating scale of the items in section B as follows: Strongly Agree, Agree, Disagree and Strongly Disagree was used for the questionnaire. In order to convert these ordinal scale to interval scale, a weighting was given to each point in the scale as follows: Strongly Agree (SA) 4 points; Agree (A)3 points; Disagree (D) 2 points; Strongly Disagree (SD) 1 point.

All the analyses were done with the aid of Statistical Package for Social Science (SPSS) Version 23 and the results were subjected to statistical analysis at 0.05 level of significance. So also the students were grouped as high, medium and low scorers' based on their continuous assessment scores that was obtained from the school. The students who scored 70% and above were grouped as high scorers, the medium scorers were those who scored between 50 and 69% while the low scorers were those who scored below 50%

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

In this chapter, the demographical representation of the respondents, the results and interpretation of findings of the study are presented.

Demographical Representation of the Respondents

Table 3 reveals that 730 students participated in the study and the distribution of the students based on their school location, class levels, gender, score levels, preference on future career and school type are also shown in the Table. Three hundred and fifty students, representing, 47.94% of the population, were from the rural areas, while 380 (52.06%) were from the urban areas. The Table shows the frequency and the percentage of students that were selected from the various class levels of the senior secondary schools, 185(25.34%,) were selected from S.S.1, 291 (39.87%) were selected from S.S.2 and 254 (34.79%) of the population were selected from S.S.3 .It was also shown from the Table that 331(45.34%) were male students, while 399 (54.66%) of the population were female students.

Table 3 also shows the distribution of the students based on score levels, with low scorers having the population of 190 (26.03%), medium scorer 336(46.03%) and high scorer 429(58.77%), respectively. The distribution of students based on their preference on future career, showed that 429 (58.77%) were selected among those who choose biology-related careers while 301(41.23%) students were selected from the students who choose non biology-related careers. Two hundred and fifty five (34.93%) were selected from the private schools, while 475 (65.07%) were selected from the public schools.

The reports in Table 3 are further illustrated in the bar charts, Figures 1, 2, 3, 4, 5 and 6

Table 3

Demographic Characteristics of the Respondents

Demographic attributes	Variables	Frequency (N=730)	Percentage (%)
School Location	Rural	350	47.94
	Urban	380	52.06
	Total	730	100 .00
Classes of students	SS 1	185	25.34
	SS 2	291	39.87
	SS3	254	34.79
	Total	730	100.00
Gender of respondents	Male	331	45.34
	Female	399	54.66
	Total	730	100.00
Cumulative students Biology results	Less than 50	190	26.03
	50 – 69	204	27.94
	Greater 69	336	46.03
	Total	730	100.00
Type of school	Private	255	34.93
	Public	475	65.07
	Total	730	100.00
Future career	Biology related career	429	58.77
	Non biology related career	301	41.23
	Total	730	100.00

The Pie chart showing the distribution of the students based on school location is shown in Figure 1, where 47.94% of the students are from the rural areas and 52.06% are from the urban areas.

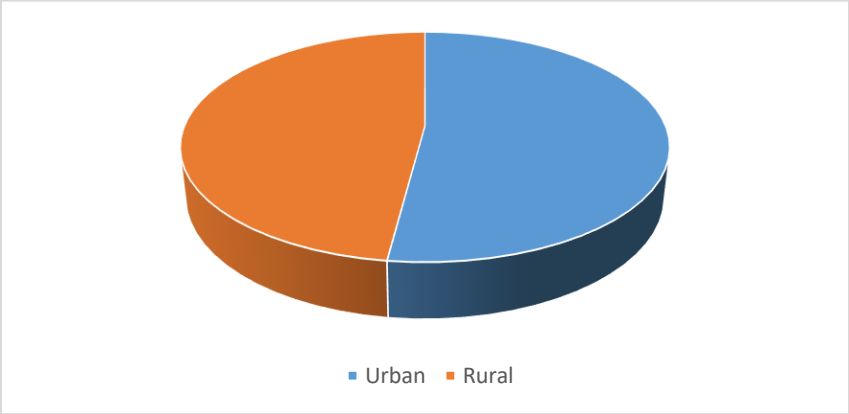


Figure 1: Pie chart showing the distribution of the students based on school location

The Pie chart showing the distribution of the students based on class level is shown in Figure 2 where 25.34%, of the population were selected from S.S. 1, 39.87% were selected from S.S.2 and 34.79% of the population were selected from S.S.3 respectively.

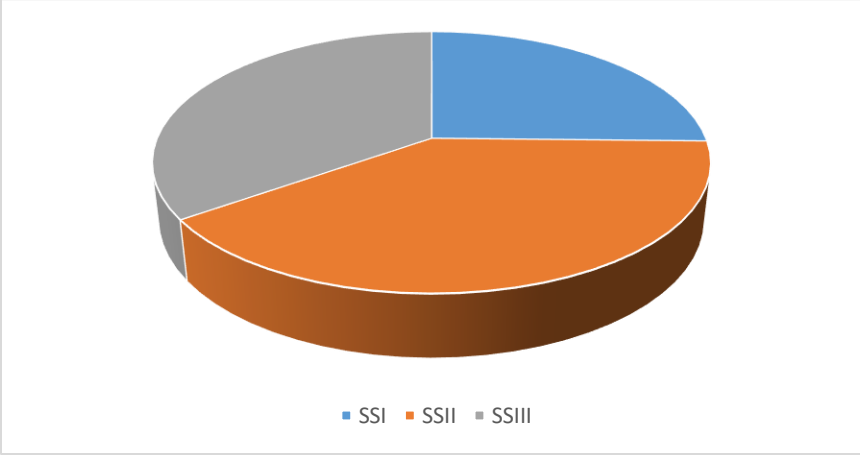


Figure 2: Pie chart showing the distribution of participants based on class level

The Pie chart showing the distribution of participants based on gender is shown in Figure 3 where 45.34% of the population were male and 54.66% were female students

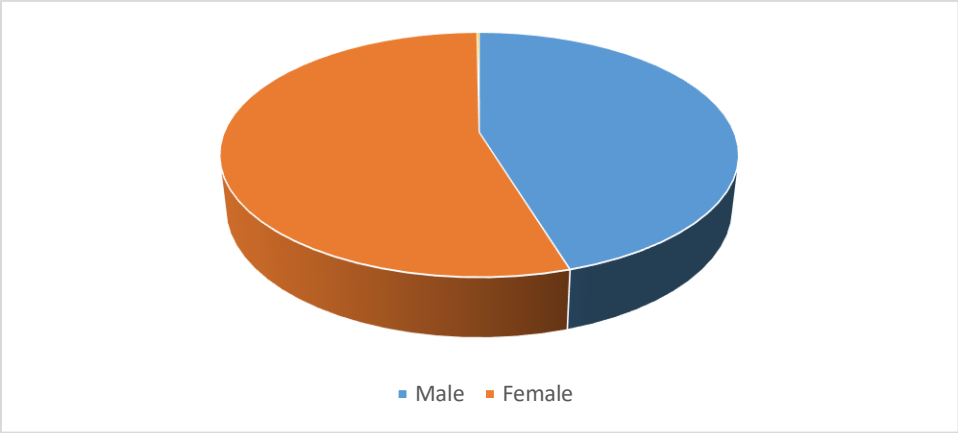


Figure 3: Pie chart showing the distribution of participants based on gender

The Pie chart showing the distribution of participants based on the students' score levels is shown in Figure 4 where 26.03% of the students were low scorer, 27.94% were medium scorer and 46.03% were high scoring students.

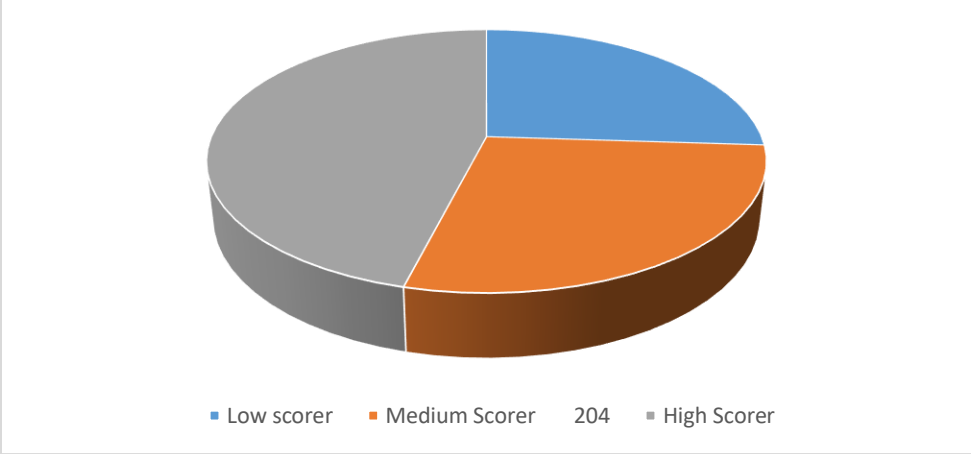


Figure 4: Pie chart showing the distribution of participants based on students' score levels.

