EFFECTS OF FIELD-TRIP AND INQUIRY-BASED INSTRUCTIONS ON INTEREST, RETENTION, PERFORMANCE AND SOCIAL SKILLS ACQUISITION AMONG SECONDARY SCHOOL BIOLOGY STUDENTS IN LERE EDUCATION ZONE, KADUNA-NIGERIA

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ZARIA

DECEMBER, 2021

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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN BIOLOGY EDUCATION

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DECLARATION

I Sunday DANJUMA with registration number P17EDSC9022, hereby declare that the work in this thesistitled “Effects of Field-Trip and Inquiry-Based Instructions on Interest, Retention, Performance and Social Skills Acquisition among Secondary School Biology Students in Lere Education Zone, Kaduna-Nigeria”has been performed by me in the Department of Science Education, Faculty of Education, under the supervision of Prof J. O. Olajide, Prof. M.A. Lakpini, and Prof. S. S. Bichi. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at any University.

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CERTIFICATION

This thesistitled “Effects of Field-Trip and Inquiry-Based Instructions on Interest, Retention, Performance and Social Skills Acquisition among Secondary School Biology Students in Lere Education Zone, Kaduna-Nigeria”by Sunday DANJUMA meet the regulations governing the award of the degree of Doctor of Philosophyin Biology Education from Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literacy presentation.

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DEDICATION

This thesis is dedicated to my father Danjuma Gizo, my son Johnson Danjuma Sunday and to the memory of my beloved mother and wife. Late Mrs. Ladi Danjuma and Mrs. Juliet Danjuma Sunday.

ACKNOWLEDGEMENTS

I sincerely express my deepest gratitude to Almighty God for granting me the grace to start and complete this work successfully.

I wish to express my profound gratitude to my SupervisorsProf. J. O. Olajide,Prof. M. A. Lakpini, and Prof. S. S. Bichi who did not only painstakingly go through the write up several times, but also provided valuable suggestions. Their constructive suggestions helped to refine this work. To me, it is a rare privilege to work under such a distinguished and highly seasoned scholars. The Lord Almighty God reward them accordingly.I am also indebted to Prof. J. S. Mari, a very patient, God fearing, a respected and highly seasoned scholar, who took his time to advice and gave useful suggestions to this thesis.

I wish to also appreciate the following; Prof. I. A.Usman, Prof. F. K. Lawal, Prof. T. E. Lawal,Prof. B. Abdulkarim, Prof. M. M. Atadoga, Prof. A. A. M. Shaibu, Prof. M. Musa,Prof. M.O. Ibrahim PG Coordinator, Dr.M.K.Falalu Asst. PG Coordinator,Dr. S. B. Olorukooba, Dr M. S. Tudunkaya, Dr. A. U. Ginga, R. E. Umahaba and members of the advisory committee for their constructive criticism and valuable suggestions.

I am grateful tothe Director and staff of Lere Education Zone particularly the Director in person of Mr. John Bala Mavisky. I am grateful to Late Mr. Jek Danjuma for taking his time, despite his tight schedules, was able to give the statistics of population of schools in Lere Education Zone. The principals, Biology teachers and Biology students of the study schools contributed to the success of this study. Thank you for your kind gesture.I appreciate Prof. M. Musa and Mr. Ojo Umoru, for their patient in seeing to the statistical aspect of this work, despite all the recalculations and corrections, at the end of the day, the

work is completed. I also appreciate my son Johnson Danjuma Sunday for his patient and co-operation during my course and research work.

My acknowledgement will not be complete without mentioning the families of Mr. Friday James Oche (Registry Department, A.B.U, Zaria), Prof. M. I. Haruna (Department of Agricultural Science Education, A.B.U, Zaria), Prof. J. A. Gwani (Department of Human Kinetics, A.B.U, Zaria), Prof. S. A. Luka (Department of Zoology, A.B.U, Zaria), Dr. Y. Tanimu (Department of Biological Science, A.B.U, Zaria),Dr. R. Yakubu (Department of Political Science, A.B.U, Zaria), Dr M. Dogara (Department of Physics, Kaduna State University, Kaduna),Dr. S. A. Anyifite (Integrated Science Department, F.C.E, Zaria), Dr. A. Maikano (Biology Department, F.C.E, Zaria),Mal. Haruna Usman Muawiya (Mathematics Department, F.C.E, Zaria), Mal. Ado Sirajo (Mathematics Department F.C.E, Zaria) Mal. Abubakar Auwal Kassim (Department of Science Education, Jigawa State University, Kafin Hausa), Mr Simon Bulus (ATAP Polytechnic, Bauchi State), Mr. Charles Isuwa, and my good friends Mr Simon John, and Mrs Andrew Theresa for standing by me under the sun and in the rain to make this study a success. I sincerely thank all others too numerous to mention who have made one input or another in this study. Thank you all.

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LIST OF ABBREVIATIONS

SECIQ:	Students Ecology Concept Interest Questionnaire
ESSAQ:	Ecology Social Skills Acquisition Questions
EPT:	Ecology Performance Test
FME:	Federal Ministry of Education
NECO:	National Examination council
NRC:	National Research Council
NTI:	National Teachers Institute
STAN:	Science Teachers Association of Nigeria
WAEC:	West Africa Examination Council
WASSCE:	West Africa Senior School Certificate Examination

OPERATIONAL DEFINITION OF TERMS

Field-Trip Instruction: it is an activity-based teaching instruction that involve taking the learners to the field to see living organisms in their natural environment.

Inquiry-Based Instruction: ateaching strategy that allow the learners to participate in proffering solution to identified problem by engaging themselves in the activities involve.

Interest: Attitudes that is developed as a result of interaction between the students and the teacher.

Performance: the changes in academic performance that occur as a result of the use of field-trip instruction and inquiry-based instruction.

Retention: it is what the learner can recall after his/her interaction with his/her classmates and the teacher

Social Skills: are learned behavior that facilitate interaction between people workingtogether for a particular goal.

ABSTRACT

This study sought to find out the "Effects of Field-Trip and Inquiry-Based Instructions on Interest, Retention, Performance and Social Skills Acquisition among Secondary School Biology Students in Lere Education Zone, Kaduna-Nigeria". The study adopted pretest, posttest and post posttest quasi experimental and control group design. The population comprised all 1979 senior secondary school Biology students in Lere zone. A sample consisting of 163 students randomly selected from three coeducational schools in Lere Education Zone participated in the study. The experimental group A having 55students and B having 56 students were taught Ecology concepts usingField-trip and Inquiry-based Instructionrespectively while the control group having 52 students were taught using lecture method. Four validated instruments called Ecology Performance Test (EPT) with r=0.87, Ecology Social Skills Acquisition Questions (ESSAQ) with r=0.82 and Students Ecology Concept Interest Questionnaire (SECIQ) with r=0.72 were used to gather data. Eight objectives, research Questions and Null Hypotheses guided the research. The hypotheses were tested at $p \leq 0.05$ level of significance. Data collected were analyzed using t-test and Kruskal-wallis statistics. The results of the study revealed that differences existed on acquisition of social skills when students were taught using field-trip, inquiry-based instruction and lecture teaching methods in favour of experimental groups A and B. Statistics revealed that significant difference existed in interest shown by SSS Students when they were taught using field-trip, inquiry and lecture teaching method in favor of experimental groups A and B.Students taught ecology using Field-trip, Inquiry-based Instruction and those taught ecology using Lecture Methods differ significantly in acquisition of social skills in favour of the experimental groups and Students taught ecology using Field-trip, Inquiry-based Instruction and those taught ecology using Lecture Methods differ significantly in the interest level towards learning of biology in favour of the experimental groups.Based on the findings the following recommendations were made; the use of field-study and inquiry-based instruction should be encourage among teachers of Biology to improve student's acquisition of social skills, interest, performance and retention ability; Field-trip and Inquiry-based Instruction should also be encouraged to promote the learning of Biology by both male and female students.

CHAPTER ONE

THE PROBLEM

1.1 Introduction

The global aim of science is to enable learners acquire knowledge and skills that would be relevant to their future livelihoods (Gali, 2018). Science, as a concept, is a process geared towards problem solving in order to enhance the living standard of man. Shaibu (2014) defines science as a complex human activity that lead to the production of a body of universal statement called laws, theories or hypotheses, which serve to explain the observable behaviour of the universe or part of it, which, in themselves, have predictive characteristics. Sanusi (2019) has observed that the economic and political strength of a nation is always assessed in terms of her achievements in science and technology. In fact, Usman (2021) posits that people live in a world where science and technology have become integral parts of human culture and any country that overlooks this significant truism does so at the risk of remaining backward in an advancing world. Hence, Omiko (2015) concluded that no nation can make appreciable progress in terms of development without correct scientific base. This is why the National Policy on Education (FRN, 2013) emphasized on the provision of science education at all levels of education in Nigeria. According to Rao (2007), science is the system of knowing the universe through data collected by observation, communication, and controlled experimentation.

The National Policy on Education (FRN, 2013) sets a goal for science education in Nigeria that government shall popularize the study of science and production of adequate number of scientists to inspire and support national development. Based on this policy, Omiko (2015) deduced that the aim of science education is to inculcate science in the thinking and working processes of the society in order to create science and technology culture. Science

subjects offered in the Nigerian Senior Secondary Schools as recognized by West African Examination Council (WAEC) and the National Examinations Council (NECO) in their Chief Examiners Reports include Biology, Physics, Chemistry, Agricultural Science, Physical Education and Health Education.

Biology is one of the science subjects that occupy a significant position in the senior secondary school curricula. Umoh (2010) defines Biology as a branch of science that is concerned with the characteristics and behavior of organism how species and individual come into existence, and the interaction they have with their environment. Biology plays a vital role in providing knowledge of relevant concepts about living about living things and developing scientific skills and attitudes. Ibrahim further stated that Biology is a subject specifically designed to provide students with skills and attitudes of caring about themselves, other organisms and the environment. In fact, Ghumdia (2017) stipulates that when the knowledge of Biology is acquired and applied in any society, it can bring about rapid and sustainable national development.To further emphasize its significant, Flowers, (2018) and Abubakar (2017) have observed that Biology, as a discipline, has contributed tremendously to financial, physical and aesthetic benefits of humanity and to national building. The areas of contributions of Biology include but not limited to, the followings: Medicine, Aquaculture, Crime detection, Forestry, Genetic Engineering, Parasitology, Biochemistry, Physiology, Ecology, Genetics and Molecular Biology has made Biology subject to become a central focus in most human activities including solutions to the problem of food security, environmental pollution, population explosion, radiation, disease, health, hygiene, family life, poverty eradication, management and conservation of natural resources as well as Biotechnology and ethics. The objectives of learning Biology at senior

secondary school level include learners having adequate laboratory and field skills in Biology in general and ecology in particular.

Obeka (2010) stated that ecology is concerned with the Biology of groups of organisms with functional process on land in the oceans and in freshwater.Ecology deals with the interaction of organisms and their natural environment and needs to be taught with an appropriate method or strategy of teaching that requires direct observation of organisms in natural habitat. These organisms may be within or far away from the school environment. Danjuma (2017) observed that teaching ecology at secondary schools in Nigeria has not been very impressive due to poor teaching instructional strategies used. Gali (2018) stated that the poor teaching strategies employed by a number of teachers affect the performance of the students in the subject. Dallatu (2019) observed that teaching Biology using teacher centered strategies such as lecture method does not encourage the learners to participate fully in the classroom activities and hence students perform poorly in Biology concept. Despite the importance of ecology as a concept in Biology, the performance among secondary school students remain poor. In fact, the failure rate in Biology is even more alarming compared to Chemistry and Physics despite its popularity among science students. Dallatu (2019) noted that a review of student's enrolment in science subject at senior secondary schools'level in Nigeria shows that more students register for Biology than any other science subject but their academic performance in the subject is comparatively lower at SSCE when compared with other science subjects.

Poor performance in Biology among Nigerian secondary school students has been the major concern of parents, teachers and the public. Jibrin and Nura (2007) have identified poor methods of teaching and improper use of instructional materials as some of the

deficiencies of Biology teachers, which has led to low academic performance on the part of the students. Researchers such as Lawal (2009), Atadoga and Lakpini (2013) have found that the persistent low academic performance in Biology education were partly attributed to teachers' instructional strategies such as lecture method in which the learner remain passive while the teacher does most of the talking. As such, instructional strategies used by teachers in the teaching and learning process have significant influence on learners' academic performance. Ecology is one of the concepts in Biology which cannot be taught theoretically. According to Gyuse (2009), vital abstract contents in Biology (like Ecology concept) can hardly be effectively communicated to the learners theoretically. One of the major purposes of Biology programme in Nigeria secondary schools is to enable students to apply it to everyday life activities. Unfortunately, this purpose has not been achievable due to poor performance of students as reported by Chief examiners of WAEC as recorded in Table 1.1.

Table 1.1 Students' Performances in Biology Kaduna State WAEC May/June, 2012-2019

Year	Total Sat	No with A1-C6	% with A1-C6	No with D7-F9	% with D7-F9
2012	126,821	59657	47.04	67161	52.96
2013	134,852	56570	41.95	78282	58.05
2014	130,653	56155	42.98	74498	57.02
2015	150,925	72204	47.85	78722	52.17
2016	143,936	62008	43.08	81928	56.92
2017	149,162	61028	40.90	88134	59.10
2018	136,916	58284	42.60	78632	57.40
2019	178,932	88643	49.50	90289	50.50

Source: West African Examination Office, Kaduna Office (2019).

Table 1.1 is a clear indication of poor performance as 50% and above that register for the subject failed every year from 2012-2019. The performance in Biology between 2012 and 2019, more than 50% of the students that sat for the examination had below credit pass. This high failure rate at SSCE Biology according to Muoneme (2015) and Dallatu (2019) has continued to be a source of worry to curriculum planners, educationists, parents and the entire society. Reports from several studies like Nworgu, (2005). Johnson (2016) and Danjuma (2017) have indicated that a vast number of factors are responsible for this poor performance. Prominent among these factors include the difficult and abstract nature of a number of Biology concepts like Evolution, Genetics, Cell Physiology, Ecology, inadequacy and poor use of instructional materials, teachers prevalent use of traditional teaching methods lack of practical classes/ activities to foster acquisition of social skills and lack of interest of students towards teaching for better retention, among others. All these have contributed directly or indirectly to the deplorable in quality of Biology teaching and learning in Nigeria especially with regards to activity-based teaching strategies such as practical activity method, inquiry-based and field-trip instructional method.

Field-trip is a teaching method that involves taking students outside the classroom for the purpose of making relevant observations about living things in their natural habitat. It could be in a nearby school farm, national park, zoo,industry, forest or game reserve. Bajah (2002) sees field-trip as an important component of science teaching. In addition, Obeka (2010) sees Field-trip as an outdoor type of laboratory activity or field work or learning exercise undertaken by teachers and students in certain aspects of a subject, to give students the opportunity to acquire relevant knowledge of the organism in the natural habitat. In

addition, Aliyu (2008) observed that Field-trip is taking students out of the classroom to places where they can see concrete illustration of classroom theories. It also offers direct observation and interpretation in their natural environment. In the field, the learners require the use of basic scientific skills that includes participation in group activities, communicating with others, cooperation, problem-solving and manipulation of substance and organism in the natural surroundings.Another method that involve the learners in active learning is the Inquiry-based.

Reports of National Research Council (NRC, 2015) identified Inquiry as a teaching and learning method that provides learners with motivation to learn and develop skills to be successful throughout life.They explained that students benefit by learning science through authentic investigations similar to those conducted by professional scientists. In theory, with the placement of science in a context through Inquiry-based instruction, teachers and students begin to develop their approach to science, and this investigative learning leads to better understanding. Inquiry method of teaching according to Danjuma (2017) is a teaching method where the learner, with minimum guidance from the teacher seeks to discover and create answers to a recognized problem through procedure of making a diligent search. Inquiry is a term used in science teaching that refers to a way of questioning, seeking knowledge or information or finding out about phenomenon. Obeka (2010) however added that the use ofthis method aids the student to learn not only concepts and principles but self-direction, responsibility and social communication. He further stated that it is a highly interactive step by step approach which involves student at all levels of discussion. It is also the way people learn when they are left alone.

In Inquiry-based learning the instructor devises a series of statements or questions that guides the learner in making a series of discoveries that leads to a single predetermined goal. The Inquiry-based method is activity oriented and involves practical demonstration, discussion and experimentation. During such instructions the students employ the processes of science such as observation, classification, investigation, and critical interpretation of findings. Okoye, Momoh, Aigbomain, and Okecha, (2008) observed that in Biology, it is possible for Inquiry-based method of teaching to enhance student's performance. This is because of the activity-oriented nature of the guided discovery strategy.Inquiry-based teaching is a pedagogical approach that invites students to explore academic content by posing, investigating and answering questions to the discovered problem or problems. Science education researchers like Maxwell (2015) showed in his research finding that Inquiry method of teaching does improve performance of students as well as retention and interest. When inquiry-based instruction is employed social skills may easily be developed.

Social skill according to Gresham and Beebe (2002)arebehaviouror interpersonal skill that facilitate interaction and communication with others where social rules and relations are created, communicated, and changed in verbal and nonverbal ways. Social skills are behaviors that promote positive interaction with others and the environment.In addition, Gresham and Honner (2001) defined social skills as the specific behaviors that individuals use to completely perform social tasks. According to Gresham (2002), social skills are the behaviours exhibited or acquired in specific situations, and they are behaviors that must be taught, learned and performed. According to Ladd (2005) the extent to which learners possess good social skills can influence their academic performance, behaviour, social and family relationship and involvement in extracurricular activities. Social skills are also linked to the quality of the school environment.People initially learn something

independently and eventually that learning is modified through interaction with others. It is very important for a child to have good social skills to learn meaningfully while interacting with the members of the society. Social skills are important for preparing young people (children) to mature and succeed in their adult roles within the family, workplace and community (Ten Dam & Volman, 2017).

Social skills help in developing caring and concern for others, taking responsible decisions andeffectively handling challenging situations. (Zins, Weissbert, Wang, & Walberg, 2014). Possessing good social skills helps an individual child not only to relate well with the peer groups but also in maintaining good relationships with the teachers and development of a healthy environment with less crisis. A child having good social skills can cope effectively with the social environment as well as the school environment. When learners interact with one another as a result of the activities they are engaged, the tendency of acquiring social skills is always high and it enhances the development of interest in the subject matter.

Walter and Hart (2009) defined interest as an individual's desire, power and tendency to act in a particular way. Krapp, (2007) described interest as being a psychological state and predisposition to reengage particular disciplinary content over time that develops through the interaction of the person and his or her environment. Krapp (2007) opined that once interest is maintained, repeated engagement can be either self-initiated or promoted by the environment thereby leading to the development of an emerging and a well-developed individual interest. Renninger (2006) added that if interest of a student could be generated during teaching and learning process, academic performance and retention of concept will be enhanced.

Retention is the ability to retain and later recall information or knowledge gained after learning. Bichi (2002) sees retention as the ability of the learner to preserve and later

remember information or knowledge gained after learning. Shehu (2016) posited that retention is a preservative factor of the mind. The mind acquired the materials of knowledge through sensation and perception. These acquired materials in the mind need to be preserved in form of image for knowledge to develop. Whenever a stimulating situation occurs, in which concepts are presented to the learners in a way or manners that touches their sub-consciousness it can trigger quick recalling of the concepts taught or learned. Hombly (2006) considered retention as the ability to remember experience, things learnt. According to Olayinka,(2016), retention is the ability to store information which can be easily recalled from the short- and long-term memory.

Retention is the ability to remember things or it is a form of reaction to what has been presented in the past. According to Wada, (2016) Students retention is very important in teaching and learning interactions. Permanent and meaningful learning is the ultimate target of our educational endeavor. Understanding and retention are products of meaningful learning when teaching is effective and meaningful to the students. Retention is the ability to remember things experienced or learned by an individual at the later time. It takes place when learning is coded in memory. Thus, appropriate coding of incoming information provides the index that may be consulted so that retention takes place without elaborate search in the memory lane. Lakpini, (2006) defined retention as the ability of a learner to recall, remember or recollect a body of knowledge after instruction. However, Nwosu, (2015). defined retention as the ability of the learner to remember and recall not only a body of knowledge but be able to recall and apply any acquired skills after engaging practically on learnt materials. Bichi, (2002); Nwajiuba, (2011), and Johnson, (2016) also reported that anything which aids meaningful learning improves retention while things that

lead to interference among learned materials decrease the speed, efficiency of learning and accelerates forgetfulness.

Social skills have also been established to relate highly with performance of science concepts. As acquisition of social skills relate with performance, is an indication that it could enhance meaningful learning and retention of the concepts with the skills acquired. The acquisition of these skills enables learners both male and female to understand how science knowledge is generated, see relationships among concepts learnt. These factors enhance retention and seem to suggest that Field-trip and Inquiry-Based Instruction could enhance retention of science concepts. Thisstudy seeks to establish ifField-trip and Inquiry-Based Instruction could enhance retention and performance of Biology concepts in male and female or not.

Gender refers to the socially culturally constructed characteristics and roles which are ascribed to males and females in a society. Studies of Adesoji (2008), and Bunkure, (2008) on the effects of instructional strategies on students' performance in science suggests that there is a relationship between gender and teaching approaches. Differences in the performance of both male and female students in science subjects when exposed to Field trip and Inquiry-basedInstructions were reported by Ahmad (2014) to be insignificant. However, research findings ofChukwuka (2009) revealed consistent differences between the performance of male and female learners in favour of female students. Okeke (2009) reported that students' performance in science is significantly higher when taught by teachers of opposite sex. The reasons researchers attribute to gender-related differences in performance between male and female learners includes the innovative nature of the instructional strategy used, student's cognitive ability levels, psychological and socio-

cultural factors, (Okeke, 2009). It will therefore be interesting to find out if there may be a link between Field-trip, Inquiry-based instruction and gender-related differences in performance between male and female learners. Therefore, the studyinvestigated the Effects of Field-trip and Inquiry-based Instruction on Interest, Retention, Performance and Acquisition of Social Skills among Secondary School Biology Students in Lere Education Zone, Kaduna-Nigeria.

1.1.1 Theoretical Framework

The theoretical framework for this study was based on Vygotsky (1986) theory of social skills, Krapp (1992) theory of interest in learning, Piaget (1952) theory of Cognitive Constructivism and Schwab (1960) theory of Inquiry.

Vygotsky (1986)theory of social skills stated that a child's intellectual growth is dependent upon social development. Whenthe learners interact during teaching and learning process, they acquire social skills which also enable them to perform better as a result of their interactions with the environment. However, traditional classroom practice in schools do not allow for a great deal of social interaction. Thesepractices might actually hinder the development of thought, language and intellectual growth. Vygotsky believed that thought and language is integral to development of consciousness as a whole. His theory promotes an understanding of social development in the modern era. His theory supports active learning where social interaction is vital for appropriate human development. When male and female learners Participate in group activities, help each other, communicate with others, cooperate with each other, and Solve problems, the skills acquired will enable them perform academically better. If students master social skills, their language will improve and therefore communication of ideas will get better among students, teacher to students

and this might lead to better performance, improved interest and retention in concepts taught. This theory is relevant because the students will be actively involved in the learning process as they interact with the environment and their peers enhancing the development of social skills which will eventually led to intellectual growth and cooperation among students.

Field-tripcan be considered as one of the avenues through which science can be taught. The theoretical basis for Field-trip and inquiry-based instruction was Piaget's (1952) developmental theory of learning and thinking "that the child should be able to explore his environment for effective learning". A central component of Piaget's (1952) developmental theory of learning and thinking involves the participation of the learner. Piaget said that knowledge is not merely transmitted verbally but must be constructed and reconstructed by the learner. Piaget asserted that for a child to know and construct knowledge of the world the child must act on objects and it is this action which provides knowledge of those objects the mind organizes reality and acts upon it. Since Field-trip involve taking the students or learner to the natural environment of the object(s), the learners have the ability to act on object(s) by observing, identifying, classifying and even by manipulating the object(s) in its natural environment. Hence, when students actively participate in field and class activities, they acquire more social skills, boost their interest, increase level of retention and academic performance.

We can learn through any of our five senses, but the three most valuable are vision, hearing and touch (Bransford, Brown & Cocking, 1999). Bransford, Brown & Cocking, (1999) claimed that learners have a preference for one learning style over another. Visual learners learn best by watching, while auditory learners learn best by verbal instruction and kinesthetic learners learn best by manipulation. Because of the demands of the profession,

teachers often resort to the instructional style that requires the least time and preparation, namely lecture and discussion. Although these may be valuable approaches to teaching and learning, they fail to take advantage of other modalities and disenfranchise students whose primary modality is visual or kinesthetic (Bransford et al, 1999). According to the old Confucus' saying in Ajeyalemi (2011) I hear and I forget, I see and I remember, I do and I understand. This implies that when students are exposed to learning by seeing and doing during instruction, they understand the learning task faster and apply it in the world of work. This is the basic reason for the choice use of this theory since it fit into the present research design.

Schwab (1960) theory of Inquiry, the theory states that the best way to gain knowledge is to see, hear, touch or otherwise sense things directly.Inquiry-based instruction which advocate on the active nature of learning. Joseph Schwab was one of the founders of the inquiry-based instruction model that relies upon the idea that individuals are able to learn by investigating scenarios and problems through social experiences. Rather than having to memorize information from printed materials, instructors encouraged their students to conduct investigations that would satisfy curiosity, help them broaden their knowledge base and develop their social skills and mental frames. Schwab (1960) emphasized on the need for Inquiry-based instruction as it is geared toward increasing level of acquisition of social skills and performance in science teaching and learning. Therefore, when students actively participate in field and class activities, they acquire more social skills, boost their interest, increase level of retention and academic performance.

1.2 Statement of the Problem

In spite of the popularity of Biology among Nigerian students, performance at Senior Secondary School level had remained poor. A critical look at students' academic performance in Biology in Secondary School Certificate Examination over the years showed consistent low academic performance as can be seen in Table 1.1.

The performance of Biology studentsin Table 1.1 May/June 2012-2019 West African Examination S.S.C.E. is an evidence of the poor performance in Biology.Nwokolo, (2013), observed that part of the reasons for failure of students in examination is attributed to the methods of teaching adopted by teachers for teaching Biology, which is mostly lecture method. Johnson (2016) reported poor skills acquisition when lecture method is used to teach Biology concepts and other science related subjects. However, teachers still prefer using the 'chalk and talk' method in instructing learners because it enhances content coverage but it does not promote social skills acquisition.

The need to find solution to students' poor acquisition of social skills and poor academic performance is therefore an obvious factor as Flowers (2018) opined that several factors have been responsible for low acquisition of social skills. This include: Teaching methods, learning materials, teaching factor, societal factors and strategies employed by teachers among others. Muoneme (2015) reported that when lecture method is used, the interest of learners is not always boosted and hence affect the performance of the students due to lack of interest. Maikano (2016) also reported poor retention ability when Biology concepts are taught using lecture method. When the interest and retention ability of learners are not enhanced/boosted it directly affect the performance and acquisition of social skills among students. It is against all these backgrounds that this study investigates the Effects of Field-

trip and Inquiry-based Instruction on Interest, Retention, Performance and Acquisition of Social Skills in Lere Education Zone, Kaduna-Nigeria.

Gender differences in cognitive abilities have also been widely analyzed in the psychological and neuropsychological literature. Ardila, Roselli, Matute and Inozemtseva (2011) and Abraham (2015) reported three major differences in cognitive abilities between males and females. Theses differences include higher verbal abilities favouring females, higher spatial abilities favouring males and higher arithmetical abilities also favouring males. However, much of the empirical evidence like those presented by Flynn and Rosi-Case (2015) have confirmed that male and female are not different in terms of general intelligence. The explanations that have been advanced by Abraham (2015) to justify the apparent gap between the sexes in their cognitive abilities and performance include both biological and socio-cultural factors. The most common biological factors include genetic difference, hormonal differences and brain differences in overall size, variability and organization. The Socio-cultural factors widely discussed in relation to gender include societal constraint, cultural factors and socialization differences. These gender-dependent factors may perhaps also have influence on other cognitive abilities like acquisition of social skills, academic performance and knowledge retention. The thrust of this study therefore, is to examine the effects of Field-trip and Inquiry-based Instruction on Interest, Retention, Performance and Social SkillsAcquisition among Secondary School Biology Students in Lere Educational Zone, Kaduna-Nigeria.

1.3 Objectives of the Study

The study has the following objectives which are to:

1. find outthe effects of Field-trip and Inquiry-based Instructions onsocial skills acquisition level.
2. find out the effect ofField-trip and Inquiry-based Instructions on students Interest on ecology.
3. determine the effect of Field-trip and Inquiry-based Instructions on student's Retention ability in ecology.
4. determine the effect of Field-trip and Inquiry-based Instructionson Academic Performance in ecology.
5. determine the difference between the mean scores of social skills acquisition level based on gender
6. find out the effects of Field-trip and Inquiry-based Instructions on Interest in ecology based on gender.
7. find out the effects of Field-trip and Inquiry-based Instructions on Retention in ecology based on gender.
8. find out the effects of Field-trip and Inquiry-based Instructions on Performance in ecology based on gender.

1.4 Research Questions

The following research questions are set to guide the study;

1. What is the difference between the social skills acquisition level mean rank among students taught ecology using Field-trip and Inquiry-based Instructions and those taught ecology using Lecture Method?
2. What is the difference between the Interests levelmean rank among students taught using Field-trip and Inquiry-based Instructions and those taught using Lecture Method?

3. What is the difference between Retention ability in ecology mean scores among students taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method?
4. What is the difference between the mean Performancein ecology scoresamong students taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method?
5. What is the difference betweensocial skills acquisition level mean rank among male and female students taught ecology using Field-trip and Inquiry-based Instructions?
6. What is the difference between the Interests level in ecology mean rank among male and female students taught ecology using Field-trip and Inquiry-based Instructions?
7. What is the difference between the mean scores on Retention in ecology of male and female students taught ecology using Field-trip and Inquiry-based Instructions?
8. What is the difference between the mean performance in ecology scores of male and female students taught ecology using Field-trip and Inquiry-based Instructions?

1.5 Null Hypotheses

This study has the following Null Hypotheses:

Ho_1: There is no significant difference between social skills acquisition level mean rank among students taught ecology using Field-trip and Inquiry-based Instructions and Lecture Method

Ho_2: There isno significant difference between the Interests level mean rank amongstudents taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method

Ho_3: There is no significant difference between Retention ability mean scores among students taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method

Ho_4: Thereis no significant difference between the mean performance scores among students taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method

Ho_5: There is no significant difference between the social skills acquisition level mean rank among male and female students taught ecology using Field-trip and Inquiry-based Instructions.

Ho_6: Thereis no significant difference between the Interests level mean rank among male andfemale students taught ecology using Field-trip and Inquiry-based Instructions.

Ho_7: Thereis no significant difference between the mean Retention scores of male and female students taught ecology using Field-trip and Inquiry-based Instructions.

Ho_8: Thereis no significant difference between the meanperformance scores of male and female students taught ecology using Field-trip and Inquiry-based Instructions.

1.6 Significance of the study

The findings of this study would hopefully be useful to teachers, students; curriculum planners, existing literature, professional bodies such as Science Teachers Association of Nigeria (STAN), National Educational Resource Department (NERD), West African Examination Council (WAEC),National Examination Council (NECO) and other researchers, to mention just a few. in the following ways;

1. **Biology Teachers:** Biology teacherswould come to realize the value of using the inquiry method of teaching Biology concepts apart from the numerous methods or

approaches of teaching Biology to enhance acquisition of social skills. It would also be made clear to teachers that different methods could be used in teaching different concept in Biology instead of the traditional methods

2. **Biology Students:** The findings would improve student's inquiry skills on some scientific concepts and encourage active participation of the students which will help in meaningful learning and teaching, help in minimizing the high failure rate of secondary school students in Biology.
3. **Educators and Curriculum Planners:**These findings would assist educators and curriculum planners to understand and appreciate the way Biology would be taught using other strategies.
4. **Professional Bodies:** Professional bodies such as Science Teachers Association of Nigeria (STAN), Millennium Development Goal (MDGs), National Educational Resource Department (NERD) and other related bodies would benefit by organizing workshops on the use of field trip and inquiry-based strategies for effective teaching of science subjects.
5. **Researchers**: It would also prepare ground for interested researchers who might wish to conduct further research in related areas and could contribute to the existing literature.
6. **Textbook Publishers**: The textbooks publishers would find this work useful as it will assist in selecting materials and exercises to be incorporated in it, making reference to field-trip and inquiry-based instructional strategy used in this study.
7. **Educational Agencies:** Relevant to educational agencies such as Federal Education Resource Centre and States Education Resource Centre in the improvement of teaching and learning of science at the secondary school level.

1.7 Scope of the Study

This studyseeks toinvestigatesthe Effects of Field-trip and Inquiry-based Instructions on Interest, Retention, Performance and Acquisition of Social Skills in Lere Education Zone.Senior Secondary II Students in three Secondary Schools in Lere Education Zone participatedin the study. The reason for not using S.S I and S.S. III is because S.S I are just coming to the school and so they are not too familiar with the subject while S.S. III are busy preparing for their final year examinations; S.S. II students were selected to participate because they are more stable receiving their lessons without much distractions. Ecology concepts weretaught because of the poor performance among secondary school students and they are activity oriented.The research study was interested in testingsixsocial skills that the students are expected to acquirewhich allow the students to come together to actively participate in class and field activities, these skills includes;Listening, Observation, Participation in group activities, communicating with others, Cooperation, and Problem solving.

1.8 Basic Assumptions

For the purpose of research work, the following assumptions are made:

i. The Biology students are taught by qualified/experienced teachers as recommended in the National Policy on Education
ii. The effects of Field-trip and Inquiry-based instructions on social skills, interest, retention and performance is measurable.
iii. When students are exposed to the treatment should be able to acquire social skills
iv. All variables are measurable

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This study investigates the Effects of Field-trip and Inquiry-based Instructions on Interest, Retention, Performance and Acquisition of Social Skills among Secondary School Biology Students in Lere Education Zone.The chapter reviews the literature relevant to thestudy. The review is presented under the following sub-headings:

2.2 Importance of Teaching Biology

A number of reasons have stated for the teaching of science, some of the reasons are as follows:

i. Biology as a school subject helps to prepare students for useful living in the society.

ii. It helps students learn what science is and how scientist work

iii. It makes the students scientifically literate.

iv. Prepares the students for higher education in application of science like in going into a science-based career like medicine, genetics etcat both polytechnics, Colleges of education and University level, as stipulated by the National Policy on Education (FRN 2005) and National Teachers Institute (NTI. 2006).

v. Biology if properly taught is aimed at developing the learners all round abilities foster citizen who are potential leaders of tomorrow, just like any other science.

2.2.1 General Problems in the Teaching of Science

Despite its importance, Biology teaching in the senior secondary schools where there is a good foundation be laid for the students, certain problems negatively affect its

teachingMusa(2017). This might be responsible for the poor performance noticed in the WAEC and NECO result as shown in Table 1.1. Some of this problem include:

i. **Lack of Understanding the Philosophy and Methodology:** Most science teachers today do not fully understand the philosophy and methodology of science. Science project is students centered, activity-oriented. But most teachers do not have the requisite skills to put these characteristics into practice.

ii. **Large Class Size:** science been a student's centered because is best taught in small class size. But most classes in our schools today are overcrowded. This makes classroom control and management difficult thereby affecting the teaching and learning of science.

iii. **Insufficient Qualified Teachers:** There is inadequate supply of teachers to teach science in all schools. In some schools, where there are no teachers, students are left without learning science subjects for one or two terms.The effect is that students are denied the knowledge, skills and attitudes that they are expected to acquire.

iv. **Lack of equipment and materials:** Inadequate equipment and materials required for the activities is another problem facing the teaching and learning of science in Nigeria. Although this problem can be solved or minimized through improvisation, most of the teachers do not have the skills needed for improvisation

v. **Inadequate Qualified Teachers:** Most of the teachers lead ling science subjects in our schools do not have the necessary training in teaching science (Gbamanja, 1991 & National Teachers Institute (NTI) (2006).

2.2.2 Nature of Biology as a Science Subject at SS Level

Biology as a separate science was developed in the nineteenth century as scientists discovered that organisms shared fundamental characteristics. Crystal (2011) stated that Biology is now a standard subject of instruction at schools and universities around the world and over a million papers are published annually in wide array of Biology and medicine journals. Also, Ambuno, Egunyomi & Osakwe, (2008) stated that Biology forms the basis of disciplines like human medicine, veterinary medicine, Nursing, Agriculture, Forestry, Fishery, Pharmacy, Food Technology, Laboratory Science Technology, Biological weapons and Human nutrition to mention just a few.

Most biological sciences are specialized disciplines. Traditionally, they are grouped by the type of organism being studied: Botany (the study of plants); Zoology (the study of animals); and Microbiology (the study of microorganisms). The fields within Biology are further divided based on the scale at which organisms are studied and the methods used to study them (Adeniyi, 2004).

1. Biochemistry examines the fundamental chemistry of life;
2. Molecular Biology studies the complex interactions of systems of Biological molecules;
3. Cellular Biology examines the basic building block of all life, the cell;
4. Physiology examines the physical and chemical functions of the tissues and organ systems of an organism; and
5. Ecology examines how various organisms and their environment interacts.

Biology is a very important part of everyday life. All advances in medicine, that deals with environmental issues, or Biotechnology depend on an understanding of living organisms, great, medium, and small (Bichi, 2003, Kalu and Ndokwo, 2006). Even if our main goal is simply ensuring the survival of the human race, we still must be able to understand and

sustain the Biosphere. We poison our land, air and water. The greenhouse effect and global warming are both threats that concern our biosphere (Christyl, 2011). According to Okeke, (2007), it would be utterly hopeless to try to sustain the diversity of life on earth in the future without a decent knowledge of Biology. In order to maintain the delicate balance of life on earth, we first must understand that we are not alone on this planet. We need to learn about the effect we have on our environment and other living things.

The value of many species cannot be predicted. Many plants may contain chemicals that could prove useful in treating illnesses, among other things. Also, the extinction of any specie can disturb the equilibrium of an ecosystem. Therefore, there is the need to understand that all of our actions have effects on other organisms and the environment (Christyl 2011).