The Pie chart showing the distribution of participants based on the students' preference on future career is shown in Figure 7 where 58.77% of the population were selected among those students who choose biology related career and 41.53% were from the students who choose non biology- related career

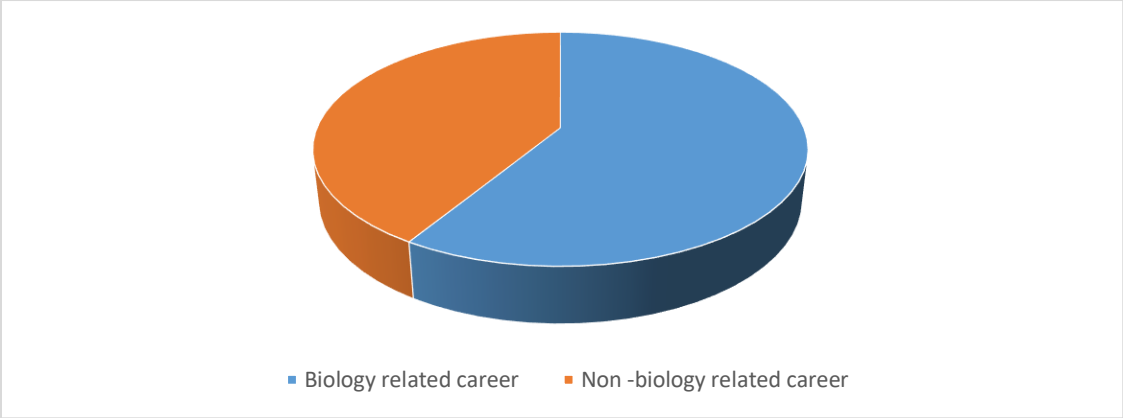


Figure 5: Pie chart showing the distribution of participants based on the choice of career

The Pie chart showing the distribution of participants based on the students' school type is shown in Figure 5 where 34.93% of the population were selected from the public schools and 65.07 % of the population were from the private schools.

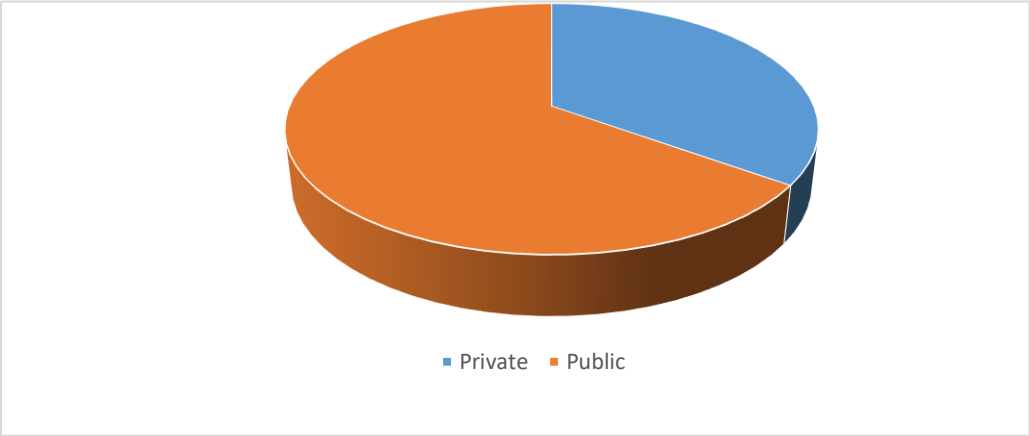


Figure 6: Pie chart showing the distribution of participants based on the students' school type

Research Question 1

What is the perception of senior secondary school students' on biology literacy?

In analyzing the question, the mean scores of senior secondary school students on the perception of biology literacy was computed based on the three components of biology literacy which are knowledge, skills and attitudes. The perception of biology literacy of the senior secondary school students was higher on biology knowledge (X = 90.35) than skills (X = 59.08) and attitudes (X = 59.75) as shown in Table 4

Table 4

Mean and Standard Deviation of Students on the Perception of Biology Literacy Based on Knowledge, Skills and Attitudes

Components of biology literacy	N	Mean ***(X)***	Standard Deviation
Perception based on knowledge	730	90.35	13.768
Perception based on skills	730	59.08	10.309
Perception based on attitudes	730	59.75	11.286
Total		209.17	32.924

Research Question 2

What is the influence of school location on the perception of senior secondary school students on biology literacy?

Table 5 shows that students' in rural areas had a mean score and standard deviation of 207.80 and 31.64, respectively, while the students in urban areas had a mean score and standard deviation of 210.44 and 34.06, respectively. Perception of students in urban area on biology literacy was higher than the perception of students in rural areas with a mean difference of 2.40. But when the analysis was subjected to hypothesis testing, the result indicated that school location had no significant influence on the students' perception of biology literacy.

Hypothesis 1

There is no significant difference in the perception of senior secondary school students on biology literacy based on the school location

This hypothesis sought to verify the significant difference in the perception of senior secondary school students on Biology literacy, based on their school location. In testing the hypothesis, scores relating to perception of senior secondary school students on Biology literacy, were computed. The mean scores on perception of Biology Literacy were compared for statistical significance using *t*-test at 0.05 level of significance based on school location. The result revealed that there was no significant difference in the perception of senior secondary school students on Biology literacy based on the school

location since the *p*-value, which is 0.28 is greater than 0.05 level of significance ($t_{(728)}$ = 1.08, p>0.05).Therefore, the null hypothesis is not rejected.

Table 5

The t-test Analysis Showing the Perception of Biology Literacy Based on School Location

School location	No	Mean	SD	df	*t*	*p*	Remark
Rural	350	207.80	31.64				
Urban	380	210.44	34.06	728	1.08	0.28	NS

Research Question 3

What is the influence of class level on the senior secondary school students' perception of biology literacy?

In determining the influence of class level on students' perception of biology literacy, the study compared the means of various class levels of the students on perception of biology literacy. Table 6 shows the mean of students in S.S 1, S S 2 and S.S.3 to be 208.85, 216.42 and 201.11 and the standard deviation to be 32.55, 30.08 and 34.49, respectively. It was discovered that the students in S.S. 2 had the highest means score compared to those in S.S. 1 and S. S. 3. This implies that the perception of students on biology literacy is influenced by the students' class level.

Table 6

Mean and Standard Deviation of Students on the Perception of Biology Literacy Based on Class Levels

Class levels	N	Mean	Standard Deviation

S S 1	185	208.85	32.55
S S 2	291	216.42	30.08
S S 3	254	201.11	34.49
Total	730	209.17	32.92

Hypothesis 2

There is no significant difference in the perception of Senior Secondary School students on biology literacy based on the class level.

This hypothesis sought to verify the significant difference in the perception of senior secondary school student on Biology literacy based on their class level. In testing the hypothesis, scores relating to perception of senior secondary school students on Biology literacy were computed. The mean scores on perception of Biology Literacy were compared for statistical significance using Analysis of Variance (ANOVA) statistics at 0.05 level of significance based on class level.

The result in Table 7 revealed that, there was a significant difference in the perception of senior secondary school students on Biology literacy based on the class level [$F_{(2,728)} = 15.247$, $p<0.05$]. The null hypothesis is rejected

Table 7

The ANOVA Analysis showing the Perception of Biology Literacy Based on Class Level

Source	SS	df	M S	*t*	*p*	Remark
Between Groups	31811. 38	2	15905. 69			

Within Groups	758421. 53	728	1043.22	15. 25	.000	S
Total	790232.91	730				

P<0.05, S-Significant

In order to locate the sources of the significant difference among the groups, Scheffe Post-hoc analysis was carried out at 0.05 level of significance. The result shows that there was a significant difference between SS 1 and SS 2 on perception of Biology literacy at 0.05 level of significance as shown in Table 8, in favour of S.S. 2

Table 8

Scheffe Post-hoc Analysis Showing Students' Perception of Biology Literacy Based on Class Level

Class level	SS 1	SS 2	SS 3	N	Mean
SS 1		*	*	185	208.85
SS 2			*	291	216.42
SS 3				254	201.11

P< 0.05

Research Question 4

Would gender have influence on the senior secondary school students' perception of biology literacy?

Table 9 shows the mean and the standard deviation of male and female students on the perception of biology literacy. From the table, male students had a mean of

212.22 with the standard deviation of 32.52, while their female counterparts had a mean of 206.65 with the standard deviation of 33.09, it was shown that male students obtained a higher mean score than female students. This implies that students' gender had influence on their perception of biology literacy.