Biological concepts (Physiology, Ecology, molecular Biology, Biochemistry, Chemical Biology) require more than one method or strategy to teach for effectiveness. For example, lecture method can be used alongside indoor laboratory teaching strategy in the teaching of physiology which examines the physical and chemical functions of the tissue and organ systems of an organism. This concept Ecology deals with the science of the interrelationship between organisms and their environment. The teaching and learning of this concept (Ecology) needs strategy that require direct observation of organisms in their natural surroundings, this strategy is called field trip. This field trip teaching strategy may help the students to use the social skills and study things in their natural environment. Therefore, the present study investigatedEffects of Field-trip and Inquiry-based Instruction on Interest, Retention, Performance and Acquisition of Social Skills among Secondary School Biology Students in Lere Education Zone, Kaduna-Nigeria.

2.2.3 Teaching Ecology Concept at Senior Secondary Level.

Ecology literary Means study of living things in their natural surrounding or habitat Usman, (2000), describe Ecology as the study of the relationship of organisms with one another and their environment. Ajaja, (2010) define Ecology as the study of the relationships of living organisms with each other and their non-living or physical surroundings. With these definitions, all are pointing to the physical environment in which the organisms live and their biotic environment. It denotes that no organism can live in isolation instead it must interact with its environment which is simply referred to us "Ecology.

Since Ecology has to do with interactions of living organisms and the non- living components of the environment, it is necessary to create the awareness of ecology as a subject early in the life of the students (Nzewi, 2008). Certain aspects of basic ecological concepts like population density, habitat e.tc are expected to be taught in secondary schools require some basic measurements and calculations. Students and teachers have a natural phobia for anything that has to do with calculations. Such teachers and students would prefer a theoretical aspect require weighing and measuring. This trend has contributed to the general poor performance of candidates in question that deal with ecological concepts in the West African Senior Certificate Examinations (WASSCE) (Oyedokun, 2002).

The senior secondary school Biology curriculum places the basic ecological concepts to be studied under year one. And some include the ecological system, environment, Biosphere, Habitat, Biome, food web, food chain, measuring instruments etc. The curriculum specified the performance objectives to be achieved as well as the activities to be carried out in the course of teaching and learning to facilitate understanding of the concepts being taught (Nzewi, 2008). Ecology as a Biology concept is mostly taught by teachers using Lecture

method and this may be why students are failing Biology at senior secondary schools, Danjuma (2017). The researcher thinks if ecology concepts are taught using these methods i.e Field-trip and inquiry-based, acquisition of social skills, interest, retention and performance of the students will be enhanced. Therefore, the present study is on Effects of Field-trip and Inquiry-based Instruction on Interest, Retention, Performance and Acquisition of Social Skillsamong Secondary School Biology Students in Lere Zone.This is because the strategies offer direct observation and interpretation of the substances in their natural surroundings. This may help the students to remember and understand what they have seen in its natural environment, thus improving the students' interest, retention ability and academic performance in Biology.

2.2.4 Science Teaching Methods

Several strategies and techniques that have been used for the effective teaching and learning of Biology in secondary school level include: Discovery approach, field trip, project method, demonstration, lecture, discussion, questioning, inquiry, experiment, group discussion, activity approach; games approach; problem solving approach; cooperative learning strategy, computer assisted instruction (CAI) teaching strategy. Below are the explanations of some teaching strategies.

Lecture Method The conventional or lecture method is a traditional talk and chalk method of teaching in which the teacher does most of the talk while students listen and write notes. This is the method of teaching that emphasizes talk and chalk to the teaching of science subjects. Science teachers embrace this method for easy coverage of the school syllabus (Stanley 2008 Dunya, 2009 Obeka, 2009).

Ezeudu and Agwagah (2006) and Usman (2000) describe lecture method as a teacher centered method. They further state that the method comprises the acquisition of subject

matter usually by memorization and close supervision of the students by the teacher: According to them, the advantages and disadvantage are numerous. These include:

Advantages:

i. It saves time

ii. It does not task the students thus, it is less tedious,

iii. It provides fascinating and aesthetically stimulating experience especially for the new students on topics of interest.

Disadvantages:

i. It is teacher centered.

ii. It views the students as a "tabular rasa" clean slate with nothing to offer, but to sit down and listen to the teacher. (Without any Knowledge) Thus, he is incapable of making value judgment or inputs in a lecture. This encourages redundancy amongst students especially the low achievers.

iii. It is dull and less challenging

iv. The method does not create opportunity for creativity and Self-discovery for learners to rationalize and explore,

v. The method does not promote excellence and hard work;thus, it leads to failure. The technique is instruction-centered and does not challenge the teachers' ability hence, teachers could be ill prepared.

Supporting the above, James, (2000), Onu (2007)and Okam (2016) maintained that it is an uninteresting, uninterrupted verbal presentation by a single speaker to an audience in the classroom environment. Michie, (2001) also confirms that in lecture method, the teacher lecture while the students only take notes and the blackboard is used for illustration. Salisu,

(2015) on the other hand sees lecture method as a technique in which all the learning processes are verbally transmitted from the teacher's desk in front of the classroom to the students. Lecture method, therefore is a talk chalk method, teacher centered and traditional ancient approach, which did not promote creativity and academic excellence, thus a need to review other strategies of teaching to ward promoting academic excellence in science education. However, teacher's qualification, experience, the skills acquired before certification are not put in practice and the method of teaching adopted by the teachers affect the level of interest and in general the performance of students in biology. In this study the lecture method would be adopted to teach students on control group to compete with students on experimental group using field-trip and inquiry-based instructional methods.

Discussion method

This is a two-way interaction method. To a large extent it is student centered since students participate actively. The teacher in a discussion class acts as a moderator. Discussion method of teaching science increased curiosity about the subject, it enhances more positive perceptions of students about value of the subject, to get information on what to contribute during discussion students spend more time readings (Obeka, 2010). Students seem to attend to class more regularly since they usually enjoy the lesson especially when it is less formal. Discussion facilitates higher levels of thinking, accommodates conflict, negotiation and consensus, enhance learning and longer retention. Although the discussion method is effective, it could be time consuming and the classroom could appear noisy. Obeka (2010) stated that if discussion is not well moderated by the teacher the discussion could be dominated by a few outspoken ones and sometimes the teacher may want to impose his

own ideas on the class. The objectives of a discussion can only be achieved if the teacher plays his role as a moderator effectively.

Project method Teachers using the project method act as guide or facilitators. In the use of the project in teaching the teacher selects a central theme, problem or an idea. The task is broken into sub-units so as to be easily understood and worked upon. The students are allowed to work independently or in groups. Allowing students to work in groups is most effective. This brings about co-operative learning among members of the group (Obeka 2010). During the project students are expected to make observations, experiment, collect data, discuss, ask questions and clarifications, manipulate instruments and variables, collect and interpret results. These results are usually discussed with the whole class (Roger, 2003). This method is most appropriate with senior primary and secondary school classes (Lvie 2006). However, students in the lower primary can undertake projects like the making of paper kits, fans, drawing objects and making simple shapes and models. The major difference between project method and field trip teaching strategy is that in the project method, students can use the strategy (project) without the teachers guiding them on the spot but field work required proper students' guidance by the teacher on the spot.This method can be used in the teaching and learning of Biology but cannot be effectively used in the teaching and learning of Ecology which requires real observation of organisms in their natural environment.

Demonstration method This involves showing students how they can carry out particular activities or do certain things to illustrate science concepts and ideas. Demonstrations are usually carried out when the resources are limited or when the activity is prone to accidents; otherwise students are expected to carry out their own experiment after the

demonstration (Rogers 2003). He further states that during a demonstration the teacher should note the following.

The teacher should state the purpose of the demonstration and this must be clear to all students participating in the activity.

i. All students should be able to see every aspect of the demonstration clearly

ii. Explanations should be very clear and unambiguous.

iii. Involve the students as much as possible. They could be called upon to do things and explain their observations.

iv. Simple and readily available apparatus and instruments should be used for demonstration.

The method can be used in the teaching and learning of some concepts in Biology because it does not require seeing things in their natural environment.

Problems Solving Strategy Problem solving is an instructional strategy that has been increasingly emphasized in recent years. It combines the advantages of several other science teaching methods. It encourages inquiry, gives room for discovery, and facilitates social skills acquisition and knowledge. When children are engaged in problem solving activities they inevitably get involved in the inquiry, discovery, exploration and perform various process of science (Bichi 2008). Abdullahi, (1982) suggest four guidelines for teaching science through problem solving approach.

i. Encouraging the learner to tackle the problem by adopting scientific approach. (Observation, hypothesis, experimentation and conclusion),

ii. provide learners with adequate instructions and guidance, and

iii. Encourage learners to keep track of their activities always by jotting down major steps in the activities they carried out. Problem solving strategy can be used to teach cell (Plants and Animals cell) effectively in Biology.

Questioning Technique Questioning is an act of making statement which requires respondents(s) to make responses(s). In teaching and learning, questions are used to determine student's readiness to learn new skill/concept (Adeniyi, 2004). When questions are appropriately used in Biology classroom, they encourage the learners to be at alert, active, thinking and seek alternative to responses.

Basically, there are two types of questions adopted in teaching and learning process in class room which are narrow questions and broad questions. Examples of narrow questions are (a) how many colour has a rain bow? (b) What is the S.I unit of mass? An example of broad questions on the other hands is, give scientific explanation to the saying that what goes up must come down.

Discovery Approach Teaching Strategy Discovery Approach is a method which offers learners the opportunity to discover scientific facts, concepts and principles for themselves rather than being told. It allows learners the opportunity to discover and learn science, (Eneh, 2001). Discovery approach is one of the instructional strategies used in effective teaching of biology. According to Bruner (1961), discovery is in essence a matter of re-arranging or transforming evidence in such a way that one is enabled to go beyond the evidence and re-assemble additional new knowledge. Discovery approach teaching strategy can be used to teach concepts of the environment (waste/refuse dispersal).

Activity Based Teaching Strategy Activity based approach is an approach to the teaching of Biology concepts that involves hand-on engagement of both the teacher and the learners. It involves the manipulation of tools, materials, accurate measurement, accurate recording

of observation, analyzing of results and drawing inferences. It also involves exchange of ideas and provides answers to questions asked by the teacher (Eneh, (2001) argued that activity approach promotes learning. This strategy can be used to teach physical properties of air in Biology.

Research in science education has continued to seek better ways of teaching science to maximize meaningful learning and improve academic achievement (Jean, 2001). Science teaching in Nigeria has experienced many obstacles such as inadequate equipment and facilities, inadequate teacher, inadequate coverage of the curriculum and inappropriate use of teaching strategies (Usman, 2008). There is no single instructional strategy that is best for science teaching but educators are in agreement that any strategy that would involve active learner participation, hands on, minds on, laboratory activities group work, concept mapping, field work, constructivism etc would ensure meaningful learning and academic achievement in science (Brown 2003). Teachers of Biology science should be acquainted with the various teaching strategies (Ajagun, 2001). The study therefore adopted Field trip teaching Instruction for the teaching and learning of ecology concepts to SSI students, which would help the students to connect school work with the world making it tangible and memorable by seeing organisms in their natural environment.

2.3 Field-Trip Teaching Strategy

Field-trip is an outdoor or field work or learning exercise undertaken by teachers and students in certain aspects of a subject to give students the opportunity to acquire knowledge. It may refer to as trips to various places to obtain information directly by seeing things as they really are (Obeka, 2010). Field-trip can connect school work with the world, making it tangible and memorable. A Field-trip stimulates questions and ideas at the beginning or end of a unit. Field-trip also provides an experimental “text” for students to

study and interrogate. In this strategy planning for Field trip, the need for Field-trips in teaching, tips and variation for field-trip, safety rules for a Field-trip and merits and demerits of Field-trip would be discussed.

Danjuma (2017) observed that children who study science through applying activity-based strategy to solve problem, do learn and remember as many or more facts than those who study science by mere traditional methods. Further support for the adaptation of the activity-based strategy in science teaching was given by Gadzama (2012), observed that science teacher cannot teach science effectively without employing activity-based strategy and neither can students learn effectively without the use of the activity-based strategy which is assured by Field-trip.

Introduction	The teacher gives a pre-trip Lecture on 'dos' and 'don'ts'.
Presentation	During the trip, teacher explains Strange phenomena, relates classroom issues discussed to reality in the natural environment. Answer questions asked by students.
Discussion	Students discuss their findings during a presentation session.
Evaluation/ Assessment.	At the end of the Field-trip, teacher evaluates Students'' understanding

Fig. 2.1 Flowchart of Field-Trip Teaching Strategy

Source: Adapted from Mayer (2011)

The flowchart was used to prepare lessons used to teach the experimental group because of the activities involved while the control group was taught using lecture method. The experimental group was taught using Field-trip by the researcher, this was done by engaging the subjects in activities that foster the acquisition of social skills, interest, retention and academic performance as stated in the experimental lesson plan. Ecology Performance Test (EPT) was used for both pre-test, post-test and post post-test. The experimental group was taught the concept of living, involving the learners to foster their interaction with the environment, and the teacher. Lesson plans for the experimental and control group were the same in terms of contents, basic instructional objectives, and length of time for teaching and mode of evaluation except for the activities in the experimental group.

At the end of the six (6) weeks, the researcher administered the posttest to the subjects in the experimental group using Ecology Performance Test (EPT). The scripts from both pre-test, post-test and post post-test of the experimental group was marked and scored using the marking guide.

In an attempt to meet the instructional demand of the new 6-3-3-4 system of education in Nigeria, Danladi (2013), observed that a greater concern was given on how to organize science lesson in line with the demand of the Field-trip. This could be the reason why science teaching presently emphasized the 3 H's (Head, Heart and Hand) and no more the out dated 3 R's (Reading, Writing and Arithmetic). On this premise, Field-trip is Students centered and can enhanced active participation which could lead to Acquisition of Social Skills, Interest, Retention and better performance among secondary school Biology students.

3.2.1 Planning a Field-Trip

According to Swaity, (2019) knowing exactly how to plan a Field-trip is a very important skill. For teachers that wish to take their students out of the classroom to experience some real-life learning, Field-trip can be a dream, or a nightmare, depending on how well they are planned. It is no wonder that school boards have become increasingly cautious when it comes to allowing Field-trip. Afraid of litigation, administrators are slow to permit anything considered dangerous or risky. Considering the current climate, it is especially important to plan carefully for all contingencies. Taking a large group of students out to a public place is a somewhat complex task, and a large amount of planning needs to be done to make it successful.This guide is directed primarily at teachers, but the information could be adapted by daycare workers, recreation workers, home schoolers, parent volunteers, or even parents planning a special trip for their child and friends.

Steps to Planning a Field-Trip

1. Decide where you are going
2. Ask your administrator
3. Arrange for transportation
4. Decide on a food plan
5. Plan your schedule
6. Arrange your supervision
7. Create a permission form
8. Decide who's allowed to go
9. Tie in your Field-tripto your curriculum

These are the steps you will need to cover for your Field-trip plan. The order of these steps may be different for you, but be sure to think about all of these points.

Decide where you are going

According to Swaity, (2019), deciding where to go for Field-trip is important; you may already know where you are going and can skip this step, but if not, do some brainstorming. Talk to colleagues who may also be involved with the trip, and try to come up with some ideas. Think about places that enhance and reinforce your curriculum goals. Do some quick research to see if these ideas are feasible. Check for cost, location and the services that the place offers. Also, check to make sure they are open on the day you are considering coming.

Once you have narrowed it down, talk to your colleagues again. You also may, depending on how much student input you allow, ask the students for their preferences. Explain that you can't promise anything, but you would like to get their ideas. Finally, decide on where you are going.

Talk to your Principal

Talking to your principal is the first step in planning a Field-trip.

Ask your administrator

According to Ahmad (2015), there is a need to inform the head of school, you have to check with your administrator. Hopefully, you already know that you are allowed to have a Field-trip of some kind, but now you will have to run the specific idea past him. Jot some

notes before you go to present the idea. Tell him/her why you want to go, what dates you are thinking of, and what the cost will be.

He/She may say yes right away, but you may have to wait. When you get the go-ahead, fill out whatever forms are required for your school division. it may be asking for permission from the board, or it may be filling out a bus form. Just make sure all of that paperwork is done well ahead of time. This keeps your principal happy, which keeps you happy.

It is important to arrange transportation

Be sure to arrange transportation for your Field-trip early.

First of all, we have to focus on some very basic things. You have to decide how you are going to get those little munchkins there and back, and how you are going to feed them. In most cases, it will be a bus, but with smaller groups, you may take staff vehicles. If it is very local, you may even walk to the destination.

If taking the bus or staff vehicles, it is important to fill out the required forms. NO BUS, NO FIELD-STUDY! The transportation has to have the time to make sure they can find a driver and have an available bus. As well, they will need to know when your departing and coming back, because they may need those buses for other purposes.

Decide on a food plan

According to Ahmad (2015) in planning your trip there is need to decide on where you will eat, and when. Here are some different options: Sometimes the facility will have a restaurant or cafeteria on-site. This makes for easier supervision, but you are not sure of the food quality. The facility may even offer a special for groups coming in, so check with them to see if they do. This would be an easy option, because it could be done up ahead, and would save on waiting time.

1. **Bring their own lunch:** This is the cheapest option. The downfall to this can be that some kids don't bother to bring one, and are grouchy and irritable from not eating. The good part is that you don't have to worry about collecting the money, or waiting for people to order.
2. **Off-site restaurant**: The advantage of this is that it is usually popular with students. The disadvantage is that it isn't healthy, and may make it harder to supervise. It can also eat up an inordinate amount of time if you have a big group.

Plan your schedule.

According to Swaity, (2019), in Field-trip, there is a need to always plan your schedule for the day. Break it up into activities, and decide how long each one would take. Take into consideration the attention span and interests of the students. Try to plan a variety of activities that different types of students will enjoy. Plan very carefully, not allowing for time that is not planned for. This is when kids get into trouble: when they don't know what they are supposed to be doing. Your students are in a new environment; they will be excited, and you don't have your safe four walls to keep them in.

When planning your trip, think in terms of “stations.” For example, I planned a trip to a senior’s lodge for all of our grade twos. We had two different areas of the lodge they were to visit: one was touring the facilities with a guide. The other was visiting the elders themselves and hearing their stories. Strive to plan your stations with equal amounts of time, so that one group is not waiting for the other group, and again, apt to get into trouble.

Besides going to your official destination, you may want to schedule some fun time at a park, or elsewhere, to let off steam. Just be sure that you can supervise properly, and everyone is clear about when they have to come back.

Figure out your supervision

You must decide how many teachers you need in order to handle the students. This will vary depending on the behaviour of your students, as well as their age and maturity. Check with your administrator for permission to take the teacher's aide, and perhaps an extra teacher's aide on the trip. Now that you have your itinerary planned out, and all the resources in place, you are ready to write your permission form letter.

Create a permission form

This letter has two parts.

First part of letter

The top part of the letter should contain the following information:

a. Where you are going

b. What the purpose of your trip, including the curriculum connection

c. When you are going, including the time you are leaving, and the time you are being picked up

d. The contact information for the school and contact person (probably you, but it could be the school secretary or another staff member.)

e. What students will need to wear (if applicable) and anything they need to bring, including money, if applicable.

f. What you will be doing for food arrangements

g. What the transportation arrangements are

h. By what date the permission forms need to be sent back

Second Part of Letter:

The second part of the letter will be at the bottom, and meant to be torn off.

This part will look like this:

I, _____ (parent/guardian) give permission for _____(student) to attend the ******** field trip on the date of ******.

Signed: _____

Decide parameters for who's allowed to go on trip

Ahmad (2015) outline the parameters as follows:

Decide who will be going on the trip. By this, I mean that you might require acceptable behaviour for a week before the trip. This is a good incentive for children, and it does stop a student from going who will be a behaviour problem and ruin for everyone else. Decide on will be done with the students that can't go on the trip (stay home? Go to another class? Library?) Check to make sure that another adult is responsible for him or her while you are gone for the day.

Have a backup plan. Decide what you will do if a student is absolutely defiant and refuses to listen and causes a scene. Hopefully, this doesn't happen, but decide ahead of time, just in case. You might an agreement that that child will go to the bus for a time to cool down. Decide whatever is appropriate, and let all the children know that there will be consequences for misbehavior. Just like they do with parents at a grocery store, kids will sometimes see a public place as an opportunity to get away with as much as they can.

Tie in your field-Trip to curriculum

Decide what kind of assignment and learning you would like to tie in with this lesson plan. For some ideas for assignments to do before the trip. This may include pre-learning where you do some background reading on the place you are going, or on a related topic. You may also do some assignments while you are there. Also, see what the facility has for learning activities while there. Tell students that they have to do these because they are part of their mark. Also, you can have follow-up activities and assignments.

Day of the Trip

1. The day of the trip, try to arrive at the school a little earlier than usual to give yourself peace of mind.
2. Check to make sure all students have their permission forms signed back in, and the money is collected.
3. Have all students wait in their rooms until is time to go. Have an activity for them. If this relates to the trip, that's great. It might be a group game or a puzzle. The point is that they have something to do, because this time is one of anticipation for them, and you need a plan!
4. When the transportation is ready, have students go the buses or cars, in groups. Don't have everyone go at once, unless you have a very small group.
5. Assign each staff member a group, and give them their list. They will do roll call throughout the day. They do this either silently by just doing a visual check, or if it's a big group, call out their names.
6. Give instructions at two times to make sure they are heard. Check for understanding by getting one of the students to repeat it. Treat this likefree the learning experience it is.

7. Bring along some puzzle books and magazines to give out to students if you're going to be driving for more than half an hour.

Have a great day! If you take the time to do all this planning, you should have a great trip!

In the case of emergencies

No matter how much we plan, there is always a chance that something that things will not go as planned. Therefore, here a few tips for preparing for those unforeseen circumstances:

1. Bring along an emergency kit. If the bus is located close to the site, you will be safe leaving it on the bus, but also taking a few key items, such as bandages and wipes, in your bag, with you.

2. Be sure to have a way to communicate with parents, in case something goes wrong. This might be by having a list of contact information in your bag, or via contact with the school, who will do the communicating with you.

General Tips and Variations for Field Trips There are several tips and variation of field trips. Christopher, (2010) explains the tips and variations for Field-trip which are organized around the following sub heading, before, during and after the trip.

i. Before the Trip, Teachers Should:

Visit the site to find connections to curricula, assess potential problems, and plan how the students could best use their time.

ii. During the Trip, Teachers Should:

Build in opportunities for students to view the site or work alone, in pairs, or in small groups. On a trip to a museum, for example, the students could be asked an open-ended question like, “Find a work that represents our theme or time period and sketch it. In class we will share our choices and discuss why we chose them.” The students could also choose one aspect or part of the site to explore.

Consider giving some students disposable cameras, small tape recorders, or mandates to record specific information. When the class is back at school, they can compile a complete picture.

iii. After the Trip:

Allow the students to synthesize their experience creatively. For example, they might create trip brochures for other classes or the school library. They might create children books about a theme from the field trip. Or they might present their experience orally to another class or grade. However, for the effective conduct of Field-trip the above-mentioned tips and variations for the Field-trip should be properly adhered. And also, a biology teacher should be acquainted with the safety rules for a Field-trip.

Safety Rules for a Field-Trip

Field-tripis an interactive and engaging method of learning in environments outside the classroom. Whether planning a zoo expedition with elementary school children or an ecology Field-trip research with college students, these rules are excellent guidelines for maintaining a safe atmosphere.

i. Safety Waivers and Permission Slips

Most school programmes have template safety waivers or permission slips. Students under 18 years old must have a parent or guardian sign a legal permission slip stating that they accept the child's participation in the Field-trip. Students 18 years old and older must sign a waiver stating they accept full responsibility for their actions and legal implications of their participation in the Field-trip.

ii. Attendance Checklist Make an attendance list of each participant. This is helpful to check at periods throughout the trip, specifically getting on or off transportation and in the middle of the trip. There is nothing worse than realizing you forgot a kid at the zoo when arriving to school greeted by a questioning parent.

iii. Clothing Rain on a Field-trip can ruin the day and jeopardize the safety of participants, but not if you planned ahead and required them to bring umbrellas, raincoats or winter clothing. Most Field-trip locations require long pants and sleeves and close-toed shoes.

iv. Chaperones Chaperones help maintain safety of the group and control the chaos that a large group of kids can cause. A good rule is to have one adult for every three to five kids. The chaperones should be school employees or parents who all participants will respect and follow. If you are planning an extensive or overnight trip, have references or a background check conducted for each chaperone.

v. Cancelling a Field-Trip You may have to cancel a Field-trip depending on the weather. If there is flash-flooding, storms or lightning, reschedule the trip. Most locations will reschedule the trip for free or even offer to send a representative to your school to bring the Field-trip to you.

vi. Bring a First Aid Kit Having a basic first-aid kit can save hours of stress and potential injury. A complete kit includes: bandages, gauze, antiseptic, tape, scissors and home-made

splint material. While you can't prevent an accident, having a first-aid kit in each group can limit the potential for disaster in an emergency.

vii. Groups Participants can be divided into groups and assigned to an adult. If students are under 10 years old, consider various techniques to keep group cohesion. For example, assign a colored rope to each group that kids must hold on to while walking through a museum or ask each chaperone to hold a painted sign so high so that school kids can identify their group while walking through the zoo.

viii. Rules Most students need the structure of having rules spelled out for them. Before embarking on the trip, make copies of the rules and regulations for each participant. To ensure each student will follow the guidelines, have each kid sign the "rule contract" promising to act respectably. Rules include: Don't run, stay with the group, complete all field coursework in a timely manner, obey all traffic laws, listen to the chaperone, don't talk to strangers, etc.

ix Stranger Danger The safety and security of each child is in your hands. Talking and interacting with strangers can be dangerous. Younger kids especially get confused in large public places and may lose track of their chaperone. Be sure to stress to participants that they are only to talk to Field-trip chaperones or staff in marked uniforms. If the safety rules elicited above are maintained and properly followed, the pupils/ students could best enjoy benefit and retained knowledge gained from seeing real objects in their natural environment during the trips.

Merits and Demerits of Field-Trip

Abdullahi (1982) and Obeka (2010) outline some of the merits and demerits of field-trip are:

Demerits of Field-Trip

The following are some of the demerits of Field-trip

1. Expensive to undertake
2. Interrupt time programme
3. Time waste excursion may be too far and accident through travel may lead to loss of life.

Merits of Field-Trip

The following are some of the merits of Field-trip

1. It enables the students to have firsthand experience of real things. Thus, it is considered as providing learning experiences which cannot be brought in to the class room practically.
2. It tends to relate things studied in the classroom with actual activities outside the classroom that is the society and community. This makes class work or subject matter and instruction more meaningful and enhance, students understanding of the subject matter.
3. It affords valuable opportunities to develop interest in some subject areas and career opportunities,
4. It helps to arouse students' interest and increases their motivation to learn a subject and related subject.
5. It makes the students to be more imaginative and inquest live observers. Hence, they acquire skills for careful observation and objective report of observations.
6. It creates opportunities for the students to interact with experts, and this enhances effective learning and teaching. Most flied-study experiences make demand of all senses. This makes the students to gain complete picture of the concept than from

any other mode of teaching. Teacher student's relationship becomes more cordial and developed more intimately during field-study. In the light of this, the study therefore, investigated the effects of Field-trip and Inquiry-based Instruction on Interest, Retention, Performance and acquisition of social skills among Secondary School Biology Students in Lere education zone.

2.3.2 Field-Trip and Academic Performance

One of the objectives of teaching Biology according to National Policy on Education (2013) is to help learners solve problems arising from observation of their immediate environment and equipping the learners to choose careers in science and technology. To achieve the above goals, the learners need to acquire necessary skills for scientific investigation in order to solve problems.

Field-trip is an outdoor or field work or learning exercise undertaken by teachers and students in certain aspects of a subject to give students the opportunity to acquire knowledge. It may refer to as trips to various places to obtain information directly by seeing things as they really are (Obeka 2010). Field-trips can connect school work with the world, making it tangible and memorable. A Field-trip stimulates questions and ideas at the beginning or end of a unit. Field-trip also provides an experimental "text" for students to study and interrogate.

The Field-trip may be of a benefit to all the students regardless of the geographical location of the school. The students in urban area are not exposed nor have access to many physical Ecological habitats like river, ponds farmland, mountain, but they may have access through

Information and Communication Technology (ICT). And students in rural area are used to many ecological habitats for their day to day activities but they don't know the scientific and English names, the scientific benefit behind, adoptive feature and theinteraction of the organisms, the possible food chain exist in each habitat, and they don't have access to Information and Communication Technology (ICT). Therefore, taking students out of the classroom, regardless of where the school is located, to the natural habitat of the living organism, to observe, identify manipulate is very vital.Study conducted by Joubert (2010), shows that the use of instructional materials is very important in boosting Biology students'performance especially when the students are to see how organisms interacts in their natural environment

2.3.3 Field-Trip and Social Skills Acquisition

Field-trip is a teaching method that involves taking students outside the classroom for the purpose of making relevant observations about living things in their natural habitat. It could be in a nearby school farm, national park, zoo,industry, forest or game reserve. Bajah (2002) sees Field-trip as an important component of science teaching. In addition, Obeka (2010) sees Field-trip as an outdoor type of laboratory activity or field work or learning exercise undertaken by teachers and students in certain aspects of a subject, to give students the opportunity to acquire relevant knowledge of the organism in the natural habitat. In addition, Aliyu (2008) observed that field-study is taking students out of the classroom to places where they can see concrete illustration of classroom theories. It also offers direct observation and interpretation in their natural environment. In the field, the learners require the use of basic scientific skills that includes observation, identification, classification and manipulation of substance and organism in the natural surroundings, the use of scientific

skills also leads to acquisition of social skills which has the ability of enhancing students' interest, retention and academic performance.

Skill acquisition according to Usman, (2012) is a special ability acquired or develop as a result of training to do something well. Oburu, (2007) however defined skill acquisition as a process of learning skills, be able to became competent and be experienced in its application to solving problems or achieving desired end result. Social Skills are sets of broadly transferable abilities that are reflective of what scientists do that the learners needs to acquire to carry out mental and physical operation in science.

2.4 Inquiry-Based Teaching Strategy

The teaching of science as inquiry is a process which encourages students to solve problems in a logical and systematic manner, using the process of science, Akinbobola and Afolabi (2010). These processes of science are characterized by various skills, such as Observing, Comparing, Inferring, Hypothesizing, Experimenting, Data collection, and interpretation of data; these are inquiry skills. Richard and Francis (2013) defined inquiry thus: "the total configuration of behaviours involved in the struggled of human beings for reasonable explanations of phenomenal about which they are curious". In a similar report, Richard and Francis (2013) defined inquiry as "the act of creating individual knowledge by gathering and processing information". Akinbobola and Afolabi (2010) were reported by Richard and Francis (2013) to have defined inquiry as a set of activities characterized by a problem-solving approach in which each newly encountered phenomenon becomes a challenge for thinking". They believed that the essence of the inquiry process lies in the questions asked. He defined inquiry as "the approach to an idea by students and teacher

through questions asked of each other at various level of difficulty." He listed the kinds and level of questions to be asked as follows:

i. Those which can be answered readily from the experience and materials at hand, together with general knowledge.
ii. Those which can be answered but only after considerable investigation and thinking.
iii. Those which cannot be answered by either students or teacher.
iv. Those which probably cannot be answered at all with the present state of knowledge.

According to him, "it is the unanswered and sometimes unanswerable questions that form the heart of inquiry process".

He concluded by asserting that "at this point, the teachers can say I don't know the answer, and I doubt if anyone does. We can look for the answer, collect evidence and possibly make a judgment as to what the answer might be, but we cannot be sure. This is inquiry". Other authors like Stanovich and West (2010) pointed out that "in true inquiry, the individual tends to act more like a maturing adult. He formulates hypothesis about a problem, designs investigative approaches, carryout experiments, synthesis knowledge and develop certain scientific attitudes".

Schwab (1962) capped the inquiry process in science thus: "the product of scientific inquiry is the accumulation and systematized tested body of knowledge which includes concepts and principles. These form the basis which scientists use in their construction of broad conceptual strategy which Schwab called theories and laws".

Richard and Francis (2013) also reported Stanovich and West (2010) to have distinguished between “inquiry as content” and “using the method of scientific inquiry to learn science” which he called “inquiry a technique”. He said: “if all that is intended by the inquiry strategy is that we should encourage students to be inquisitive, curious, ask questions and try to find answer by himself then we are advocating no more than what good teachers have long believed in and practiced”. Inquiry instruction attempts to help students and discover answers to their questions. In inquiry, the emphasis is on learning principles, concepts and problem-solving skills rather than on mere memorization of factual information.

A variety of studies like that of Danjuma (2017) investigated the effectiveness of inquiry teaching strategy as it enhances the academic performance of students, particularly in science subjects. Although, a few researchers have argued to the contrary; Stanovich and West (2010). The overwhelming evidence in the literature shows that the inquiry strategy is the most effective method of teaching science.

Richard and Francis (2013) in their research titled “A re-assessment of the effectiveness of inquiry-based science curricular of the 60s on students’ performance”. Arrived at three major conclusions:

a. That the new science curricular of the 60s and 70s (inquiry-based) were more effective in enhancing students’ performance than the traditional textbook based progammes.
b. That inquiry-based science curricular of the 60s and 70s had significant positive effects on males but not on females at the composite performance level.

c. That at the criterion level, achievement and perception in inquiry-based science curricular were significantly positive but the female performance on corresponding criteria were not.

Tornquist, (2006) pointed out that the inquiry approach which they called the new science curricular enhanced the performance of students more than the conventional teacher centered approach (expository strategy). Nurshamshida, Abdullah and Yaamat (2013) in a research titled "Guided inquiry approach to science instruction versus lecture laboratory approach", found that the inquiry approach has proved to be a successful teaching methodology for high school science instruction. Nurshamshida, Abdullah and Yaamat (2012) concluded that, "the conventionally taught science courses are typically instructor-centered, in the sense that they provide the subjects with very little opportunity for self-initiated and self-directed study. Stanovich and West (2010) examines the relative effectiveness of a verbal approach (expository strategy) and a guided discovery approach (similar to inquiry) to the teaching of science principles at the seventh and ninth grades. They found out that the guided discovery approach was more effective than the verbal approach.

Here in Nigeria, James (2000) showed that the inquiry approach to the teaching of science was more effective than the traditional lecture method. In a related finding, Shaibu (1997) surveyed all the methods of teaching science in the secondary schools in Kaduna State. His findings revealed that the inquiry method of teaching was the most effective method of teaching science. Due to the nature of activities involve in inquiry method it is suitable for teaching Biology and ecology concept in particular.

Eniayeju in Danjuma (2017) observed that children who study science through applying activity-based strategy to solve problem, do learn and remember as many or more facts than those who study science by mere traditional methods. Further support for the adaptation of the activity-based strategy in science teaching as given by Gadzama (2012), observed that science teacher cannot teach science effectively without employing activity-based strategy and neither can students learn effectively without the use of the activity-based strategy which is assured by Inquiry-based instruction. Figure 2.2 shows the Flowchart for Inquiry-based instruction.

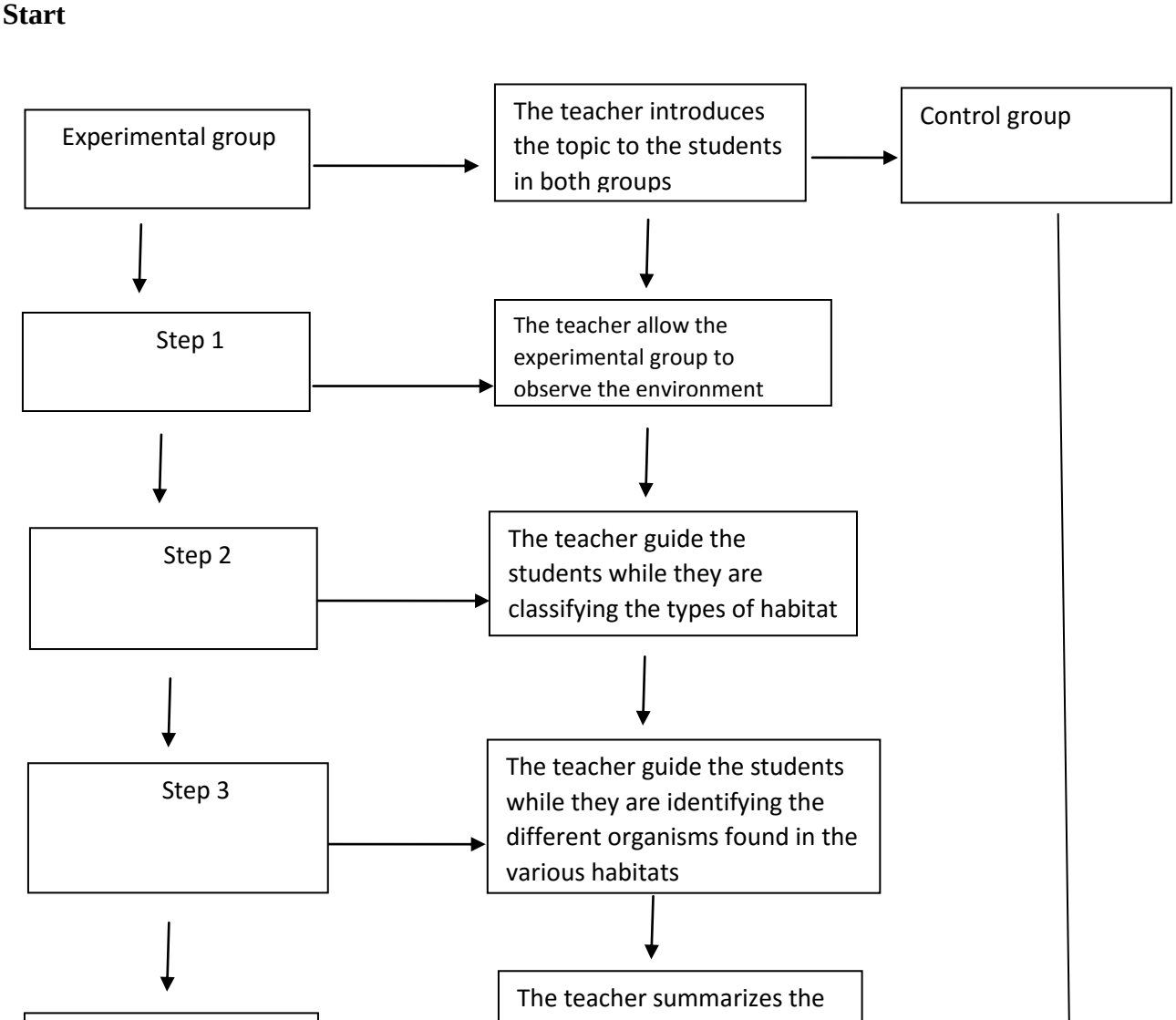

Fig. 2.2 Flowchart for Inquiry-based Instruction

Source: Adapted from Joshua (2010)

The flowchart was used to prepare lessons used to teach the experimental group because of the activities involved while the control group was taught using lecture method. The experimental group was taught using Inquiry-based instruction by the researcher, this was done by engaging the subjects in activities that foster the acquisition of social skills, interest, retention and academic performance as stated in the experimental lesson plan. Ecology Performance Test (EPT) was used for both pre-test, post-test and post post-test. The experimental group was taught the concept of living, involving the learners to foster their interaction with the environment, and the teacher. Lesson plans for the experimental and control group were the same in terms of contents, basic instructional objectives, and length of time for teaching and mode of evaluation except for the activities in the experimental group.