Hypothesis 3

There is no significant difference in the perception of senior secondary school students on biology literacy based on gender

The *t*-test analysis in Table 9 shows that the *t*-value to be 2.28 and the *p*-value to be 0.02, which is less than 0.05 level of significance, This implies that, there was a significant difference in the perception of senior secondary school students on Biology literacy based on the gender ($t_{(728)} = 12.281$, $p<0.05$) in favour of male students. The null hypothesis is rejected.

Table 9

The t-test Analysis Showing the Perception of Biology Literacy Based on Gender

Gender	N	Mean	SD	df	*t*	*p*	Remark
Male	331	212.22	32.52				
Female	399	206.65	33.09	728	2.28	0.02	S

P<0.05, S-Significant

Research Question 5

Is there any difference in the perception of senior secondary school students on biology literacy based on their score levels?

In determining the influence of score levels on students' perception of biology literacy, the study compared means of various class levels of the students on perception of biology literacy based on the students' score levels. Table 9 shows the means and the standard deviations of low scorer, medium scorer and the high scorer to be 208.2, 201.90 and 214.24 and standard deviation of 39.81, 29.45 and 29.68, respectively. It was discovered that high scoring students had the highest means score compared to low and medium scoring students. This implies that the perception of students on biology literacy is influenced by the students' score levels.

Table 10

Mean and Standard Deviation of Students on the Perception of Biology Literacy Based on Score Levels

Score levels	N	Mean	Standard Deviation
Low scorer	190	208.02	39.81
Medium scorer	204	201.90	29.45
High scorer	336	214.24	29.68
Total	730	209.17	32.92

Hypothesis 4

There is no significant difference in the perception of senior secondary school students on biology literacy based on score levels

This hypothesis sought to verify the significant difference in the perception of senior secondary school students on Biology literacy based on their score levels. In

testing the hypothesis, scores relating to perception of senior secondary school students on Biology literacy were computed. The mean scores on perception of Biology Literacy were compared for statistical significance, using Analysis of Variance (ANOVA) statistics at 0.05 level based on score level.

The result shows that there was a significant difference in the perception of Senior Secondary School students on Biology literacy based on the score level ($F_{(2,728)}$=9.284, P<0.05) as shown in Table 11. The null hypothesis is rejected.

Table 11

The ANOVA Analysis showing the Perception of Biology Literacy Based on Score Level

Source	SS	df	MS	*F*	*p*	Remark
Between Groups	19679.93	2	9839.96	9.28	.00	Significant
Within Groups	770552.98	728	1059.91			
Total	790232.91	730				

p<0.05

In order to locate the sources of the significant difference among the groups, Scheffe Post-hoc analysis was carried out at 0.05 level of significance. The result shows that there was a significant difference between medium and high scorers on perception of Biology literacy at 0.05 level of significance. However, the mean difference between the perception of low and high, medium and low scorers on Biology literacy was statistically significant at 0.05 level of significance in each case as shown in Table 12

Table 12

Scheffe Post-hoc Analysis showing students' perception of Biology literacy Based on score level

Score Level	Low	Medium	High	N	Mean
Low				190	208.02
Medium			*	204	201.90
High				336	214.24

*$p<0.05$

Research Question 6

Does career choice influence the senior secondary school students' perception of biology literacy?

In answering research question 6, the mean of students' scores on perception of biology literacy was computed and the mean score obtained. Table 13 shows that the perception of students who preferred biology related career was higher than the perception of those students who preferred non-biology related career with the means score of 213.40, 203.15 and standard deviation of 31.16 and 34.45 respectively. This implies that students' preference on biology- related careers has influence on their perception of biology literacy.

Hypothesis 5

There is no significant difference in the perception of senior secondary school students

This hypothesis sought to verify the significant difference in the perception of senior secondary school students on Biology literacy based on their future career. In testing the hypothesis, scores relating to perception of senior secondary school students on Biology literacy were computed. The mean scores on perception of Biology Literacy were compared for statistical significance using *t*-test at 0.05 level of significance based on future career.

The result reveals that there was a significant difference in the perception of senior secondary school students on Biology literacy based on their future career ($t_{(728)} = 4.19$, $p<0.05$) as shown in Table 13. The null hypothesis is rejected.

Table 13

The t-test Analysis Showing the Perception of Biology Literacy Based on the Students Choice of Future Career

Future career	N	Mean	SD	df	*t*	*p*	Remark
Biology related career	429	213.40	31.16	728	4.19	0.00	S
Non-biology related career	301	203.15	34.45				

P< 0.05, S-Significant

Research Question 7

Is there any difference in the perception of senior secondary school students on biology literacy based on the school type?

In answering research question 7, the mean of students on perception of biology literacy was computed and the mean score obtained. Table14 shows that students' in private school had a mean score of 212.94 and standard deviation of 25.07, respectively, while students in public schools had a mean score and standard deviation of 207.15 and 36.31, respectively. This shows that the Perception of students in private schools on biology literacy was higher than the perception of students in public school with a mean difference of 5.79. This implies that the perception of students on biology literacy is influenced by the students' school type

Hypothesis 6

There is no significant difference in the perception of senior secondary school students on the perception of biology literacy based on school type

This hypothesis sought to verify the significant difference in the perception of senior secondary school students on Biology literacy based on school type. In testing the hypothesis, scores relating to perception of senior secondary school students on Biology literacy were computed. The mean scores on perception of Biology Literacy were compared for statistical significance using *t*-test at 0.05 level of significance based on school type. The result in Table 14 reveals that, there was a significant difference in the

perception of senior secondary school students on Biology literacy based on their school type ($t_{(728)} = 2.279$, $p<0.05$). The null hypothesis is rejected.

Table 14

The t-test Analysis Showing Perception of Biology Literacy Based on the Students School Type

School Type	N	Mean	SD	df	*t*	*p*	Remark
Private	255	213.40	31.16				
				728	4.19	0.02	Significant
Public	475	203.15	34.45				

P<0.05, S-Significant

Summary of Findings

The following is the summary of the major findings:

1. The results from the research question one revealed that perception of biology literacy of students were highest on biology literacy knowledge (X = 90.35) than skills (X = 59.08) and attitudes (X = 59.75)

2. There was no significant difference in the perception of Senior Secondary School students on biology literacy based on their school location. ($t_{(728)} = 1.08$, $p>0.05$).

3. There was a significant difference in the perception of Senior Secondary School students on biology literacy based on class level. ($F_{(2,728)}$ =15.25, p<0.05).

4. There was a significant difference in the perception of Senior Secondary School students on biology literacy based on gender. ($t_{(728)}$ = 12.28, p<0.05).

5. There was a significant difference in the perception of Senior Secondary School students on biology literacy based on their score levels ($F_{(2,728)}$ =9.28, P<0.05).

6. There was a significant difference in the perception of Senior Secondary School students on biology literacy based on their choice of career ($t_{(728)}$ = 4.19, P<0.05).

7. There was a significant difference in the perception of Senior Secondary School students on biology literacy based on their school type ($t_{(728)}$ = 2.27, p<0.05).

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This chapter discusses the results of the study. Data analysis, conclusion and recommendations are also stated.

Discussion

This study sought to find out the students' perception of biology literacy in Ekiti State, Nigeria. Seven research questions were formulated and six hypotheses were raised and tested. The research questions were answered using mean and standard deviation to

determine the students' perception of biology literacy while hypotheses 1, 3, 5 and 6 were tested using *t*-test statistic and hypotheses 3 and 4 were tested using Analysis of Variance (ANOVA) and in order to locate the sources of significant difference among the groups, Scheffe Post-hoc analysis was carried out where necessary.

The results from the research question one reveals that the perception of students on biology literacy was higher in favor of biology knowledge than skills and attitudes. This implies that the students did better on perception of biology literacy based on knowledge than the skills and the attitudes. This may be due to the fact that the students were taught more theory than practical, which would have developed their skills and attitudes in biology. This is in support of Ajaja (2009) who discovered that students are taught more theory than practical.

On the perception of students on biology literacy based on the school location, the t-test statistic shows ($t_{(728)} = 1.08$, $p>0.05$). This implies that the perception of biology literacy does not depend on the students' school location. This may be due to the fact that students in both rural and urban schools are exposed to the same biology curriculum. The outcome of this finding is in line with the work of Thomas and Ikuyero (2013) that school location did not significantly influence the students' perception and Lawal (2013) who found no significant difference in the levels of scientific literacy between students in rural and urban areas but contrary to the work of Juma (2015) who discovered a significant difference in students 'perception of biology knowledge in rural and urban areas.

The result of the students on the class levels showed that the perception of students on biology literacy depends on the students' class levels. It was discovered that

S.S.2 students' perception of biology literacy was higher than the S.S. 1 and S.S. 3 and the ANOVA statistic shows that ($F_{(2,728)} = 15.25$, $p<0.05$).This may be due to the fact that the students in S.S.1 were yet to have the proper perception of biology literacy while the perception of students in S.S.3 decreases due to the volume of work they have to cover in Senior Secondary School Biology Curriculum. The finding of this study is in agreement with Afuye (2008) who discovered that there was a significant difference between the performance of students in S.S 1, 2, and 3.