At the end of the six (6) weeks, the researcher administered the posttest to the subjects in the experimental group using Ecology Performance Test (EPT. The scripts from both pre-test, post-test and post post-test of the experimental group was marked and scored using the marking guide.

In an attempt to meet the instructional demand of the new 6-3-3-4 system of education in Nigeria, Danladi (2013), observed that a greater concern was given on how to organize science lesson in line with the demand of the Inquiry-based instruction. This could be the reason why science teaching presently emphasized the 3 H's (Head, Heart and Hand) and no more the out dated 3 R's (Reading, Writing and Arithmetic). On this premise, Inquiry-based instructionis Students centered and can enhanced active participation which could

lead to acquisition of social skills, interest, retention and better performance among secondary school Biology students.

2.4.1 Inquiry-Based and Academic Performance

The Inquiry-based instruction is activity oriented and involves practical demonstration, discussion and experimentation. During such instructions the students employ the processes of science such as observation, classification, investigation, and critical interpretation of findings. Okoye, Momoh, Aigbomain, and Okecha, (2008) observed that in Biology, it is possible for Inquiry-based instruction of teaching to enhance student's performance. This is because of the activity-oriented nature of the guided discovery strategy.

Some Biology teachers do not discriminate in the teaching method they use. The Inquiry-based instruction of teaching encourages interaction between students therefore social skills can actively be developed.Inquiry-based instruction can thus be seen as a pedagogical approach that invites students to explore academic content by posing, investigating and answering questions to the discovered problem or problems. Science education researchers like Maxwell (2015) showed in his research finding that inquiry method of teaching does improve performance of students as well as retention and interest.Therefore, taking students out of the classroom, regardless of where the school is located, to the natural habitat of the living organism, to observe, identify manipulate is very vital.Study conducted by Joubert (2010), shows that the use of instructional materials is very important in boosting Biology students'performance especially when the students are to see how organisms interacts in their natural environment.

2.4.2 Inquiry-Based and Social Skills Acquisition

Reports of National Research Council (NRC, 2000) identified Inquiry as a teaching and learning method that provides learners with motivation to learn and develop skills to be successful throughout life. They explained that students benefit by learning science through authentic investigations similar to those conducted by professional scientists. In theory, with the placement of science in a context through inquiry-based instruction, teachers and students begin to develop their approach to science, and this investigative learning leads to better understanding. Inquiry method of teaching according to Danjuma (2018) is a teaching method where the learner, with minimum guidance from the teacher seeks to discover and create answers to a recognized problem through procedure of making a diligent search. Inquiry is a term used in science teaching that refers to a way of questioning, seeking knowledge or information or finding out about phenomenon. Obeka (2010) however added that the use of this method aids the student to learn not only concepts and principles but self-direction, responsibility and social communication. He further stated that it is a highly interactive step by step approach which involves student at all levels of discussion. It is also the way people learn when they are left alone.Inquiry-based instruction offers direct observation and interpretation in their natural environment. In the field, the learners require the use of basic scientific skills that includes observation, identification, classification and manipulation of substance and organism in the natural surroundings, the use of scientific skills also leads to acquisition of social skills which has the ability of enhancing students' interest, retention and academic performance.

Skill acquisition according to Usman, (2012) is a special ability acquired or develop as a result of training to do something well. Oburu, (2007) however defined skill acquisition as a process of learning skills, be able to became competent and be experienced in its application to solving problems or achieving desired end result. Social Skills are sets of

broadly transferable abilities that are reflective of what scientists do that the learners needs to acquire to carry out mental and physical operation in science.

2.5 The Concept of Social Skills and Learning of Science

Social skills as defined by Amosa, (2018) as a learned behavior that a student is taught that will enable him/her interact with persons in ways that elicit positive responses and assist avoiding negative responses. Some of these social skills according to Ladd (2005)includes;

Basic Communication Skills

These include the ability to listen, follow directions and refrain from speaking. For example, listening skills involve the abilities of concentration and ignoring distractions. Good listening skills are demonstrated through indicating attention, such as nodding and smiling, and giving feedback on what has been said or discussed. It also includes the ability to refer to past comments, such as tying a current statement to a previous one, or query about potential, future ideas, actions and events. Basic communication skills include body language and behaviors, like eye contact, physical stillness and emotional attentiveness while the other person is talking.

Interpersonal Skills

Interpersonal skills include the abilities of sharing, joining activities, asking for permission and waiting turns. Those who have a social skill deficit may struggle with asking accurate and concise questions. Being unable to ask a simple question creates barriers to obtaining information and initiating a conversation. Those who struggle to ask questions will appear disinterested and even anti-social. Those with poor social skills may prefer to ask closed questions because these elicit brief and controlled responses. For adults with limited social

skills, they may struggle to understand proper manners in different social contexts and settings.

Problem Solving Skills

Problem solving involves asking for help, apologizing to others, deciding what to do and accepting consequences. Some people may struggle to identify the root causes of problems, so they can't fully have understood potential solutions or strategies. Those who struggle with solving problems may be morbidly shy or clinically introverted. They may prefer to avoid problems because it makes them feel uncomfortable. Those who struggle with solving problems will most likely have poor conflict resolution skills. Some children struggle to appropriately deal with teasing, while some adults have difficulties dealing with losing to competition.

Empathy and Rapport Skills

Empathy is a very important skill. To interact well with others, you must be able to understand how they are feeling. Empathy is especially critical when dealing with clients who come to you with questions or problems. You need to express genuine concern for their issues, as well as helping to solve them.

Certain cognitive, behavioral and mental health conditions may limit an individual's ability to feel empathy and connect with others. This includes Autism, which comes with documented social impairments, and Borderline Personality Disorder. Those who suffer from severe social anxiety and those who are highly self-conscious may display either too little or too much focus on someone else. This means that some people with anxiety are desperate to please others and avoid confrontation, so they will pay close attention to what

others say, or always volunteer to help or do favors. Opposite of this, some people will feel overwhelmed by their social environment and simply shut down around others.

Accountability

Some people are petrified of being criticized in public. They may struggle with accepting blame for problems or dealing with constructive feedback. Some people naturally associate accountability with reliability and maturity. Someone who promises to do something and then fails to do it may have a legitimate excuse, but their overt lack of accountability may indicate that they are unreliable and immature. Accountability is also an essential part of conflict management because recognizing mistakes are an excellent way to indicate a conciliatory and cooperative attitude. Those who want to improve their social skills should focus on imitating desirable attitudes and eliminating undesirable behaviors. They can use modeling, role-playing and performance feedback to improve their specific social skills deficit.

Listening

Another important communication skill that helps you interact well with others is listening. You need to be able to listen carefully to what your employer tells you to do, to what your colleagues say in a meeting, and to what your employees ask of you. You must listen to clients' concerns and express to them that you have understood them. People respond well to others when they feel they are being heard.

Nonverbal Communication

While verbal communication is an important skill, so is nonverbal communication. Through your body language, eye contact, and facial expressions, you can express that you are an empathetic person who carefully listens to others.

Cooperation

Cooperation is especially important when you work on a team, where you will be required to partner with others to reach a common goal. However, even if you do not work on a team, cooperation is still necessary on those occasions when you are asked to work alongside colleagues to help achieve the goals of your organization.

Verbal and Written Communication

Verbal communication is the ability to express yourself using clear language that others can understand. You'll need solid verbal communication skills whenever you speak to others in person or on the phone. Written communication comes into play whenever you write an email, text, letter, report, or presentation – here, appropriate grammar, spelling, and format are necessary.

The research study was interested in testing four social skills that the students are expected to acquire and which would allow the students to come together to actively participate in class and field activities, these skills includes; Participation in group activities, communicating with others, Cooperation, and Problem solving.

2.5.1 Social Skills Acquisition and Academic Performance

Amosa(2018), defined social skills as a learned behavior that a student is taught that will enable him/her to interact with persons in ways that elicit positive responses and assist in avoiding negative responses.

Skill acquisition according to Usman, (2012) is a special ability acquired or develop as a result of training to do something well. Oburu, (2007) however defined skill acquisition as a process of learning skills, be able to became competent and be experienced in its application to solving problems or achieving desired end result. Social Skills are sets of broadly transferable abilities that are reflective of what scientists do that the learners needs to acquire to carry out mental and physical operation in science. In teaching and learning Biology, the acquisitions of social skills are the bases for scientific investigation. Nwagbo (2008) and AI-Swidi, (2010) asserted that social skills are abilities which can be developed by experience and used in carrying out mental and physical operations.

Academic skills are being defined as the basic and complex cognitive skills that are the primaryeducational outcome of elementary and secondary schooling. Diperna (2006) stated that duringthe past two decades, researchers have tried to determine the factors contributing to students'failure in the classroom relating to academic achievement.

Some researchers, who have contributed to the research, have characterized the interplayas what will enable students to have academic success in high schools.Diperna and Elliott(1999) assumed that a student's academic performance and success in classroom learningincluded their attitude and behavior that goes beyond the foundation of the educational setting.Diperna and Elliott (2000) attempted to identify and describe some factors that may contribute toa student's academic success as "enablers" – interpersonal skills, study skills, motivation andengagement. However, the one limitation in their research was that the academic "enablers"were explored in isolation rather in relationship to one another.

Ray and Elliott (2006) found that previous research suggested that a student with earlychildhood positive behavioral characteristics predicted later academic achievement,

but thosewith early negative behavior traits did not exhibit successful academic success. Flowers.(2018) found that there is a link between social skills and academic performance. Social skillsand academic competence influenced each other consistently over-time, a pattern whereacademic competence casually influenced social competence, which in turn casually influencedacademic competence (Flowers, 2018). Some researchers have concluded that academicachievement can be predicted from indicators of social adjustment. Ray and Elliott (2006) testedwhether a student's self-concept, social skills and social support influence academicachievement. The participants varied in race, sex and grade level. Attempting to explain theirfinding, Flowers. (2018), suggested that the behavioral pattern and skills that the studentbrings to the educational setting are likely to carry over to the classroom learning environment.

Secondly, the student's ability to concentrate and direct his attention during classroominstruction, varies from student to student, impacts the student cognitive tasks and interaction.A third explanation can be related to interpersonal relationship between the teacher and child.(Flowers. 2018). The relationship between social competence and academic success is not asimple one. It has been researched that there is a reciprocal relationship between social andacademic mastery (Welsh, Parke, Widaman, & O'Neal, 2001). Students learn much aboutfairness, injustice and problem solving through play. Logue (2007), suggested that manychildren grow into social competence through negotiation, taking turns, and internalizing rules,and making friends. Logue (2007) concluded that unless there is teaching of social skills, role-playing and modeling for these students, these students faced learning of negative consequencesfor negative social interaction between their teachers and classmates.

The second part of this review explored various social skills that are suspected of causinga student's lack of academic success in high school. Social learning theory and content-drivenresearch have traditionally been separated (Logue, 2007). Unless children are given anopportunity to learn social skills in context, they may not benefit from academic instructionsoffered (Logue, 2007). Based on their research, DiPerna and Elliott (2000) as well asothers (Greenwood, 1991; Wentzel, 1993; Wigfield & Karpathin, 2018) identified four specificacademic enablers: interpersonal skills, study skills, motivation, and engagement. DePerna(2006) has defined academic enablers as positive relationships between a student's behaviors andattitudes and his' or her's academic achievement. A number of researchers have shown thatstudents social functioning influenced their academic achievement (Ray & Elliott, 2006).

Manning (2007), suggested that some students failed to have successful and positive academicsuccess because of low self-concept. Self-concept referred to the student's perception ofcompetence or adequacy in academic and non-academic domains and is best represented by aprofile of self-perception across domains. Ray and Elliott (2006) conducted a study relating tostudents (1) undeveloped academic competence (UAC) – students not performing at grade levelin reading and math; (2) undeveloped behavior competence (UBC) – students not acting in amanner that is developmentally appropriate or consistent with their peers (behavior thatinterferes with the students learning or ability to attend to their instructions); and (3) proficientacademic behavior competence (PABC) – students acting in a developmentally appropriatemanner consistent with his or her peers' behavior. Although, Ray & Elliott (2006) concludedthat students (UBC) grades were not below grade level, a careful reading of their study indicatedthat the sample pool was relatively small and

that their model included several social variableswhich did not affect the student's performance on standardized academic test.

Teacher expectations of their students suggest that it is important and imperative thatstudents demonstrated and displayed cooperation and self-control skills during school hours.

Lane, Pierson and Givner (2003) studied the expectations of teachers with regard to students'behavior in class. Each year, many educators expect their students to listen carefully andattentively, follow direction and turn in assignments that are done correctly and adequately(Hersh & Walker, 1983; Kerr & Zigmond, 2014). Students who lack these skills or expectationsare at risk for pejorative outcomes including poor school adjustment in the form of impairedrelationships with teachers and peers, academic underachievement, high rates of disciplinarycontact (Coie & Jacobs, 1993; O'Shaughnessy, Lane, Gresham & Beebe-Frankenberger, 2002;Walker & Severson, 2002). However, it must be first recognized and noted whether theteacher's goals and expectations are explained clearly and identified prior to the beginning of theschool year.

The final part of this review explored the best practices and strategies for supportingstudents in need of social and academic skills in the high school. Utilizing the current research,researchers have not able to succinctly determine what can be provided to teachers andeducational leaders to assist them in promoting meaningful contextual texts and academicenablers in an effort to enhance and enrich the basics in social skills during the instructionalperiods in high school. Early investigations related to teacher expectations regarding students ineducational setting by Hersh & Walker (1983); Walker et al., (2012), led to the development ofthe Model of Interpersonal Social-Behavior competence with School Settings. This study wasdesigned to provide research information regarding teacher-

preferred and peer-preferredbehaviors that are associated with positive and negative school outcomes. The model identifiedbehaviors (following rules, controlling anger, positive reactions to teacher remarks, anddisturbing others, ignores the teacher, and disrupts the group) that are likely to lead to adaptiveand maladaptive relationships with teachers and peers. The resulting study displayed correlativeevidence that adaptive behaviors produced academic success, acceptance and friendships;whereas, maladaptive behavior produced social rejection, low social engagement, and referral forspecialized placement. (Walker, et al. 2012; Walker &McConnell, 2018).

In spite oflimitations, Ray & Elliott (2006) suggested that the limitation in their study provided directionfor future research related to students' social and academic competence and have implicationsfor the selection of intervention targets aimed at improving student's school performance.Teachers must be equipped with research, studies, proffered suggestions and results to use aseducational equipment and tools to assist and help them in teaching and demonstrating acceptable social skills that will benefit them beyondhigh school (Tatum, 2006). The changing dynamics of our society and world through technologyand global synergy, makes it imperative that teachers and educational leaders finds solutions toaid the student in achieving academic success during their school age years and prepare themacademically and socially for their roles beyond high school (Garrett, 2006).

Impact of Social Skills on academic Performance and adjustment in schools

The process of Education takes place in the society. Learning is ultimately a social process (Bandura, 1986; Dewey, 1916; Vygotsky, 1978). People initially learn something independently and eventually that learning is modified through interaction with others. It is

very important for a child to have good social skills to learn meaningfully while interacting with the members of the society. Social skills are important for preparing young people (children) to mature and succeed in their adult roles within the family, workplace and community (Ten Dam & Volman, 2017).

Social development is represented best after birth. The process of social consciousness begins when the child realizes the necessity of his / her mother to satisfy all the needs. At age 3 to 4 months the baby responds to environmental factors and tries to communicate with pleasant emotions like joy and laughter. In the second-year child expresses his / her feelings and show desires easily to be able to develop independence and self-reliance (Jalali, 2015).The pre-school years are considered as the sensitive period for children's social development. During this period young brains develop rapidly and the children are having their first social interactions outside of the home (Sigelman & Rider, 2016). The most important factor in successful social development of the child is a strong and healthy relationship between home and school (Brooks-Gunn, et al. 2010), for the sake of maintaining such relationships they need to have good social skills and this is the perfect time to teach the little children good social skills.

As the children grow up they have to face a new environment at school and have new experiences with new peer groups, teachers and other persons at school or neighborhood. They need to adjust with everybody. Social skills are the ability of establishing healthy and effective communication with otherpeople (Bacanli, 1999; Kabasakal and Çelik, 2010; Segrin, 2001). Good social skills enable them to get adjusted with the challenging situations in life.How a child behaves in the society affects his educational goals and ultimately his school achievement too. His good behaviour helps in establishing good relations with

others, which in turn help him in acquiring new experiences and developing his true potentials to improve his school achievement.

Social skills help children to adjust in their social life as well as get succeed in their academic activities. Children's school performance behaviour and involvement in co-curricular activities are influenced by the extent to which they possess good social skills. (Walker 2013) defines social skills as "a set of competencies that contribute to peer acceptance and to a satisfactory school adjustment". Social skills help in navigating everyday interactions e.g. exchanging information, holding conversation, making new friends, maintaining the friendship, asking for help from others and giving instructions. The child having good social skills behaves properly in his peer group and easily gets adjusted in the group, which helpshim in satisfactory school adjustment and improving his school achievement. Possessing good social skills helps a child not only to relate well with the peer groups but also in maintaining good relationships with the teachers. A child having good social skills can cope effectively with the social environment as well as the school environment. Children's school performance, behaviour, social and family relationships and involvement in co-curricular activities are influenced by the extent to which they possess good social skills.

Social skills help in developing caring and concern for others, taking responsible decisions andeffectively handling challenging situations. (Zins, Weissbert, Wang, & Walberg,17. Possessing good social skills helps an individual child not only to relate well with the peer groups but also in maintaining good relationships with the teachers. A child having good social skills can cope effectively with the social environment as well as the school environment. "The development of social skills lays a critical foundation for later academic achievement as well as work-related skills" (McClelland & Morrison, 2013). Social skills

encourage positive interactions and avoid negative interactions with others. (Flowers, 2008).

Some researchers conducted studies to see the effect of social skills on academic achievement and school adjustment. Gilliam & Shahar (2006) conducted a study on Behavior problems as meaningful predictors (during the preschool years) of continued behavior problems i.e. poor peer standing, and academic difficulties during Kindergarten. The research has documented that children without adequate social skills are at risk to face difficulties as peer rejection, behaviour problems, and poor academic achievement. (Masten et al., 2015) found that interpersonal skills are important for peer acceptance and social adjustment throughout childhood and adolescence. (Joseph.Durlok, 2011) reported in "Study Finds Social-Skills Teaching Boosts Academics" that students who took part in Social and Emotional Learning of SEL program improved in grades and standardized test. On the bases of the review of the researches mentioned above it can be concluded that Social Skills play an important role in the academic achievement and adjustment in school among children.

Social skills are important for human beings throughout their life because they allow them to

understand others and to be understood by others in a right way. Social skills help people to express their positive and negative feelings in interpersonal situations (Herson & Bellack,1977). Social skills play an important role in every situation whether it may be for the children in the age of their schooling or for the adults in their career.

Social skills help children to adjust well with their peer group and to maintain good relationships with teachers and other adult members of the society. Social skills play a very important role in adolescents also. Adolescence is the period in which transition from

childhood to adulthood takes place. Rapid physiological and psychological changes occur in the children in this stage. Now, children begin to mature and they extend their relationships beyond their family. They face identity crises in this age and are in the need to make their own identity. They need to have better social skills to develop good relationships and make their identity. Social skills help people to succeed in their personal, academic, social and future professional activities (Elias et al. (2007).

After adolescence period it is the time to be independent for an adult. Social skills form an important factor of employee success (Beheshtifar and Noroy, 2013), so an individual also needs to have good social skills to be successful in his professional life. Strong social skills help in facilitating interpersonal interactions which lead to efficient job outcomes. Social skills allow an individual to face every situation confidently without losing social reinforcement. Social skill enhances people's performance (Hogan & Shelton, 2008). Basically, for having good performance in one's professional life, a person should have good social skills which include what is said by an individual during the conversation and how it is said.While communicating with others a firm and good voice tone, good expressions on face, body language, eye contact etc play an important role and all these qualities are related with having good social skills. People who are sociable early in life are more likely to get the jobs (Borghans, Weel and Weinberg, 2006).

Social skills tend to enhance personal development, better understanding, productivity, employability and career success. Everybody wants to have good, strong and close relationships in their life; it increases quality of their life. Social skills are the basic need of good relationships and better understandings. This leads to their good psychological and physical health. If a person is capable of establishing and maintaining positive and healthy relationships with others, he is often free from psychological disorders like depression,

anxiety, loneliness, frustration and his self-identity, self-esteem and autonomy start to increase (Johnson and Johnson, 2009).

2.5.2 Gender Differences in the Acquisition of Social Skills

Nwosu and Okeke (2015) observed that any meaningful learning of science by students in Nigeria secondary schools must include the development of social skills and the science curricular were modified to reflect this emphasis when these social skills are developed, intellectual ability of the students is widened and this could be used for life in the understanding of nature and problem solving. This is true and as rightly observed by Olayede (2012) that "Give a man fish and he eat for a day, teach a man to fish and he eats for a life time". For science teaching and learning to be interesting and meaningful, the development of social skills should become a necessary and integral part of school, science curriculum. Research conducted by Lock (2013) on gender and practical skill performance on science indicated that there is no gender difference in observation, reporting or planning skill and there was no differential performance in the use of scientific language. This report also indicated that boys performed better in interpretation than girls' similarly Danladi (2003) reported that there is no significant difference in achievement between girls and boys on the involving social skills acquisition. Nwosu (2001) in her study revealed that expose to social skills-based learning involving activities for both girls and boys (experiment group) yield a more effective learning irrespective of gender and ability level.

Johnson and Murphy (2017) reporting data collected from the Assessment of Performance Unit (APU) in the United Kingdom who indicated that girls show superior performance in observational skill at all ages tested (11, 13 and 15 years). The report suggests that girls our performed boys with respect to questions that require objects or features to be compared

and contrasted but that the reverse trend to seen with respect to question where scientific explanation of observation are required. Girls were however found to outperformed boys in relating to reporting observations of colour – change in chemistry context. Data collected form low achievers aged 15-16 years in Scottish schools on the skills of measuring Robert (1987) indicated that no gender related differences were found for using lenses or stop block but those girls were better at focusing of microscope those boys.

A study conducted to determine the influence of sex upon the acquisition of social skills by Ameh (1980) revealed that boys were better at using numbers measuring and experimenting than girls, while girls performed better in the process of observing and informing. However, the overall mean score of girls in social skills was found to be higher than that of the boys. Nwosu (2001) suggest that gender stereotyping has to be discouraged in the home; school and societies to enable girls participate freely in skill-based activities.

2.6 Interest in Teaching and Learning

According to Barron (2006), interest involves a particular relationship between a person and the environment and is sustained through interaction. The potential for interest is in the genetic makeup of the person, and the content and the environment determine the direction of interest development. Interest has both cognitive and affective components, although the relative amount of each may vary depending on the phase of interest (Ainley, Hidi, and Berndorff, 2002). Interest is now recognized to be a critical cognitive and affective motivational variable that guides attention (Hidi, 2001), facilitates learning in different content areas (Ainley et al., 2002) and for learners of all ages (Palmer, 2009), and develops through experience. The way in which interest is generated and/or affects learning has been found to vary depending on whether a person is in an earlier or later phase of interest

development (Hidi and Renninger, 2006). According to Uitto (2011), interest is important, because it is linked to the positive attitudes towards environmental responsibility. Empirical studies have repeatedly shown declines in students‟ interest for school subject matter as students‟ levels of schooling increase (Hidi, 2001), although interest of school-age students can develop with support from the tasks and/or the organization of the learning environment (Barron, Kennedy-Martin, Takuechi, and Fithian, 2009).

Factors that affect interest in learning as pointed out by Aggarwal (2008) include personal factors (socio-economic status, learners‟ mental health and development, age, sex, motives and wishes), ineffective teaching method, and environmental factors such as cultural factors. Interest has both subjective and objective aspects. In the subjective aspect the emphasis is on the feeling component, and in the objective aspect the emphasis is on the motor behavior of the individual. All interest has cognitive, affective as well as motor aspects. Interest give rise to certain activities. The attitude towards these activities is part of the affective domain. It is developed from personal experiences as well as from the attitudes of others especially parents, teachers and peers towards the particular activities (Shri, 2012). Dupigny-Giroux (2010) noted that educators can stimulate students‟ interest and begin their process of lifelong learning.

Some research like Wada (2016) work on the effect of teaching methods on students‟ interest have been conducted. Obeka (2009) confirmed that students taught using EPODEWALAD simulation displayed greater interest in the environmental concept of geography than the lecture group. The work of Weinberg, Basile and Albright (2011) titled effect of experiential learning program on middle school students‟ motivation toward mathematics and science also revealed that there was no difference in the proportion of males and females who responded that their experience in the program increased their level

of interest, and the proportion of males and females who reported an increase in their interest in mathematics as a result of the program was not found to be statistically different. Ibe (2013), worked on the effect of guided inquiry and expository teaching methods on the performance and interest of secondary school students in Biology, it was found out that guided inquiry method fosters students' interest in biology. Also, the findings of the study conducted by Obeka (2010) revealed that Development Model and Concept Mapping have significant effects on students‟ achievement and interest in Climate Change concepts of environmental education.

However young students in Philippine have shown growing interest in environmental issues spurred on by their own concern over the increasingly unusual weather patterns and worsening typhoon flooding that the country has seen in recent years. This interest was very much in evidence among the students who attended the forum and those that participated in the environmental project contest organized by the Communication Foundation for Asia (CFA), with the support of the Foundation for the Philippine Environment (FPE). The contest invited high schools to come up with environmental projects that would address Climate Change and involve the community in their efforts. The students‟ project show ingenuity, adaptability and sustainability, and varied from simple recycling, waste segregation and a floating model house (CFA, 2013). The work of Aminu (2015) also revealed that students taught weather concepts using animated-media package show positive interest than their lecture group counterparts. This study also aims at finding out the effect of inquiry-based teaching on the interest level of the students. This will be measured in both the experimental and control groups.

2.6.1 Relevance of Interest in Teaching and Learning Science

People are bound to develop more interest and put more effort and energy to the activities they like or perceive most thus, when children are interested in an activity they persevere, spend more time and embark on venture to attain their desired objective. According to Obeka (2009) 'interest is more than a discipline, is the key to education successes. For this submission, he further observed that, at any level of graduation, learners will learn better in subjects or courses if they have some degrees of likeness for such subject or the courses. This implies that learners will fail to learn little if they do not like the subjects. Interests therefore at a higher stage become subjective feeling of value which is experienced when striving. This feeling implies an end-point object, reward, purpose, or situation in which one is interested and for which an individual strives at (Johnson, 1972). This means that when one is interested in a thing one is ready to devote attention.

Okafor (2000), interest can be described as the attraction which forces or compels a child to respond to a particular stimulus. Okafor (2000) in his opinion maintained that effective domain is primarily concerned with beliefs, attitudes, interest, motives, needs and satisfaction, feeling and emotions. Thus, it is generally believed that the effective disposition of the student has direct consequences on his acquisition of science process skills and academic achievement. Therefore, the interest of the child has direct bearing to the quality of work and educational attainment.

Obeka (2009) opined that interest is indispensable for learning. He further opined that there can be no real education without interest. Abidoye (2015) was of the view that test of interest cannot be used with children below nine years to achieve any useful result. Similarly, Mehrens and Hehman in Obeka (2009) stated that interests tend to be relatively

unstable for young children but become progressively more stable with age after adolescences.

2.7 Retention Ability in Sciences

Retention is the ability to retain and later recall information or knowledge gained after learning (Bichi, 2002). Kundu and Tutoo (2002) defined it as a preservative factor of the mind. According to them, the mind acquires the materials and knowledge through sensation and perception. These acquired materials in the mind need to be preserved in form of images for knowledge to develop. Whenever a stimulating situation occurs, retained images are revived or reproduced to make memorization possible. Aggarwal (2008) regarded it as the process of relegation of the past experience in the sub-conscious mind of the individual in the form of mental experience. According to Sousa (2008), information is most likely to get stored if it makes sense and has meaning. A primary goal of education is to promote long-term knowledge storage and retrieval, not just memories that fade after a given lecture or conference, and the process of retaining knowledge is essential for students to become successful in learning science (Raman, 2010).

Four methods of measuring retention have been identified by Aggarwal (2008). They include: Recall or reproduction; Relearning or saving method; Recognition and Reconstruction. A good memory and retention lead to meaningful learning. Obeka (2010) identified some factors that affect knowledge retention among which are type and content of tasks to be learned, amount of original learning, instructional strategy used and length of retention interval. The goal for teachers is to have their students retain concepts and to apply those concepts to situations. The more actively involved students are in the learning process, the more likely the information will be retained; hopefully for longer periods of

time (Bouman, 2012). Even though learning takes place every day, learning and retention does not always take place together. Students are exposed to new information multiple times throughout a day and are expected to remember that information the next day. Teachers become frustrated when information is not easily recalled (Bouman, 2012). Teachers need to find a way to make the information meaningful to students so that it lasts longer, hence the need to change teaching style. Anyagh (2006) said the ability to remember takes place more effectively when experiences are passed across to the learners via an appropriate instructional method.

Several researchers have worked on the effects of teaching methods on retention abilities of learners. In the study conducted by Chianson, Kurumeh and Obida (2011), it confirmed that students who were subjected to the cooperative learning strategy were able to retain the concepts of circle geometry more than those students who were taught using the conventional learning approach and maintained that how well students retain taught concept can be traced back to the teaching approach used. Bouman (2012) in his study found out that the use of inquiry learning has help improved the students‟ ability to remember more difficult trapezoid formula compared to some of the fo-rmula taught by traditional means. The result of the research conducted by Bahrami, Chegini, Kianzadeh, Emami and Abdi (2012) showed that in comparison to traditional teaching, game-based teaching improved learning and retention of some math concepts. The work of Ifamuyiwa and Ajilogba (2012) also revealed a no significant difference between the retention scores of male and female students exposed to problem solving model strategy in further mathematics. The research conducted by Ajai and Imoko (2015) also revealed that male and female students taught algebra using problem-based method did not differ significantly in their retention scores.

A retention interval is the time that elapses between a test of original learning and that of a retention test, thus Knowledge retention is defined as the proportion of knowledge retained by an individual after a specific retention interval. Research has, in general, proposed three main principles pertaining to knowledge retention. First, knowledge retention generally falls to 75-89% of its original level after a relatively short period of time, Secondly, retention rate decreases over time as a finding of the length of retention interval in a relatively linear manner. Thirdly, all performances regardless of their individual levels of achievement have similar knowledge retention rates. Many researchers have investigated and defined several variables that affect knowledge retention. According to Obeka (2010) they include the type and content of task to be learned, the amount of original learning, the instructional strategy used, the length of the retention interval and subject individual. Retention is generally affected by two very important variables.

(1) Duration of study session.

(2) The temporal distribution of study time across the session.

Retention of material is the primary goal of every teacher. However, in present day school, it is common for a student to learn material, take a test and forget the material soon after. This may likely be the reason for students' poor performance in Biology WAEC and NECO exams.

It is, therefore, important to consider knowledge retention when evaluating learning strategies. One such strategy is distributed learning also known as spread practiced. In this procedure total study time is held constant but is spread across multiple study sessions. For example, if a student solves five long-division problems in one day and five others in one week later, the study is distributed.

However, if the student solves all the 10 questions on the same day, it would be considered mass practices. At longer retention intervals, distributed practice better retention than mass practice, this is termed spacing effect by Demster (1998). According to Bichi (2000), it is widely accepted that the longer the period of non-use of retained material, the greater the probability of decay. Other factors that affect the amount of skill decay include, task type and over learning.

Usman, (2001) conducted a study, investigating eight areas affecting acquisition and retention of knowledge and skills. The aim was to produce recommendations for effective training. They found three classes that optimize retention. These are: (1) Optimizing the conditions of training. (2) Optimizing the learning strategy used and (3) Achieving automatic levels of processing. Michie (2005) performed an experiment using 2 groups of subjects to learn either 20-word definition pairs or 10-word definition pairs in the same study time (2 minutes). They were then given a test to establish initial learning followed by retention test 1 or 4 weeks later. Their findings showed that the individuals learning the 10 word-definition pairs, who had twice the study time, recalled a far greater proportion of their words after 1 week. This difference disappeared after 4 weeks and the number of words recalled by the 20-words group was greater than those recalled by the 10-word group. The implication of this finding is that quantity is important in retention; an individual would be better studying 50 words in 5 minutes and recall 20 than studying 20 words in the same time and recalled 15. That is, increase in information can be used to increase retention.

Nussbaump, (2000) examine differences in retention of learned material using lecture-based and small group-based teaching methods in a continuing medical education course. The result demonstrated that although both groups had a significant decline on a three-

month follow-up exam, the group who attended lecture classes retained information better than the group who attended small group classes. In another study, OKoli, (2006) separated second year gastrointestinal medical students in to two groups one attended teacher-centered lecture-based classes and the other student-centered small group-based classes. They concluded that the small group-based classes led to a greater learning and retention compared to lecture-based classes. Fred, (2007) Stated that Biological science trip has long been recognized as a teaching device since it presents the concept being studied in its natural environment. Studies conducted by Aklugemidu, (1994), on the use of excursion showed that field trip stimulate student's interest in learning and allows for more retention of knowledge. In addition, Maikano, (2010) made comparism between outdoor and indoor laboratory teaching strategies on secondary school's students' academic achievement and retention in ecology. The result implies that, the experimental group taught ecological concept using the outdoor laboratory approach achieved significantly higher than the control group taught the same concept using the indoor laboratory.

Also, another study by Harrison (2004) tested medical students, by comparing knowledge retention after one-year interval between groups assigned to attend either lectures or self-study classes. On both the original final examination and retention examination, there were no statistically significant differences between the two groups' performance. In addition, Obeka (2010), study on the effect of inquiry and demonstration methods on students' achievement and retention in some environmental education concepts of geography. It found that there was a significant effect due to instructional methods on student's retention. However, the present study is on Effects of Field Trip and Inquiry-based Instruction on Interest, Retention,Academic Performance and Social Skills Acquisition among Secondary School Biology Students in Lere education zone.

2.8 Gender and Academic Performance in Biology

Gender refers to the socially culturally constructed characteristics and roles which are ascribed to males and females in a society (Okeke, 2008). Gender is a major factor that influences career choice and subject interest of students (Ezeudu and Obi, 2013). Okeke (2008) and Nwajiuba (2011) described the male attitudes as bold, aggressive, tactful, economic use of words while the females are fearful, timid gentle dull, submissive and talkative. That is the reason why Umoh (2010) stated that more difficult task is usually reserved for males while the females are considered feminine in the natural setting. Thus, in schools, males are more likely to take difficult subject areas like science while the females take to career that will not conflict with marriage chances, marriage responsibilities and motherhood such as humanities, languages and domestic subjects (Bichi, 2002; Okeke, 2008; Nwajiuba, 2011). Erinosho (2005) asserted that, biases and misconception about women and science are great challenges in the field of science education as people continue to describe science as a male enterprise. Jacobs and Simpkins (2006) are of the view that, girls tend to express lesser confidence in their science and maths abilities, lower expectations for success in science and math courses, and lesser interest in science and math than do boys. In Nigeria and Africa in general, gender biasness is still prevalent (Arigbabu and Mji, 2004). Onyenechere (2014) in her study documented the gender imbalance in the geography discipline in Nigerian universities. She concluded that the number of women academics is grossly inadequate.

Academic performance on the other hand refers to the display of knowledge attained or skills developed by students in the school subject usually designed by test scores or by marks assigned by the teachers which can either be low or high (Ogundukun and Adeyemo,

2010). The academic performance of students in many learning situations depends on several factors such as method of teaching, teachers‟ qualification, students‟ socio-economic background, school environment, attitude, interest and even sex of the learners (Popoola, 2010). There are many research works conducted on academic achievement/performance and gender in science education. Some shows significant differences between the males and females while others show no difference. The findings from the work of Usman (2000) pointed out that male students are academically superior to their female counterparts in integrated science. Uhumuavbi, Oriahi and Olusi (2003) also raised the concern and worry about female performance in Science, Technology and Mathematics not being encouraging. Njoku (2007) also reported that boys perform better than girls in Science, Technical and Mathematical subjects. Further Appaw (2011) in his work using concept mapping as a teaching method also pointed out that the male students scored significantly higher than the females.

On the contrary, Maikano (2007) in his work revealed that there is no significant difference in the academic performance of male and female students taught ecological concepts using the outdoor laboratory instructional strategy. Igbogoro (2008) carried out an investigation to determine the effect of inquiry approach on students‟ achievement in environmental education contents of secondary school Geography. The findings also revealed that there is no significant difference in the mean achievement scores of male and female students taught with inquiry approach. Yusuf (2009) in his research titled comparative study of gender difference in achievements in geography concluded that female students with very good results are more than that of the male students. However, pairwise comparison, using the pearson‟s correlation coefficient showed that the correlation between the achievements of boys and girls was very high indicating no significant difference in gender achievement

in the selected schools. In a similar vein, Shittu (2012) in his study on the effect of guided inquiry strategy on the academic performance and attitude of low achievers in physics concluded that the level of performance of male low achievers exposed to guided inquiry strategy is the same with their female counterparts.

Gender issues in the context of education refer to the differences, both real and perceived, between boys and girls and their relative academic performance and opportunities (Westminster Institution of Education, 2006). Gender in science is the classification of the roles males and females play in science. This is the consequences of genders stereotyped which have classified different roles for male and female in the society.

Gender differences may exist in many different areas of education from performance to attitudes, from classroom activities and course enrolment to perceptions about careers. Obeka (2009) stated that girls and women over the years have tended not to study science when compared to boys and men. Mari (2001) revealed superiority in performance of female students over their male counterpart in task involving science process skills.