The result of analysis of the perception of students on biology literacy based on gender showed that gender has influence on the perception of biology literacy and the *t*-test statistics showed ($t_{(728)} = 12.28$, $p<0.05$). This indicates that the perception of students depends on gender. This may be due to the fact that males have larger average brain sizes than females and therefore expected to have higher average intelligent quotients, it may also be due to the differences in male and female students in terms of treatment. Their treatment in schools, at home and in society may lead to under-development which may negatively affected their perception.

The finding of this study is in agreement with the study of John (2007), Ayodele (2009), Lawal (2013) and Bernard (2014) who found gender difference significant at 0.05 level of significance but contrary to Oludipe (2012), Adeniyi (2012), Baanu (2014) who found gender differences not significant at 0.05 level of significance.

The result of analysis on the perception of students on biology literacy based on the students' score levels showed that there are differences in the perception of students of varied score levels and the ANOVA statistic shows that ($F_{(2,728)} = 9.28$, $p<0.05$) there was a significant difference in the perception of senior secondary school students based

on the students' score levels .This implies that the students' perception of biology literacy depends on their score levels. This is in agreement with Idowu (2008) who found that there was a significant difference on students' performance based on their academic ability level, but contrary to the work of Onijamowo (2010) who discovered that the score levels of students did not actually influence the number of misconceptions and alternative conceptions held by students on some selected concepts.

The result of analysis on perception of biology literacy based on the students' preference on careers showed that there are differences in the perception of students who preferred biology- related careers and those who preferred non-biology related careers and the *t*-test statistic shows ($t_{(728)} = 4.19$, $p<0.05$).This showed that the students' choice of career influences their perception of biology literacy and this may be due to the fact that some students' belief that they do not need the knowledge of biology. This finding is in agreement with the work of (Obura and Ajowi 2012) who found that there was a significant difference between students' career aspirations and performance in examination but disagreed with the finding of Juma (2015) who discovered that the knowledge of biology can be of value in careers that are not directly related to the biological sciences.

The result of the analysis of the perception of students on biology literacy based on the students school type shows that ($t_{(728)} = 2.27$, $p<0.05$) there was a significant difference in the perception of students on biology literacy This may be due to the advantages that private schools have over public school in term of infrastructures, small class size, thorough supervision and rigorous academic environment. This finding is in

agreement with the work of Familola (2011) who found that there was a significant difference in achievement of students from private and public schools.

Conclusion

The findings of this study showed that the students had high perception of biology literacy. It was also discovered that the perception of students based on knowledge was higher than those that are based on skills and attitudes this implies that students perception of biology literacy was better on biology knowledge than the biology skills and attitudes.

The study also shows that there was a significant difference in the perception of senior secondary school students on biology literacy in Ekiti State, Nigeria based on class levels, gender, score levels, preference for future career and the students' type of school but there was no significant difference in the perception of senior secondary school on biology literacy based on the students' school location.

Recommendations

Based on the research findings, the following recommendations were made:

1. Biology teachers should try to develop students' skills and attitudes on biology literacy through regular practical in biology and by relating biology knowledge contents scope to the students' everyday life so as to develop their literacy in biology for better performance.

2. Students in rural and urban areas should be given equal opportunity to learn by providing them materials and resources that will develop their literacy in biology.

3. Students must be encouraged to develop the proper perception of biology at all the class levels and that the biology teachers must assist in making sure that the students' perception of biology at S.S.3 does not drop due to the complexities in the curriculum as the year progressed.

4. Male and female students should be given equal treatment in the class to improve female students' perception of biology literacy and male students should not relent their effort in studying.

5. Students of different score levels should be encouraged to develop their literacy in biology especially the low scorer and that teachers should also develop a strategy that will suit students of different score levels so as to bridge the gap between the high, medium and low scoring students

6. Students who preferred non-biology related career should be encouraged to develop a proper perception of biology as it is directly having relationship with human beings whether in the field of biological sciences or not as the knowledge of biology is useful in everyday life. So also the students who preferred biology related career should not relent their effort in studying.

7. Students in public schools should be encouraged to develop their literacy in biology through regular class attendance, reading and studying and students' in private school should not relent their efforts in studying

Limitation to the Study

This study was limited to Ekiti State, Nigeria because of the financial implications and during the course of written this thesis, the researcher met with some problems which made the project a little bit difficult. Some of these problems are: lack of similar study to serve as a guide, inability to get enough materials for the study, problem of transport fare as repeated journeys were made to some sample schools in order to get the questionnaire retrieved. Out of 850 administered questionnaire, 730 copies were properly completed and returned.

Suggestions for Further Studies

The following suggestions are made for further studies:

1. This research is a descriptive study of the survey type. Experimental study should be conducted to confirm the findings of this study and to also find out the knowledge, skills and attitudes that are developed in students and those that are yet to develop so as to foster the biology literacy of the students.

2. This study should also be carried out in other States of Nigeria to examine the perception of students on biology literacy throughout the nation in order to bring about a biology literate society.

3. This study made use of students as the respondents 'further researcher should examine the perception of teachers on biology literacy in Ekiti State, Nigeria

REFERENCES

Abimbola, I. O. (2009). *Scientific literacy and the African worldview: implications for sustainable science education*. Department of Science Education, University of Ilorin, Ilorin, Nigeria.

Abimbola, I. O. (2013). *Philosophy of science for degree student*. Bamitex Printing and Publishing works, Ilorin.

Abimbola, I. O. (2013). "*The misunderstood word in science: towards a technology of perfect understanding for all"* The One Hundred and Twenty-Third (123rd) Inaugural Lecture Ilorin: Unilorin press.

Abimbola, I. O. (2016). *Perception of biology literacy by Senior Secondary School biology teachers in Ogun state, Nigeria.* A research proposal. Available from the author.

Abimbola, I. O., & Abidoye, F. O. (2013). Effect of qualification and experience of biology teachers on the status of ecology teaching in Kwara State. J*ournal of Education and Practice, 4(24), 1-8.*

Abimbola, I. O., Olorundare, A. S., Omosewo, E. O., Ahmed, M. A., Upahi, J., & Yahaya, L. A. (2011). Way forward for STEM education. *Proceedings of the 52nd Annual* Publisher Plc

Abimbola, I. O., Olorundare, A. S., Omosewo, E. O., Ahmed, M. A., Upahi, J., & Yahaya, L. A. (2011). Way forward for STEM education. *Proceedings of the 52nd Annual Conference of the Science Teachers Association of Nigeria* (STAN) HEBN Publisher Plc

Adodo, S. O., & Oyeniyi, J. D. (2013). Student variables as correlates of secondary school students' academic performance in biology. *International Journal of Science and Research 2(7)* 386-390. Retrieved from www.ijsr,net

Agbonna, S.A. (2006). *Influence of school location on student' academic achievement in private and public secondary schools in Ilorin,* unpublished M.Ed. dissertation University of Ilorin, Nigeria.

Afolabi, A. O. (2006). *Effects of computer-assisted instructional package on secondary school students' performance in biology*. Unpublished Ph.D. Thesis, Department of Science Education, University of Ilorin, Ilorin, Nigeria

Afuye, I. (2008) *Senior Secondary School students' Performance In mathematics in ifelodun local government area, kwara state Nigeria* unpublished M .Ed research project University of Ilorin, Nigeria.

Ahmed, M.A. (2008). *Personality factors and biology lecturers' assessment of difficulty levels of genetics concepts in Nigeria colleges of education.* Unpublished Ph.D. Thesis University of Ilorin, Nigeria

Ajaja, O. P. (2009). Evalution of science teaching in secondary schools in Delta State 2-teaching of the sciences. *Journal Edu Sci 1(2):119 129. Retrieved from IJES-01-2-119-09-006-Patric-A-0Tt.pdf.*

Akanmu, M. A., & Fajemidagba M. O. (2013). Guided -discovery learning strategy and senior school students' performance in mathematics in Ejigbo, Nigeria. *Journal of Education and Practice (4)12,*

Akintola, D. A. (2017). *Assessment of the knowledge of biological drawings possessed by senior school students in Oyo State, Nigeria*. Unpublished Ph.D. Thesis University of Ilorin, Nigeria

Akuezuilo, E.O., & Agu,N. (2004). *Research and Statistics education and social science.*

Methods and applications Awka: Nuel centi publishers and Academic press Ltd.

Alabi, H. I. (2016) *Comparative effects of text structures on achievement in genetics of senior secondary school students in Ilorin, Nigeria.* Unpublished Ph.D. Thesis University of Ilorin, Nigeria

American Association for the Advancement of Science [AAAS]. (2009).

Benchmark for science literacy. Oxford University Press, New York.

Aristotle on perception. Retrieved August 24, 2014 from https://faculty.washinton.edu/smcohen/433perceptionlecture.pdf/3/4/2008. Copyright© 2008 S. Marc Cohen

Attention theory. Retrieved August 24, 2014 from www.intinno.iitkp.ernet.in/ courses/1170/wfiles/235886.

Aworanti, O. A., & Abimbola, I. O. (1997). The level of achievement on ecology concepts among Nigerian final-year secondary school students. *Journal of the Science Teachers' Association of Nigeria, 32(1&2), 51-58.*

Ayanda (2016). *Effects of analogies and concept maps on senior school students' achievement in ecological concepts in kwara south, Nigeria.* Unpublished Ph.D. Thesis, Faculty of Education university of Ilorin, Nigeria.

Ayodele, O. M. (2009). Gender difference in mathematics and integrated science achievement among junior school students. *MJLI 6, 41-53.*

Azmi, M.O. (2010). Biology laboratory apparatus: Retrieved from http://www.laboratoryapparatus.org

Baanu, T. F. (2014). *Influence of selected personality factors on chemistry students' academic achievement in Senior Secondary Schools in North-Central Nigeria*. Unpublished Ph.D. Thesis, University of Ilorin, Ilorin, Nigeria.

Babajo, H. H. (2011). Associated problems in public and private schools in Nigeria and the way forward *Paper presented at a Conference Organized by Shehu Shagari College of Education, Sokoto, Nigeria.*

Balogun, E. M. (2010). *Conception of thermodynamics held by chemistry students in Kwara State Colleges of Education, Nigeria*. M.Ed. Dissertation, Department of Science Education, University of Ilorin, Ilorin, Nigeria.

Bernard, N. G. (2013). Secondary school students' perceptions of mathematics formative evaluation and the perceptions' relationship to their motivation to learn the subject by gender in Nairobi and Rift Valley provinces, Kenya. *Asian Journal of Social Sciences and Humanities (2)1*

Bernardo A.B.I., Limjap A.A. Prudente M. S., Roleda L.S.(2008). Students' perceptions of science classes in the Philippines. *Asia Pacific Education Review 9(3)285-295.* Retrieved from 56bed6960c63ee023 aofd1677f6899dd8d23.pdf

Biology literacy in a college biology classroom. *Bioscience, 42(1), 63-65.*

Biology literacy. Retrieved September 15, 2015 from: www.psychwiki.com/dms/other/labgroup///measufgdfsdbger345/resweeki/mario/ baldwin1999,pdf.

Biological Sciences Curriculum Study (B S C S) 1993. *Developing biology literacy*. New York; John Wiley and Sons, Inc.

Carrier, R. (2001).*Test your scientific literacy*. Retrieved from infidel.org/library/modern/Richard carrier/sciLit.html

Celtin , G. (2014) Prospective teacher's view about video-enhanced general biology instruction *academic Journals.9(22),1182-1199 retrieved from E8D224948674.Pdf.*

Cernerud, L., & Keller, C. (2002). Students' perception of e-learning in University education. *Journal of Educational Media, (2)*

Centra J.A., & Gaubatz N.B. (2005). Student perceptions of learning and instructional effectiveness in college courses: A validity study of Student Instructional Report (SIR)

Coll, R. K., & Taylor, N. (2009) Exploring international perspectives of science of science literacy: An overview of the special issues. *International Journal of Environmental & Science Education, 49(3), 197-200.*

Colman, A. M. (1993). *What is Psychology*: The inside story. London: Harper and Row Ltd.

Colom, R., & Lynn, R. (2004). Testing the developmental theory of sex differences in intelligence on 12-18 years old. *Personality and Individual Differences, 36, 75-82*

Demastes, S., & Wandersee, J. H. (1992). Biology literacy in a college biology classroom. *Bioscience, 42(1), 63-65*.

Durojaiye, F.F. (2012). *Basic science as a predictor of students' performance in senior school science subjects in Ekiti State, Nigeria*. An unpublished M .Ed Dissertation, University of Ilorin, Nigeria

Early and Late Selection Theories of Attention Retrieved August 20, 2014 from www.epistemic.co.uk/staff/nmilton/papers/attention.htm.

Edomwonyi-Otu, L., & Avaa, A. (2011). *The challenge of effective teaching of chemistry:* A case study among selected secondary schools in Zaria Metropolis. Retrieved from http://lejpt.academicdirect.org

Edmore, M., Maropeng, M., & Cosmas, M. (2012). Female students' perceptions of gender and academic achievement: A case of sixth form in girls Zimbabwen school. *Journal of Social Science 32(1):111-120*

Erin S., Travis P., & Michele S. (2009). High school students' perception and knowledge about agriculture based upon location of the high school. Smith *NACTA Journal* retrieved from www.nactatteachers.org/vol-53-num-3sept-2009/141

Egwu, S.O. (2009). Senior Secondary School curriculum. Abuja NERDC.

Extension America's Research based Learning Network (2014): *Three ways nutrition influences students learning potential and school performance.* Retrieve March 12, 2015 from htm#VNIZqyc67dc

Eniayeju, A. A. (2010). Effect of cooperative learning strategy in the achievement of primary six boys and girls in mathematics. *ABACUSThe Journal of Mathematical Association of Nigeria, 35(1) 1-9.*

Faitar, G.M., & Faitar, S.L. (2013) .Teachers influence on students' science career choices. *American International Journal of Social Science 2(5)*

Familola, A. D. (2011). *Effect of mathematical language as pre-instructional strategy on junior secondary students' performance in mathematics in Ilorin, Nigeria*. Unpublished M. Ed. dissertation, University of Ilorin, Nigeria

Federal Republic of Nigeria (FRN) (2004).National policy on education (4th edition) Lagos. NERDC Press

Federal Republic of Nigeria (FRN) (2013).National policy on education (6th edition) Lagos. NERDC Press

Federal Ministry of Education (FME) (2009). Senior secondary education curriculum biology for Senior Secondary Schools 1-3 Abuja NERDC

Genci, M. (2015). The effect of scientific studies on students' scientific literacy and attitudes Ondokuz Mayis University. *Journal of Faculty of Education 34(1), 141-152 doi:10.7822/omuefd.34.1.8*

Gbigbadua, D. A. (2014). *Effects of pre-instructional word-clearing strategy on the achievement of senior secondary school biology students in NIgeria*. Unpublished M.Ed. Dissertation, Department of Science Education, University of Ilorin, Nigeria.

Gestalt Psychology-Wikipedia Retrieved 31/12/2017 from https//:en.m.wikipedia org/wiki/Gestalt psychology

Gibson, E.J. (1988a). Exploratory behavior in the development of perceiving, acting, and the acquiring of knowledge. *Annual Review of Psychology, 39, 1-41.*

Gibson, E.J. (1988b). Levels of description and constraints on perceptual development. In a Yonas (Ed.), *Perceptual development in infancy:* Minnesota Symposium on Child Psychology (20), 283-299

Gibson, E. J. (1997). An ecological psychologists' prolegomena for perceptual development: A functional approach. In C. Dent-Read, & .P. Zukow-Goldring (Eds).Evolving explanations of development: Ecological approaches to organism-

environment systems (23-45).Washington, D. C: American Psychological Association.

Gibson, J.J. (1966) .The senses considered as perceptual systems .Boston-Houghton Mifflin.

Gibson, J. J. (1987). *The ecological approach to visual perception*. New York USA. Lawrence Erlbaum Associates.

Glasersfeld, E. (1995). *Radical constructivity*. A way of knowing and learning.

Gormally, C., Brickman, P., & Lutz, M. (2012). Developing a test scientific literacy skills (TOSLS): Measuring undergraduate' evaluation of scientific information and arguments .*CBE Life Sci Edu* 11(4 :) 364-377.

Graham, R. L. (1999). *Theory of Perception*. Retrieved from www.griphilosophy.co.nz/paper/htm.

Gregory, R. (1970). The intelligent eye. London: Weidenfeld and Nicolson.

Gregory, G. (1988). *Direct theory of perception*. Retrieved from www.griphilosophy.co.nz/paper/htm.

Hacer, S. (2006). *The effect of gender and reasoning ability on the students' understanding of ecological concepts and attitude towards science*. A Master of Science thesis submitted to the Graduate School of Natural and Applied Sciences of Middle East Technical University.

Herz, R. S. (2010). *Odor-association learning and emotion*: *Effect on perception and behaviour: Retrieved from* http://enwikipedia.org/wiki/interactiveactivationandcompetion.

Himschoot, (2012). Student perception of relevance of biology content to everyday life: A study in higher education biology courses. *Faculty Scholarship-Biology. Paper2.* Available at http://digital.commons.