Academic performance is affected by many factors such as interest, motivation, student's ability and the equality of secondary education received, etc. Educational achievement according to Raji (2004) can be considered to mean the successful outcome of accomplished activities to tasks in educational measurement in relation to accepted standards. Ditch and Scott in Bichi (2002) stated that one such controversy is that girls do not like practical work and can't handle the inquiry method.

Different instructional strategies have relative different effectiveness on student's performance. James, (2000) compared the effectiveness of laboratory approach and the traditional method of instruction on acquisition of process skills and found significant

differences in favor of laboratory method. Bichi (2002) compared the effectiveness of problem-solving instructional method and traditional method in promoting students' academic performance in evolution concepts and found the former to be more effective than the later.

Oraifa (1990) explained the patterns of performance among male and female students in science. The result showed that there is significant difference in the performance of male and female students in school science in favor of males. Njoku in Nworgu (2005) in a study of trends in student performance in science observed that male students perform significantly better than female students. Researchers such as Eriba and Sesugh (2006) and Onekutu (2002) have reported that boys outperformed girls in science and mathematics performance.

Other researchers have report differently on this issue. For example, Freedman (2002) Sungur and Tekkaya (2003), Oludipe (2008) have provided reports that there is no longer distinguishing difference in the cognitive, affective and psychomotor skill performance of students in respect of gender. According to Levi (2000) teacher plays a vital role in addressing the problem of gender equity in science education. To him, there are three main roles teachers most play, namely;

i. ensured provision of equal opportunities and respect for differences in the classroom.

ii. Ensure that boys and girls have the same expedience, that is treat boys and girls equally and

iii. Compensate for gender differences in society

The study therefore, is on Effects of Field-trip and Inquiry-based Instruction onInterest, Retention,Performance and Acquisition of Social Skills among Secondary School BiologyStudents in Lere education Zone. .

2.9 Overview of Similar Studies

Many scholars and researchers have used Field-trip and Inquiry teaching strategy in various subject areas such as Biology, Chemistry, Geography and Business studies. However, in the field of Biology particularly on the concept of Ecology not much work has been carried out on the effect of Field-trip and Inquiry teaching instruction on students' acquisition of social skills, retention, interest and performance. This informed the researcher choice of this research.

Ajaja, (2010), investigated the Effect of Field-trip on Learning Outcome in Biology among Secondary School Students in Abraka, Delta State. The design of the study was Quasi experimental involving pretest posttest control group design. Four research questions were usedto four hypotheses. The four hypotheses were tested with Pearson Product Moment Correlation Statistic. The population of the study comprised of 826 Biology students and sample of the study used consists of 100 Biology students in two intact classes. The instruments used was Biology Achievement Test (BAT). The instrument was validated and four hypotheses were tested with Pearson Product Moment Correlation Statistic and reliability was found to be r = 0.78 and good for the main research.The data was collected using BAT and analyzed using t-test The major findings of the study included a significant difference in process of science scores between pretest and posttest of Field-trip students, a significant difference in process of science test scores between students exposed to Field-trip experiences and those who were not exposed a significant difference in Biology

achievement test scores between students exposed to Field-trip experiences and those who were not. It was concluded that Field-trip experience enhanced students understanding of process of science, improved students' attitude toward Biology and significantly influenced their Biology Achievement.Unlike the Ajaja (2010) however, the present study differs in two independent variables (Field-trip and Inquiry-based Instructions); location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Independent Sample t-test). The present study would therefore, address the gaps in the social skills acquisition, interest, retention and academic performance as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Similarly, Patrick (2010) conducted a research on the Effect of Field-trip on Learning outcome of Senior School in Biology Achievement in Delta State. The design of the study was Quasi experimental involve pre-test, post-test control group design. The population consist of 1132 and sample of the study consisted of 122 Biology students in two interactive classes. The research was guided by Four objectives, Four research questions and four null hypotheses. Biology Achievement Test was used as an instrument for data collection and it was validated by experts. The first three hypotheses were tested with t-test statistics at 0.05 level of significance. The fourth hypothesis was tested with Pearson product Moment Correlation Statistics. The data collected was subject to analysis using t-test. The major findings of the study included: a significant difference in process of science scores between pre-test and post- test of field trip students; a significant difference in process of science test scores between students exposed to Field-trip experiences and those

who were not exposed. A significant difference in Biology achievement test scores between students exposed to Field-trip experiences and those who were not; and a strong correlation between process of science score and Biology achievement score. It was concluded that Field-trip experiences enhanced students understanding of process of science, improved students' attitude towards Biology and significantly influenced their Biology Achievement.Unlike the Patrick (2010) however, the present study differs in three dependent variables (Social Skills Acquisition, Interest, Retention); one independent variable (Inquiry-based Instructions), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Independent Sample t-test). The present study would therefore, address the gaps in the Social Skills Acquisition, Interest, Retention and Academic Performance as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Sanusi, (2019) Investigates the effect of Standard and Improvised Instructional Materials on retention and performance in Biology among Secondary School Students in Sokoto Metropolis, Nigeria. The study developed Four Research Objectives, Four research questions and four null hypotheses. A quasi experimental design using pre-test and posttest was adapted. The population consists of 1519 students. Random sampling was used to select the 3 schools out of 20 Secondary Schools in Sokoto Metropolis. A sample of 242 secondary school students was selected through the use of table of random numbers. The selected schools were randomly assigned to experimental group I, experimental group II and control group. The experimental group I was exposed to standard materials and

experimental group II was taught with improvised instructional materials. The control group was taught with lecture method without any instructional materials. The instruments used for data collection were Biology Performance Test (BAT) with reliability co-efficient of 0.73. Four hypotheses were tested at P≤0.05 level of significance using independent t-test. The findings showed that students taught with standard and improvised instructional materials have significant difference in their mean scores but showed significant difference with the control group. Based on the findings, it was recommended that teaching of Biology in secondary school should be conducted using standard or improvised materials. Teachers should try to improvise instructional materials and encourage students to do the same. This will give students enough understanding of Biology concepts as the child's local environment will be used to source for the materials.Unlike Sanusi, (2019) however, the present study differs in two dependent variables (Social Skills Acquisition, Interest); two independent variables (Field-trip and Inquiry-based Instructions), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Independent Sample t-test). The present study would therefore, address the gaps in the Social Skills Acquisition and Interest as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

In a similar study, Maikano, (2010) compared outdoor and indoor laboratory teaching strategies on 200 secondary school's student academic achievement and retention in ecology. After t-test was used to analyze the posttest result, the result implies that, the experimental group taught ecological concept using the outdoor laboratory

approachachieved significantly higher than the control group taught the same concept using the indoor laboratory. ANOVA was used to analyze the post test result which showed that the results of his experiment placing the experimental group who were taught using excursion approach are better in terms of performance after the experimental treatment, than control group who were taught the same concept using lecture method.Unlike the Maikano, (2010) however, the present study differs in two dependent variables (Social Skills Acquisition, Interest); two independent variables (Field-trip and Inquiry-based Instructions), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Kruskal-wallis). The present study would therefore, address the gaps in the Social Skills Acquisition and Interest as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Furthermore, Chukwuemeka (2008), worked on "the effect of practical activities on academic achievement and acquisition of social skills among Biology students in Delta State Capital Territory (DSCT) Nigeria. The research design of the study was quasi experimental and the population of the study was 3,252 Senior Secondary three (SS3) Biology students from twelve (12) secondary schools in Delta State Capital Territory (DSCT). A sample of four hundred and five (405) was randomly drawn from the population. Three research question and two null hypotheses guided the study. Biology Assessment Test (BAT) was used for data collection. The data collected was analyzed using Z-test.It was observed that the experimental group had a higher mean academic score (MAS) than the control group. Thus, the Z-test showed a significant difference in

favour of the experimental group. The current study differs from the aforementioned study in that the experimental group in the just mentioned study already had pre-practical experience while in the current study none of the groups has pre-practical experience. The research investigates “the effect of practical activities on academic achievement and acquisition of social skills among Biology students in Delta State Capital Territory (DSCT) Nigeria. UnlikeChukwuemeka (2008), however, the present study differs in two dependent variables (Interest and Retention); two independent variables (Field-trip and Inquiry-based Instructions), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Kruskal-wallis).The present study also differs from the aforementioned in the instrument used for assessing students Social Skills Acquisition. The present study shall therefore fill these gaps in the Interest and Retention as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Chinwe and Chukelu (2012), investigated “Effects of discovery method on Secondary School Students’ Process Skill Acquisition in Abuja Municipal Area Council, Nigeria. The research design of the study was quasi-experimental and the population of the study was 3245 Senior Secondary one (SS1) Biology students. A sample of one hundred and eleven (111) was randomly drawn from the population. Three research question and three null hypotheses guided the study. Science Process Skills Acquisition Test (SPSAT) was used for data collection. The data collected were analyzed using mean, standard deviation and Analysis of Covariance (ANCOVA) at 0.05 level of significance. The results revealed that practical activity method was more effective in fostering students’ acquisition of science

process skills and not gender related. However, the present study differs in four dependent variables (Social Skills Acquisition, Interest, Performance and Retention); two independent variables (Field-trip and Inquiry-based Instructions), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Kruskal-wallis). The present study also differs from the aforementioned in the instrument used for assessing students Social Skills Acquisition. The present study shall therefore fill these gaps in the Social Skills Acquisition, Interest, Performance and Retention as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Nnamonu and Joel (2009), investigated 'Effects of Biology Practical on the Secondary Students Academic Performance in Biology in Enugu State Nigeria. In Enugu North Local Government Area of Enugu State. The design was quasi experimental. The population of the study was 2,745 senior secondary two (SSII) students. A sample of 160 students were randomly drawn. Three research questions and three null hypotheses guided the study. ANOVA and Post hoc Scheffe's test were used to analyze the result. The result revealed that there is high academic performance in the group exposed to practical activities than those exposed to lecture. Also, male students performed significantly better than female when taught with practical activities. The study was carried out among SS2 Biology students in Enugu state. ANOVA and Post hoc Scheffe's statistical tool were used for result analysis. The study investigates 'Effects of Biology Practical on the Secondary Students Academic Performance in Biology in Enugu State Nigeria. The present study compares with Nnamonu and Joel (2009) in that it examines the impact of activity-based

Instruction on SS2 students' academic performance, retention as well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in two dependent variables (Social Skills Acquisition, Interest); two independent variables (Field-trip and Inquiry-based Instructions), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Social Skills Acquisition, Interestas well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Also, Danjuma (2017) investigated Effects of Inquiry-Based Instruction on Acquisition of Skills, Interest and Performance in Ecology among Secondary School Students. Four objectives, research Questions and Hypotheses guided the research. The hypotheses were tested at $p \leq 0.05$ level of significance. Pretest and posttest, experimental and control group design was used for the study. The population comprised all 1908 senior secondary school Biology students in Lere zone. A sample consisting of 118 students randomly selected from two coeducational schools in Lere Education Zone was used for the study. The experimental group was taught Ecology concepts using Inquiry-based method while the control group was exposed to lecture method. Three validated instruments called Student Process Skills Test (SPSAT), Ecology Performance Test (EPT) and Students Ecology Concept Interest Questionnaire (SECIQ) were used to gather data. Data collected were analyzed using t-test and Kruskal-wallis statistics. The results of the study revealed that differences existed on acquisition of skills when students are exposed to inquiry and

lecture teaching method in favour of experimental group.Statistics revealed that significant difference exist in the interest shown by SSS Students when they are exposed to Inquiry and lecture teaching method in favor of experimental group. Based on the findings the following recommendations were made; the use of Inquiry-based instruction should be encouraging among teachers of ecology to improve student's acquisition of skills and Inquiry-based instruction should also be encouraged to promote the learning of Biology by both male and female students.The present study compares with Danjuma (2017) in that it examines the impact Inquiry-based Instruction on SS2 students' academic performance, interest as well as in its address of gender issues. It is also similar in the design and similar location (Lere Education Zone, Kaduna State, Nigeria). In contrast to the aforementioned study, the present study differs in two dependent variables (Social Skills Acquisition andRetention); one independent variables (Inquiry-based Instruction), sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ). The present study shall therefore fill these gaps in the Social Skills Acquisition, Retention as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Muoneme (2015), investigated the 'Impact of Enriched-Lecture Method with Interactive Multimedia Board on Academic Achievement and Interest of Students in Evolution Concepts in Rijau Educational Zone, Niger State. The design was quasi experimental with a population of 498 senior secondary school (SSII) students. A sample of 89 students was randomly drawn. Three objectives, three research questions and three null hypotheses guided the study. ANOVA was used to analyze the result. The results revealed that there was significant interest change towards Biology for the students exposed to enriched

lecture method with interactive multimedia board.The present study compares with Muoneme (2015)investigated the 'Impact of Enriched-Lecture Method with Interactive Multimedia Board on on SS2 students' Academic performance and Interest as well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in two dependent variables (Social Skills Acquisition andRetention); two independent variables (Field-trip and Inquiry-based Instructions), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ). The present study shall therefore fill these gaps in the Social Skills Acquisition, Retention as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Chukwuemeka and Nwosu (2008), investigated the 'Effects of inquiry method on Academic Achievement of Senior Secondary School Students in Enugu east local Government Area, Nigeria. The design was quasi experimental with a population of 2,974 senior secondary two (SSII) students. A sample of 180 students was randomly drawn. Two research questions and two null hypotheses guided the study. Biology Achievement Test (BAT) was used as an instrument for data collection. ANOVA was used to analyze the result. The result revealed that practical activities method was more effective in fostering students understanding of Biology concepts than the lecture method. The study was carried out in Enugu state, Nigeria. The present study compares with Chukwuemeka and Nwosu (2008) in that it examines the impact of Inquiry-based Instruction on SS2 students' academic performance as well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study

differs in three dependent variables (Social Skills Acquisition, Interest and Retention); one independent variables (Field-tripInstruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Social Skills Acquisition, Interest, Retention and Field-trip as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Nwokolo (2013) investigate the effect of Argument-Based Inquiry (ABI) approach on acquisition of written communicating skills and interest of Senior Secondary School Biology students. Four research questions and six null hypotheses tested at 0.05 level of significance guided the study. A quasi experimental (non-equivalent control group) design was adopted for the study. 138 (58 males, 80 females) Senior Secondary School year one (SSS1) students from four co-educational public secondary schools in Oshogbo Local Government Area of Osun State were involved in the study. Simple random sampling technique was used to select the four co-educational senior secondary schools from 13 of such senior secondary schools in the Local Government Area. The four randomly selected schools were randomly assigned, two schools each to the experimental and the control groups. The Experimental Group (EG) was taught nutrition in animals using ABI approach while the Control Group (CG) was taught the same topic with TI approach. Science Written Communicating Skills Acquisition Test (SWCSAT) and Biology Interest Inventory (BII) were used for the study. The SWCSAT had 0.84 using Pearson-Product Moment correlation while BII had 0.74 using Cronbach's Alpha. The findings among

others showed that teaching biology with ABI approach enhanced the students' acquisition of written communicating skills and interest in biology better than the TI approach. The implications of the findings include that science teachers should use ABI approach so that the students can acquire written communicating skills.The present study compares with Nwokolo (2013) in that it examines the impact ofArgument-Based Inquiry (ABI) approach on acquisition of written communicating skills and interest as well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in three dependent variables (Social Skills Acquisition and Retention); two independent variables (Field-trip and Inquiry-based Instructions), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Social Skills Acquisition, Interest, Retention and Field-trip as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Obadiora (2016) in his study compared the effectiveness of virtual Field-study and real Field-trip on students' knowledge and retention ability in Social Studies in Osun State secondary schools. The sample consist of 127 JSS I students. Two public schools were randomly selected for the study. From each of the two schools, one intact JSS1 class was randomly assigned to either virtual field trip or real field-study group. One instrument was used for this study. Data collected were subjected to analysis of covariance (ANCOVA). The result showed that there is a significant difference in the effectiveness of virtual Field trip and real Field-study on students' knowledge in Social Studies (F = 433.108) in favour

of virtual field trip at p = 0.000. The results also indicated significant effectiveness of virtual Field-study and real field-study on student's retention ability (F = 470.020) in favour of real Field-study at p = 0.000. Based on the findings of this study it was concluded that virtual Field trip strategy is more effective in enhancing students learning in Social Studies than the real Field-trip strategy. Whereas real field-study strategy can help students to retain knowledge better and longer than virtual field-trip strategy.The present study compares withObadiora (2016)in that it examines the effectiveness of virtual Field-study and real Field-trip on students' knowledge and retention ability in Social Studiesas well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in three dependent variables (Social Skills Acquisition and Interest); one independent variables (Inquiry-based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2), subject (Biology) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Social Skills Acquisition, Interest, Retention and Field-trip as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Abdul and Mohammed (2015) investigates the effectiveness of community of inquiry method in preparing students to develop listening and speaking skills in a sample of junior secondary school students in Borno state, Nigeria. A sample of 100 students in standard classes was drawn in one secondary school in Maiduguri metropolis through stratified random sampling technique. A self-developed questionnaire was used in generated the

data from the respondents and data was analyses using descriptive consisting of mean and standard deviation as well as and inferential statistics one-way ANOVA and multiple regression analysis (MRA). The findings show that speaking skill is stronger than that of listening; gender is significant predictor of speaking skill and no significant difference between students in different classes. The study revealed that community inquiry approach is a good method of teaching speaking skill and teachers should be encouraging to master and employ the approach for developing English language skills to students.The present study compares withAbdul and Mohammed (2015) investigates the effectiveness of inquiry method as well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in four dependent variables (Social Skills Acquisition, Performance, Retention and Interest); one independent variables (Field-trip Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2), subject (Biology) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Social Skills Acquisition, Interest, Performance, Retention and Field-trip as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Yakubu (2016) investigated the effects of Field-based Teaching Strategy on Interest, Retention and Performance in Climate Change among Secondary School Students in Anchau, Kaduna, Nigeria. The study adopted the quasi experimental non-equivalent pretest, posttest control group design. The population of the study consisted of 1,655 SS II Geography students (1,010 males and 645 females). The sample for the study consisted of

75 students who were randomly assigned into experimental and control groups. 35 students in the experimental group were taught using Field-based Teaching Strategy and 40 students in the control group were taught with lecture method for six weeks. Two instruments, namely Climate Change Performance Test (CCPT) and Climate Change Interest Questionnaire (CCIQ) were developed and used for data collection. The reliability coefficient of CCPT is 0.64and that of CCIQ is 0.70. Six objectives, research questions and six hypotheses were raised. Among the hypotheses of the study is that there is no significant difference between the mean academic performance scores and retention ability of students taught Climate Change Concepts using Field-based Teaching Strategy and those taught using lecture method only. Data was analyzed descriptively using means, standard deviations, mean ranks and sum of mean ranks. Inferentially, hypotheses were tested using t-test and Mann-Whitney U-test at $p < 0.05$ levels of significance. Findings of the study showed a significant difference in interest, retention and performance between students taught Climate Change using Field-based Teaching Strategy and those taught using lecture method in favour of those taught using Field-based Teaching Strategy. Findings of the study also indicated no significant difference in interest, retention and performance between male and female students in the experimental group which implies the teaching strategy is gender friendly. Based on the findings of the study, it was recommended amongst others that geography teachers should use Field-based Teaching Strategy to teach the concepts of Climate Change.The present study compares withYakubu (2016) investigated the effects of Field-based Teaching Strategy on Interest, Retention and Performanceas well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in one dependent variable (Social Skills Acquisition); one independent variables (Inquiry-

based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2), subject (Biology) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Social Skills Acquisition and Inquiry-based Instruction as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Internationally, Cephas and Seoi-Sekgethelo (2009), investigated "Acquisition of Social Skills in Botswana General Certificate of Secondary Education. The population of the study was 12,342 students. Sample of 860 students was randomly drawn from the population. Ex-post facto design was adopted. Two research questions and two null hypotheses guided the study. ANCOVA and t-test was used to analyze the result. The result indicated that social skills are significantly higher in senior secondary school science curriculum in Botswana. Also, students perform better in the basic social skills than the integrated skills in Botswana General Certificate Examination. The study was carried out in Botswana. The present study compares withCephas and Seoi-Sekgethelo (2009), investigated "Acquisition of Social Skills as well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in three dependent variable (Interest, Performance and Retention); two independent variables (Field-trip and Inquiry-based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2),

subject (Biology) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Field-trip, Inquiry-based Instruction, Interest, Performance and Retention as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