Ibitomi, O. O. (2006). *Integrated science topics perceived difficult by junior secondary school students in Offa Local Government Area of Kwara State, Nigeria.* Unpublished M.Ed. Dissertation, Department of Science Education, University of Ilorin, Nigeria.

Idowu, C. B. (2008). *Effects of content structures on the performance of college of education biology students in South-Western Nigeria*. Unpublished Ph.D. Thesis Department of Science Education, University of Ilorin, Ilorin, Nigeria.

Ingraham, P. (2004). *An introduction to biology literacy* .Retrieved from Wikipedia the free encyclopedia.

International Council for Science. (2011).*Report of the ICSU Ad-Hoc review panel on science education.* Retrieved March 14, 2016 from *http://www.icsu.org/publications/reports-and-reviews/report-of-icsu-ad-hoc-review-panel-on-science-education*

Iyekolo, A. O. (2013*). Influence of family and school variables on secondary school students' academic achievement in Kwara State,* Nigeria. Unpublished Ph.D. Thesis, University of Ilorin.

Jannah, M., Halim, L. Meerah, T.S.M &, Fairuz, M. (2013).Impact of environmental education kit on student' environmental literacy. Retrieved from 30025-101036-SM.pdf

Jimoh, M. A. (2009). *Effect of the use of analogy on Senior Secondary School students' performance in chemistry in Ilorin, Nigeria*. An Unpublished M. Ed. Dissertation, University of Ilorin, Ilorin, Nigeria.

Jiyah, (2016). *Effects of hands-on with mind-on instructional strategy on senior school students' achievement in cell-division in Lafiagi, Nigeria*. Unpublished M.Ed Dissertation, University of Ilorin, Ilorin, Nigeria.

John, F. (2007). *Analysis of problems of learning biology as perceived by Senior Secondary School students in Kaduna metropolis*. An unpublished M.Ed. Dissertation, University of Ilorin, Nigeria.

Jones, M. G., Howe, A., & Rua, M. J. (2000). Gender differences in students' experiences, interests and attitudes toward science and scientists. *Science Education, 84, 180-192*

Juma, Z. R. (2015). *Exploring the development of biology literacy in Tanzanian junior secondary school students A Ph.D.* Thesis University of Wellington, New Zealand retrieved from researcharchive.vuw.ac.nz/xmlui/bitstream/handle/10063/4246/thesis.pdf?sequence=2

Kanan, H. M., & Baker, A. M. (2006). *Influence of international schools on the perception of local students' individual and collective identities, career aspiration and choice of university.* Retrieved from www.jri.sagepus.com/egi/content/refs.

Kinyota, M. (2013).*Students' perception of factors influencing choice of science streams in Tanzania secondary schools.* A master's Dissertation School of Education,

Department of Education Policy Research and Administration. The Center for International Education

Kolawole, E .B. (2010). *Principles of test construction and administration Revised Edition*. Bolabay Publications. Ikeja, Lagos, 8, 24

Kurt, H., kaya, B., Ates, A., & Kilic, S. (2009). The biology literacy of biology teacher candidates' .Retrieved from E8D224948674.pdf

Kwesigabo, G., Mwangu, M.A., Kakoko, D. C., & Killewo, J. (2012).Health challenges in Tanzania: Context for educating health professionals. *Journal of Public Health Policy (3)23-34.*

Lawal, K. B. (2013). *Levels of scientific literacy among Senior Secondary School students in Oyun Local Government Area, Kwara State, Nigeria*. Unpublished M.Ed. Dissertation, University of Ilorin, Nigeria.

Lubienski, S. T., Lubienski, C., & Crane, C. (2008). Achievement differences and type: The role of school climate, teacher certification and instruction. *American Journal of Education, 115(1), 97-138.*

Lubienski, S., Lubienski, C. and Crane, C. (2009). 'Public Schools Outperformed Private Schools in Mathemathics', Publication of College of Education, Illinois University USA.

Luketic, C. D., & Dolan E. I.(2013). Factors influencing student perceptions of high school science laboratory environment. *Learn Environ Res.16 (1)37-41*.Retrieved from www.ncbi-nlm.nih.gov/p.

Malic, A. B.; Ngban, A. N., & Ibu, J. E. (2009). Analysis of students' performance in junior secondary school mathematics examination in Bayelsa State of Nigeria. *Study Home Comm Sci 3(2): 131-134.*

Mayr, E. (2004). How biology differs from the physical sciences: Towards a new philosophy of biology. *Observations of an Evolutionist* .Cambridge: Harvard University Press

McLeod, S. A. (2007). Visual Perception Theory. Retrieved from www.simplypsychology.org/perceptiontheories.html

McLeod, S. A. (2008). *Selective attention*. Simply psychology Retrieved from http://www.simplypsychology.org/attention- models.html

Miller, J. D. (2011).To improve science literacy, researchers should run for School board .*Nature Medicine, 17(1), 21.*

Naugah, J. (2011). *Factors affecting the choice of science subjects among girls at secondary level in Mauritius*. A Thesis Submitted for the Degree of Doctor of Philosophy School of Sport and Education Brunel University. Retrieve from full text thesis.pdf

Nauert, R (2015).Our perceptions influences how we learn.*Psych.Central Retrieved from Psycentral. Com/news/2*

Nelson, G. D. (1998). Science literacy for all: An Achievable Goal? *Optics &Photonics News, 9(9).*

Nigerian Education Research and Development Council (NERDC). (2009). *National Senior Secondary School Curriculum* 1-3. Abuja NERDC

Ndu, F. O.C, & Somoye, E.O. (2008). *Basic science: An integrated science course for junior secondary school* .Longman, Publisher, Ikeja.

Njoku, A.S. (2011). Literacy for economic development and financial rectitude. *International Journal of Environmental Science and Development*, 2(1), 24-26.

Nwagbo, C., & Adam, (2012). Level of biology literacy of first year biology students of colleges of education in Yobe State: Implication for biology education in Nigeria. Retrieved from researchgate.net/publication/223481909

Nyambura, R. (2015). Influence of students' self-perception on biology achievement among secondary school students in Nakuru county, Kenya. *International Journal of humanities and social sciences 8(3) pp21-30 Retrieved from 184-534-1-1PB.pdf*

Nyamwange, J. (2016). Influence of students' interest on career choice among first year university students in public and private university in Kisii county, Kenya.Journal of Education in Kisii County, Kenya. *Journal of Education* and practice 7(4).Available at www.iiste.org

Obura, C.A., & Ajowi (2012). Students' perception of career: the influence of academic performance and self-efficacy in Kisumu munipallity, *Modern Social Science Journal, 1(1), 56-93*

Olasehinde, K. J. & Olatoye, R. A. (2014). A compare study of public and private senior secondary school students' science achievement in Katsina state, Nigeria. *Journal of Educational and Social Research 4(3) pp.203-207. Available at Doi:10.5901/jesr.2014v4n3p203*

Oliver, N. E. (2014). *Comparison of boarding and day senior secondary students' performance in biology in Owo Local Government, Ondo State,* Nigeria. Unpublished M.Ed. Dissertation, University of Ilorin, Nigeria.

Ogweno, P.O., Kathuri, N.N. & Obara (2014). Influence of students characteristics on academic performance in secondary agriculture,in Rachuonyo North sub county,Kenya .

Okereke, C., & Onwukwe, E. O. (2011*).* Influence of gender, school location and the use of play-simulation on school achievement in Chemistry. *JORIND (9)1 ISSN1596-8303.* https://www.transcampus.org/JORINDV9June2011/JORINDVol.9No .chapter50.pdf.

Okunloye, R. W. (2001). *Teacher perception of, and preference for social studies curriculum models at the secondary school level*. A Ph.D. Thesis. University of Ilorin, Ilorin, Nigeria.

Olibie, E.I, Anyikwa, N.E. Okoli (2014). Primary school teachers' perception of the effects of instructional media on basic science and technology curriculum delivery in Nigeria. *Open Journal of Education OJE 2014, 2(1), 37-46*

Olorundare, A. S. (2014). "*Theory into practice: Beyond surface Curriculum in science education".* The one hundred and forty-seventh (147th) Lecture. Ilorin, Unilorin Press.

Olorundare, A. S. (2011). Advancement of the theory and practices in science education within the context of the Nigerian educational system. *Lead paper presented at the 1st annual International Conference on Education*. Osun State University, Ipetu-Ijesha, Nigeria. February 7-10.

Oludipe, D. I. (2012). Gender difference in Nigerian junior secondary students' academic achievement in basic science. *Journal of Educational and Social Research, 2(1),* 93-99

Olufemi, O. (2016, January 15). Lassa fever: Don't allow your pet to eat rat. *Nigeria Punch. pp. 17, 20.*

Omosewo, E. O. (2008). Physics teacher education and national education reforms in R. A. Lawal, S. A. Jimoh Olorundare and NYSC Ijaya *(Eds) Education reforms in Nigeria, past-present and future, 246-250 Ilorin*: Faculty of Education, University of Ilorin.

Onijamowo, O.T. (2010). S*enior school chemistry students' misconceptions and alternative conceptions of selected chemistry concepts in Kogi State*, Nigeria. An Unpublished Ph. D. Thesis, Department of Science Education, University of Ilorin, Ilorin, Nigeria

Orederin, A., & Oloyede, D. (2006). Supervision and quality of teaching personnel effects on students' academic performance in Institute of Education, *Olabisi Onabanjo University, Ago-Iwoye. Education Reserve and Review, 2*(3) 032-035.

Oxford Advanced Learners Dictionary (2015).Oxford University Press. (9th Ed.) Oxford New York.

Oyekan, B. E. (2011). *Influence of secondary school laboratories on the performance of physics students in kwara State*. An Unpublished M.Ed. Dissertation, University of Ilorin, Nigeria

Perception – Retrieved from http://www.ifla.org/vii/s.34/pubs/glossar.

Pinto. J. A., Lopes, J. B., Silva, A. A., Santos, C. A. (2014). Developing a teacher's

education programme to promote scientific literacy improving a positive attitude about science. *Problems of Education* in *the 21st Century (60).*

Ramalingman, S. T. (2011). Modern Biology for Senior Secondary Schools. Onitsha: Africana First Publishers Plc.

Rennals, P. A. (2006). *Black middle school perceptions of success and their influence on academic performance*. Retrieved from www.http://digital.commons.fiu.edu/dissertation/^^13217577

Rong'uno, S.K. (2017). A comparison of academic performance between public and private secondary schools in Wareng District, Kenya.*British Journal of Education 5(11) 58-67 Retrieved from www.eajournals.org*

Rustaman, N., & Hailu, S. (2012).Characteristics of biology instruction and science teaching. Faculty of science and mathematics education. Department of biology. Universitas Pendidikan Indonesia.

Sharma, H. C., Crouch, J. H., Sharma, K. K., Seetharama, N., & Hash, C. T. (2002). Application of biotechnology for crop improvement: Prospects and constraints. *Plant Science*, *163*(2), 381-395.

Shwart, Y., Ben-Zvi & Hofstein, A. (2006). The use of scientific literacy taxonomy for assessing the development of chemical literacy among high-school students. *Chemistry Education Research and Practice, 7* (4) 203-225.

Smith, E., Park, T., & Sutton, M. (2009). High school students' perceptions and knowledge about agriculture based upon location of the high school. *Smith NACTA Journal*

Soyibo K, Ekpunobi, E. N.; Akinade, E. A., & Mohammed, Tureta, M. S. A. (2013). Revised Edition. *Nelson functioned biology for Senior Secondary Schools.* Nelson Publishers. Ibadan, Nigeria.

Theories of perception – Retrieved August, 24 2014 from: www.cranepsch.edublogs.org/file/2009/06theories_of_perception.pdf.

Thomas, B., & Ikuyero O. I. (2013). Influence of school location and achievement level on integrated science students' perception of their classroom environment. *Developing Country Studies ISSN2224-607X (Paper) ISSN2225-0565 online (3)1.*

Torpev, T. F. (2010). *Stakeholders' perception of use of multi-Grade instructional approach for the implementation of Universal Basic Education in North Central Nigeria*. A Ph.D. Thesis University of Ilorin, Ilorin, Nigeria.

Tudor, J. Penlington R. & McDowell L. (2015). Perceptions and their influences on approaches to learning 5(2)69-79 Retrieved from www.tandfon line.com

Uno, G. E. (2009). Botanical literacy: What and how should students learn about plants? *Am.J.Bot.96* (10) 17530-1759.*doi:10.3732/ajb.0900025.*

Uno, G. E. & Bybee, R.W. (1994). Understanding the dimensions of biology literacy. *JSTOR Bio-Science 44*(8), P.553.

Weiner, F. (2000). Attribution of a good motivation in science teaching in school. *Analyst of Journal of Youth and Adolescent II* (2)

Wilms, C. E. (2014). *How elementary school teachers teach science: using nature of science to understand elementary teachers' science identities and teaching practices a case study*. A Ph.D. Thesis, Miam University, Oxford, Ohio.

World Health Organization (2013). Life expectancy. *World HealthOrganization Global*

Health Observation Data Repository. Retrieved September 20, 2016 from: http:apps.who.int/gho/data/view.main.690?lang+en

Zeidan. A. H. & Jayosi M. R. (2014). Science process skills and attitudes toward science among Palestinian secondary schools student. *World Journal of Education.* Retrieved from 5890-19640-1-1 PB. Pdf

APPENDIX A

DISSEMINATION OF MAJOR FINDINGS

The findings of this research would be disseminated as discussed below:

Research Article Publication in Reputable Journals:-The results of this study would be published in reputable journals. Preference would be given, first to journal of biological education and science- based journals such as International Journal of Science Education, STAN.

Workshops:-The researcher would plan to organize workshop for biology teachers to communicate the major findings of the research work to them on how to improve teaching and learning of biology via knowledge of biology literacy

Organization of Seminars:-Seminars would be organized by the researcher for the biology teachers and the students to equip the teachers and the students with the importance of biology literacy for the students' success in biology and other related biology subjects.

Print Media Engagement:-Print media would be engaged through monthly write-up to educate and bring to the knowledge of the general public, the benefits of biology literacy to improve teaching and learning of biology in Nigeria institutions of learning.

Memo Writing:-The researcher would communicate the results of this finding to the Federal and State Ministries of Education to push through the ideal of national acceptance of the results of the findings. National examination bodies and agencies would also be involved with the hope to improve the quality of teaching and learning of biology.

APPENDIX B

UNIVERSITY OF ILORIN, ILORIN, NIGERIA

DEPARTMENT OF SCIENCE EDUCATION

INFORMED CONSENT FORM

Dear Student,

Please be informed that you are selected to participate in a research study. Your consent is here by required to take part in the study. Details information about the research is provided below .kindly endorse this consent form if you volunteer to participate in the study after reading about the research.

The Purpose of the Research. The purpose of the research is to examine the perception of Senior Secondary School students on biology literacy

Procedure. Student's participants was required to fill the questionnaire on student's perception of biology literacy

Confidentiality. All information provided by you was treated with utmost confidentiality and used for the purpose of the research only

Risks .The questionnaire was administered in your free period; hence no risk is envisage to your person during the period.

Benefit .The likely benefits to you are to expose you to the importance of biology literacy and to arouse your interest in learning biology. You therefore stand to excel in biology in both internal and external examination.

Right of volunteers (Student participants). Your participation in this research questionnaire is voluntary; hence, if you decide not to take part or stop your participation in the research at any time, you will not lose anything .if you have any question about this research, you may contact the Department of Science Education, University of Ilorin, Ilorin, Nigeria, or call the researcher on cell phone number 07065584620.

Student's Respondent Agreement. I hereby voluntarily consent to participate in the research. I know that I may refuse to participate or stop my participation in the research at any time. Also, I understand that if I have any question about the research questionnaire or my right as a student participant, I may contact the Department of Science Education, University of Ilorin, Ilorin, Nigeria, or call the researcher on cell phone number 07065584620.

Student participant	signature	Date
……..	……	… ……
Parent/guardian	signature	Date
……	……	…….

APPENDIX C

UNIVERSITY OF ILORIN, ILORIN, NIGERIA

DEPARTMENT OF SCIENCE EDUCATION

INFORMED CONSENT FORM

Dear Parents,

Please be informed that your Child is selected to participate in a research study. Your consent is here by required to allow him/her take part in the study. Details information about the research is provided below .kindly endorse this consent form if you agree that your Child should participate in the study after reading about the research.

The Purpose of the Research. The purpose of the research is to examine the perception of Senior Secondary School students on biology literacy

Procedure. Student's participants was required to fill the questionnaire on student's perception of biology literacy

Confidentiality. All information provided by you was treated with utmost confidentiality and used for the purpose of the research only

Risks .The questionnaire was administered during the student's free period; hence no risk is envisage to the students during the period.

Benefit .The likely benefits to your child is to expose him/her to the importance of biology literacy and to arouse his/her interest in learning biology. He/she therefore stand to excel in biology in both internal and external examination.

Right of volunteers (Parents participants). Your participation in this research questionnaire is voluntary; hence, if you decide to stop your child participation in the research at any time, you will not lose anything .if you have any question about this research, you may contact the Department of Science Education, University of Ilorin, Ilorin, Nigeria, or call the researcher on cell phone number 07065584620.

Parent's Respondent Agreement. I hereby voluntarily consent to allow my child participation in the research. I know that I may refuse to allow my child to participate or stop his/her participation in the research at any time. Also, I understand that if I have any question about the research questionnaire or my right as a parent, I may contact the Department of Science Education, University of Ilorin, Ilorin, Nigeria, or call the researcher on cell phone number 07065584620.

…

Student participant	signature	Date
……..	……	
Parent/guardian	signature	Date

……

APPENDIX D

UNIVERSITY OF ILORIN, ILORIN, NIGERIA

DEPARTMENT OF SCIENCE EDUCATION

INFORMED CONSENT FORM

Sir/Ma,

Please be informed that your School is selected to participate in a research study. Your consent is here by required to allow the school takes part in the study. Details information about the research is provided below. Kindly endorse this consent form if you agree that your School should participate in the study after reading about the research.

The Purpose of the Research. The purpose of the research is to examine the perception of Senior Secondary School students on biology literacy

Procedure. Student's participants was required to fill the questionnaire on student's perception of biology literacy

Confidentiality. All information provided by Students was treated with utmost confidentiality and used for the purpose of the research only

Risks .The questionnaire was administered during the student's free period; hence no risk is envisage to the students during the period.

Benefit .The likely benefits to you include mandating it for your teachers to attend professional meetings in order to be more familiar with the content of biology curriculum and update their knowledge in the subject so that students' performance in Biology could be improved.

Right of volunteers (Principal participants). Your students' participation in this research is voluntary; hence, if you decide to stop your Students' participation in the research at any time, you will not lose anything. If you have any question about this research, you may contact the Department of Science Education, University of Ilorin, Ilorin, Nigeria, or call the researcher on cell phone number 07065584620.

Principal Respondent Agreement. I hereby voluntarily consent to allow my students' participation in the research. I know that I may refuse to allow the students to participate or stop their participation in the research at any time. Also, I understand that if I have any question about the research questionnaire or my right as a principal, I may contact the Department of Science Education, University of Ilorin, Ilorin, Nigeria, or call the researcher on cell phone number 07065584620.

…….. …….....

Principal signature Date

Appendix E

RESEARCH INSTRUMENTS

University of Ilorin,

Department 0f Science Education

Biology literacy as Perceived by Senior Secondary School Biology Students in Ekiti State, Nigeria.

Dear Student,

This questionnaire has been designed to find out your perceptions of Biology literacy. Kindly supply the necessary information required honestly by ticking ( ) in appropriate column.

Section A: Personal Data

The name of your school:

……...

The School Senatorial Districts……..

The School Location- Rural ( ) Urban ( )

Class– S.S1 ( ), S.S 2( ), S.S 3( )

Gender- Male ( ) Female ( )

Cumulative Result in Biology-

Type of School - Private ( ) Public ( )

Future Career (Biology related career: Nursing ( ) Medicine ( ) Pharmacy () Biology teaching ( ) others ……

Future Career (Not related to Biology): Journalism ( ) Law ( )

Banking ( ) Trading ( ) Others……

Instructions- Please tick ( ) in the appropriate column to indicate your view about the following statements on the perception of Biology literacy

The responses scales are as listed below:

Strongly Agree (SA)

Agree (A)

Disagree (D)

Strongly Disagree (SD)

Section B

Perception of the Senior Secondary School Biology students based on knowledge

No	Item	S	A	D	SD
	A biologically literate person should understand that the knowledge of :				
1.	biology helps to know that all living things are made up of cells				
2.	nutrition is useful in good food habit				
3.	nutrition is useful in maintaining good health				
4.	nutrition is useful in avoiding deficiency diseases e .g. kwashiorkor				
5.	ecology is useful in knowing how to relate with the immediate environment				
6.	ecology is useful in identifying factors that affect population				
7.	global warming helps to understand the causes of the increase in atmospheric temperature				
8**.**	the control of global warming helps in reducing carbon iv oxide emission unto the atmosphere				
9.	the use of alternative sources of energy such as hydroelectric power, wind power and solar power will help in reducing global warming				
10.	genetics is useful in choosing a marriage partner				
11.	heredity helps in reducing the number of people with				

	hereditary diseases, e.g. sickle cell anemia				
12.	genetics is used in crime detection				
13.	the principle of heredity is applied in agriculture in breeding plants and animals				
14.	microorganisms around us protects humans from various diseases	**SA**	A	D	SD
15.	the relationship between biology and agriculture is useful in the planting of crops				
16.	the relationship between biology and agriculture is useful in rearing animals				
17.	the use of biotechnology is useful in improving crops yield				
18.	the use of biotechnology in medicine is useful in preventing diseases				
19.	biotechnology is useful in population control through contraception	SA	A	D	SD
20.	the reproductive system is useful in knowing the number of children to have				
21.	biology is useful in everyday life				
22.	the knowledge of the reproductive system allows one to avoid sexually transmitted diseases such as HIV/AIDS				
23.	evolution helps to know that all living things have arisen from pre-existing ones by a gradual process of change over a long period of time				
24.	organisms show different adaptations in their form and function to survive in their respective environments				
25.	biology is based on experiments or experience rather than ideas or theories				
26.	biology is available to people in the society				

27.	biology knowledge can be copied exactly from one biologist to another				
28.	biology is related to other school subjects				
	Perception of senior secondary school student based on skills	SA	A	D	SD
	A Biologically literate person should be able to				
29.	make observations using the five sense organs				
30.	make observations using tools that extend the five sense organs				
31.	draw tentative inference about cause-effect relationship				
32.	accurately measure dimensions or object characteristics with appropriate scientific tools				
33.	formulate hypotheses	SA	A	D	SD
34.	ask meaningful questions that can be tested in an experiment				
35.	write out the procedures for an experiment				
36.	Conduct experiment in biology with control measures				
37.	analyze the results of biological experiments				
38.	analyze interactions among science, technology and society				
39.	reject hypothesis if it is not consistent with the results				
40.	write conclusion to a laboratory report				
41.	determine the correctness of the source of biological information				
42.	distinguish between reliable and unreliable information				
43.	pass biological information to other people				

44.	utilize biological knowledge in solving problems at home				
45.	utilize biological knowledge in solving problems in the society				
46.	provide biological explanation to a layperson using everyday occurrences				

Perception of a biologically literate person based on attitudes

	A biologically literate person should develop appropriate personal values regarding:	SA	A	D	SD
47.	biological investigations				
48.	observation of natural events without bias				
49.	objectivity in biological investigations				
50.	curiosity in exploring the environment				
51.	open mindedness in biological investigation				
52.	respect for biological data				
53.	the usefulness of data in biology				
54.	the need to verify biological data				
55.	the need to develop interest in biology				
56.	respect for the use of biological evidence				
57.	suspension of judgments until necessary biological data are collected				
58.	honesty in recording biological data				
59.	positive attitude to scientific failure	SA	A	D	SD

60.	willingness to accept criticisms of others				
61.	unwillingness to believe in superstitions or unfounded beliefs				
62.	cultural diversity in the society				
63.	carefulness in making biological decisions				
64.	respect for orderliness in nature				
65.	recognition that there is beauty in nature				

Appendix F

BUDGET PROPOSAL

DESCRIPTION OF ITEM	EXPECTED FROM SPONSOR STUDENT OTHERS	TOTAL
1.0. Personal Cost/Allowances		
1.1. Three Research Assistants	Student	30,000
1.2. Research Informants	Student	NIL
1.3. Technical Assistant NIL		Student
Subtotal (not>w20% of budget 30,000		Student
2.0. Equipment (List & Specify)		
2.1. Samsung Laptop	Student	96,000
2.2.Hp LaserJet Printer (Coloured &Black and White)	Student	60,000
2.3. Toner	Student	20,000
2.4.F lash card , Modem and Memory card	Student	10,000

Subtotal(not>25% of budget)		**186,000**
3.0 Supplies/consumables		
3.1.Books,Journal and pen	Student	20,000
3.2 Purchase of MTN Data	Student	45,000
3.2 Printing and Binding 100,000		Student
Subtotal		**165,000**
4.0 Data Collection and Analysis		
4.1. Photocopies of materials 10,000		Student
4.2. Questionnaire Administration & Collection 50,000		Student
Subtotal		**60,000**
5.0 Travels		
5.1 Researcher	Student	50,000
5.2 Research Assistants 30,000		Student
Subtotal		**80,000**

6.0. Dissemination		
6.1 Proposal presentation		Student
50,000		
6.2 Protocol presentation		Student
10,000		
6.3 Mock Defence		Student
50,000		
6.2. Conferences		Student
100,000		
6.3. Journal Publications		Student
100,000		
6.4. Oral Examination		Student
250,000		
Subtotal		Student
660,000		
7.0. Others/Miscellaneous		
7.1 Thesis Preparation and Binding	Student	50,000
7.2 Course Fees	Student	400,000
7.3 Accomodation (48 months)	Student	168,000

7.4 Miscellaneous 100,000	Student
Subtotal	**718,000**
Grand **1,899,000**	**Total**

APPENDIX G

TIME LINE