David (2006) the study was on the comparative effect of different museum tours on children attitudes and learning. The study involved 200 students in 6 tours of the natural History Gallery of the British provincial museum in Victoria. The t-test was used to analyses the data collected after posttest. This study concluded that students of grades 5, 6 and 7 had significantly greater learning when they participated in a more structured tour. Studies conducted showed that field-study stimulate student's interest in learning and allows for more retention of knowledge. He also reported that field-study enables students to see things in their true situation and translate classroom theory into practice. Studies conducted showed that a greater percentage of what is heard, see and touched during Field-study is remembered than what is merely heard. Field-trip, if properly planned, it affords the students the opportunity to become actively engaged in observing, collecting, classifying studying relationships and manipulate objects. A field-study is one of the most enjoyable and exciting experience for students studying Biology which has a lot to do with living organisms and their environment.In contrast to the aforementioned study, the present study differs in four dependent variable (Social Skills Acquisition, Interest, Performance and Retention); one independent variables (Field-trip Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2), subject (Biology) and in the tool employed for data analysis (Kruskal-wallis). The present

study shall therefore fill these gaps in Inquiry-based Instruction, Social Skills Acquisition, Interest, Performance and Retention as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Similarly, Fred, (2007) Conducted research on the field-study in Biology in the New York City. Two groups of incoming freshmen in a New York City High School were selected on the basis of the "Otis Mental Ability Test." The groups, designated as "A" and "B" each consisted of two Hundred and one pupils although later in the experiment the number dropped to one hundred and ninety-four. Groups "A" had an Intelligent Quotient average of 103.75 and group "B" an Intelligence Quotient average of 102.09. After the groups were post tested and t-test was used to analyzed the data, the result demonstrated that, groups exposed to field-study teaching strategy achieved more significantly than their counter part that were strictly taught in the class using lecture method. Another research was conducted by Aliyu, (2008) on education excursions and student achievement in Business studies. The result shows that the performance of both the experimental and control groups in business studies after the excursion remain the same. The research was carryout in New York using Field-study on student's performance. The present study compares withFred, (2007) Conducted research on the field-study in Biologyas well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in four dependent variable (Social Skills Acquisition, Interest, Performance and Retention); one independent variables (Inquiry-based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2) and in the tool employed for data analysis (Kruskal-wallis). The present study

shall therefore fill these gaps in the Inquiry-based Instruction, Interest, Performance and Retention as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

In addition, Melkisedek, (2017) carried out research to analyze the effects of Field trip learning method toward the conceptual understanding of Local History in improving the students' learning achievement. This is a quasi-experiment research. The population in this research is all students of the History Education Studies, the Faculty of Teacher Training and Educational Sciences at Nusa Cendana University, with the sample is 38 students of the fifth semester. The sample-collecting method is purposive-sampling. The data are analyzed by using One Way ANOVA technique with Analysis Pre-requirement Test, that is, Normality Test using Lilliefors' significant correction method from Kolmogorov-Smirnov Test and Homogeneity Test with F Test. Result of data analysis shows that there are effects on the implementation of the Field trip learning method toward the conceptual understanding to improve the students' learning outcome of Local History with F count = 28,301, p value = 0,001 < 0,05. Therefore, it can be concluded that there are some effects of the Field-trip learning method toward the conceptual understanding of Local History. The research was carryout in Indonesia using only Field-trip and this present study will be carryout in Nigeria using Field-trip and inquiry-based instruction.

Pedro, Amaury and Francis (2016) investigates the effectiveness of a physical education (PE) program focused on the affective domain for 6th to 8th grade students with respect to the acquisition and transfer of social skills and values. Further, the extent that general classroom teachers and parents perceived if the learned skills where transferred to other context outside the PE class was examined in a sample of 274 students (ages 11 to 13 years old). One hundred and forty-five males (53%) and 129 females (47%) from five urban

schools in Albacete Spain were studied. Three questionnaires were used (pre and post rating scales) as data collection instruments for students, teachers and parents. Results demonstrated encouraging estimates of reliability for the subscales of PE teachers' perceptions of students' values and regular education teaches perceptions with very strong values of internal consistency .82 and .93 respectively. Posttest values were slightly higher. Further, findings demonstrated positive outcomes after the intervention in teacher perceptions about student's values levels, enjoyment, fair play, social relation, good habits and emotional control in favor of the intervention group. These results support previous studies evidencing that integrating social skills and values intervention in the PE class increase students' development in the affective domain. The research focused on investigating the effectiveness of a physical education (PE) program focused on the affective domain for 6th to 8th grade students with respect to the acquisition and transfer of social skills and values. The present study compares withPedro, Amaury and Francis (2016) investigatesacquisitionof social skillsas well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in three dependent variable (Interest, Performance and Retention); two independent variables (Field-trip and Inquiry-based Instructions), location (Lere Education Zone, Kaduna State, Nigeria); sample size (in = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2), subject (Biology) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Field-trip, Inquiry-based Instruction, Interest, Performance and Retention as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Similarly, Namasaka, Mondoh and Wasike (2017) investigate effectiveness of Sequential Teaching Methods (STM) on the, retention of knowledge in Biology by secondary school students. The study was Quasi- experimental using the Non-equivalent control- group 16 study design.Two objectives, research questions and two null hypotheses were used for the study. The target population comprised students in the 18 old category National Schools in Kenya that were in existence before 2012. Purposive sampling was used to obtain a sample of eight (8) schools and 402 Students. The students in the eight (8) sub-groups were taught the same Biology topic: ‚General Characteristics of Enzymes', using different sequences of three teaching methods namely: lecture, slide demonstration and laboratory (student experiment). Group I (ELD) began with experiments, followed by lecture method and was lastly shown, animated slides. The sequence of the three different methods used in the first group was altered in both the second and third groups as follows: The lecture method, slide demonstration and laboratory experiment (LDE) for Group II, and slide demonstration, experiment and lecture method (DEL) for group III. Students in group IV (control group) were taught using (oral-only) lecture method. The teachers gave lectures and performed slide demonstration while the students carried out laboratory experiments. The test was used as a pre-test and also as a retention test that was administered 40 days after the Post-test BAT. This test had 25 objective questions testing knowledge of facts, application of knowledge and problem-solving ability. To measure Retention of Knowledge, the researcher used Biology Retention Test (BRT). The research hypothesis was tested using ANOVA at significant level of 0.05. The results and findings of the study show that STM, when efficiently used in instruction, enhance immediate retention of knowledge in Biology more effectively than the oratory lecture method predominantly used in Kenyan Secondary schools. Furthermore, DEL sequence was identified as the most effective in comparison to

LDE and ELD. The findings of the study will help curriculum developers and teachers to choose the most appropriate sequence to use in Biology. The study investigated the effectiveness of Sequential Teaching Methods (STM) on the, retention of knowledge in Biology and this present study is onthe effects of Field-trip and Inquiry-based Instruction on Interest, Retention, Performance and Acquisition of Social Skills.

Amosa, (2018), investigated the effect of Field-trip on students' academic performance in learning social skills in Basic Technology in Ilorin, Nigeria. A Pre-test, post - Test and control group quasi - experimental design was adopted for this study. Two objectives, research questions and two null hypotheses were used. Two Sampled upper basic Schools Were selected from Ilorin East Local Government Area of Kwara State Using purposive sampling technique. The Two sampled upper basic Schools Comprised 50 Students who were randomly assigned to treatment (25 students) and control (25 students) groups. Two instruments were used to gather the relevant data for this study: Instructional Strategy on social Skills (Treatment) ISPS and Basic Technology Performance Test (BTPT). Analysis of Co-variance (ANCOVA) Was used to analyze the data collected. The Findings revealed that at significant level, the value produced $F(2, 22) = 3.44 > 0.109$ Therefore, Hypothesis one was rejected. Also, at 0.05 Significant level, the value produced $F(2, 9) = 4.26 > 0.433$. Therefore, Hypothesis two was rejected. Based on the findings, it was recommended among others that; teachers should take students on Field-trip so as to promote and encourage active engagement in learning, self-motivation, discovery learning and learning by experience. The research investigated the effect of Field-trip on students' academic performance in learning social skills in Basic Technology in Ilorin, Nigeria. The present study compares withAmosa, (2018), investigated the effect of Field-trip on students'

academic performance in learning social skillsas well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in two dependent variable (Interest and Retention); one independent variables (Field-trip Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2), subject (Biology) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Inquiry-based Instruction, Interest and Retention as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Omer, and Gokmen (2017) investigated the effects of the social skill training program on the social skill levels of young people in the age of military service in Cyprus. The sample of the investigation consists of 68 young people, who were applied to the military service in 2015. In order to determine social skill levels of the participants, Social Skill Inventory (SSI) was used. And the effects of the social skill training program on the social skill levels of participants were analyzed by the experimental method, which was based on pre-test and post-test model. As a result of the comparison, there were significant differences found between the pre-test scores of the test group before the execution of social skill training program and post-test scores after the execution of social skill training program. In the light of the data, it was concluded that the social skill training program has a positive impact on the social skill level of participants.The research investigatesthe effects of the social skill training program on the social skill levels of young people in the age of military service in

Cyprus. The present study compares withOmer, and Gokmen (2017) investigated the effects of the social skill training program on the social skillas well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in three dependent variable (Interest, Performance and Retention); two independent variables (Field-trip and Inquiry-based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2), subject (Biology) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Field-trip, Inquiry-based Instruction, Interest, Performance and Retention as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Neboh, (2009). conducted a research to determine the effectiveness of the Learning Activity Package (LAP) in influencing students‟ achievement and retention in Senior Secondary School Biology in Enugu Educational Zone. Eight research questions and eight null hypotheses guided the study. A Quasi-Experimental Pre-test, Post-test, Non-equivalent Control Group Design was adopted for the study. A sample of 317 SS II biology students, drawn by both purposive and simple random sampling techniques from four co-educational schools in Enugu Educational Zone was used for the study. The four schools were assigned to experimental and control groups respectively. Two intact classes in each school – (one as experimental and the other one as control group) were randomly selected. The experimental and control groups were taught the biology topic (Unit of Life) by the regular biology teachers. Three instruments – Pre-BAT, Post-BAT and Retention Test (which is the same as the Pre-BAT) were developed, duly validated and reliability of equivalence, internal

consistency and stability duly established (0.79, 0.83, 0.73 and 0.92 respectively) before using them for data collection. The research questions were answered using mean and standard deviation while the hypotheses were tested at ($P < 0.05$) using analysis of covariance (ANCOVA). The result of data analysis showed that;there is a significant difference between the experimental and control group, with the mean achievement and retention scores of the LAP group being significant more than the control group.Based on these, some recommendations were made which include; that seminars and workshops should be organized by government and relevant professional bodies like STAN to educate and sensitize the teachers on the use of Learning Activity Package as they may not be familiar with it. The research was conducted to determine the effectiveness of the Learning Activity Package (LAP) in influencing students‟ achievement and retention in Senior Secondary School Biology in Enugu Educational Zone. The present study compares withOmer, and Gokmen (2017) investigated the effects of the social skill training program on the social skillas well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in three dependent variable (Interest, Performance and Retention); two independent variables (Field-trip and Inquiry-based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2), subject (Biology) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Field-trip, Inquiry-based Instruction, Interest, Performance and Retention as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Mamudu, and Alairu, (2018). investigated the effects of jurisprudential model of instruction on the performance and retention ability of Senior Secondary School students of Bichi Educational Zone in ecological concepts. The study population consisted of 2078 biology students, and the sample consisted of 100 SS Il biology students sampled using the random table of numbers, 50 for the experimental and 50 for the control group. The design for the study was quasi experimental control with pre and posttests. The experimental group was taught using jurisprudential model, while the control group was taught using the conventional lecture method. The students were pre-tested and post-tested on Ecology Achievement Test (EAT). To guide the study, three research questions and three hypotheses were put across. Findings revealed that, the jurisprudence model of teaching strategy proved more effective than the conventional lecture method on students' achievement and retention ability in ecological concepts. Jurisprudential model strategy was also found to be gender friendly. Based on the findings, it was recommended that science teachers and curriculum developers should popularize and incorporate jurisprudential model approach into the teachers' training curricula at all levels.The present study compares withMamudu, and Alairu, (2018). investigated the performance, retention and ecological conceptsas well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in two dependent variable (Interestand Social Skills); two independent variables (Field-trip and Inquiry-based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Field-trip, Inquiry-

based Instruction, Interest and Social Skills as well as gender-related issues among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Ibrahim; Hamza; Bello and Adamu, (2018). Investigated effects of Inquiry and Lecture methods of teaching on students' academic achievement and retention ability among N.C.E 1 Chemistry students of Federal College of Education, Zaria. The study is a pre-test, post-test quasi experimental control group design. A total of 256 students formed the sample of the study which was selected in line with Krejcie and Morgan (1970) sample size table. A Separation Techniques Chemistry Achievement Test (STCAT) was used for data collection. The STCAT was developed by the researcher and validated by experts in chemistry education. The reliability coefficient of STCAT was found to be r=0.88. Analysis of data using t-test statistics shows that the experimental group which was taught chemistry using inquiry teaching methods performed significantly better than the control group which was taught using the traditional lecture method. Other findings of the research were that inquiry method of instruction was gender-sensitive and that it enhances retention. The study recommends, among others, that chemistry teachers should be encouraged to use inquiry method in the teaching of chemistry. Lecture method and Field-trip was used. The present study compares withIbrahim; Hamza; Bello and Adamu, (2018). Investigated effects of Inquiry method of teaching on students' retentionas well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in three dependent variable (Interest, Performance and Social Skills); one independent variable (Field-trip Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2), subject (Biology)

and in the tool employed for data analysis Kruskal-wallis). The present study shall therefore fill these gaps in the Field-trip, Inquiry-based Instruction, Interest, Performance as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Ibrahim, (2015) investigated the ―Impact of 5E Teaching Cycle on Attitude, Retention and Performance in Genetics among Pre-NCE Biology Students with Varied Abilities, North-West Zone, Nigeria. Five research objectives, research questions and five hypotheses guided the study. Quasi-experimental and Control group Design involving pretest, posttest and post-posttest was used for the study. A total of one hundred and ten (110) students were used for the study. Equal numbers of subjects were selected for each group in order to have a fair representation of the subjects in the study. The experimental groups were exposed to 5E teaching cycle while the control group was exposed to lecture method. Two instruments, namely Genetics Academic Performance Test (GAPT) with reliability coefficient of 0.79 and Students Attitude Genetics Questionnaire (SAGQ) with reliability of 0.82 were used for data collection. Recommendations were made based on the findings source of which is: The teaching of Biology especially genetics should be conducted using 5E teaching cycle as it makes students learn meaningfully, enhances better retention of knowledge and develop positive attitude towards the subject. It should therefore be incorporated into the main stream of pedagogy in the teaching of Biology at pre-NCE level of colleges of education.The present study compares withIbrahim, (2015) investigated the ―Impact of 5E Teaching Cycle on Retention and Performance as well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in two dependent variables (Interestand Social Skills); two independent variables (Field-trip and Inquiry-based Instruction), location (Lere Education

Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ), level (S.S. 2), concept (Ecology) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Field-trip, Inquiry-based Instruction, InterestSocial Skills as well as gender-related issues in ecology concept among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Also, Wada (2016), Investigate the impact of Field-trip on motivation, retention and performance on plant adaptation among secondary school students in Gumel, Jigawa State, Nigeria. Quasi-experimental research design, which utilized pretest, posttest and postpost test, was adopted. The population of the study consisted of 3449 SSII students from 15 public schools in Gumel, Jigawa State. Two out of 15 schools were randomly selected as a sample, where one school each were used as experimental and control group. The experimental group was taught using Field-trip teaching strategy while the control group was taught using lecture method. Two intact classes were selected to form a sample of 124 students. Instruments used for the study were Plant Adaptation Performance Test (PAPT) and Plant Adaptation Motivation Questionnaire (PAMQ) with the reliability value of r = 0.78. Research questions were answered descriptively using means and standards deviation and the hypotheses were tested at 0.05 level of significance. t-test and Kruskall Wallis statistical tools were used in analyzing the data collected. Major findings of the study revealed that plant adaptation concept favoured Field-trip teaching strategy. The study further confirmed that Field-trip teaching strategy enhanced retention, motivated students and it is gender friendly. From the results of analysis discussed, recommendations were made one of which was that there is need for teaching and learning strategies involving

student's participation such as Field-trip teaching strategy which enhanced performance, retention and motivation of students.The present study compares with Wada (2016), Investigate the impact of Field-trip on motivation, retention and performance on plant adaptation among secondary school studentsas well as in its address of gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in two dependent variables (Interest and Social Skills); one independent variable (Inquiry-based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Inquiry-based Instruction, Interest Social Skills as well as gender-related issues among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

In a similar study, Iwuju, (2011) examined the effect of Activity Based Teaching Strategy (ABTS) on Academic Achievement in Basic Science among Junior secondary school students in Katsina. 118 JSS 2 students and quasi-experimental research design were employed for the study. Using Basic Science Achievement Test (BSAT) with reliability of 0.85 and t-test statistical analysis; findings revealed a significant difference in the academic achievement of students taught using ABSAT and those taught using lecture method. The previous work was carried out on Basic Science on effect of academic performance while in the present study, will be on social skills, retention, interest and performance. The study investigated the effect of activity-based strategy on performance only.The present study compares with Iwuju, (2011) examined the effect of Activity Based Teaching Strategy (ABTS) on Academic Achievement. It is also similar in the design and sampling technique.

In contrast to the aforementioned study, the present study differs in three dependent variables (Interest Retention and Social Skills Acquisition); one independent variable (Inquiry-based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) level (S.S. 2), subject (Biology) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Field-trip, Inquiry-based Instruction, Interest, Retention, Social Skills Acquisition among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Ekon and Eni (2015) investigated Gender and Acquisition of Social Skills among Junior Secondary School (JSS) 3 students in Calabar Municipality: Implication for Implementation of Universal Basic Education Objectives. One research question and a null hypothesis were used for the study. Two hundred (200) JSS 3 students in three (3) co-educational schools participated in the study. A Social Skills Acquisition Test (ASSAT) developed by the researchers was used for data collection. descriptive statistics in terms of percentages was used to answer the research questions; independent t-test and contingency chi-square were used to test the null hypotheses at 0.05 level of significant. The result of analysis showed that majority of the students acquired the social skills measured in favour of female students but at a very low and little above average. Students who acquired social skills performed better than those who did not acquire those skills measured. The findings of the first study showed low social skills acquisition. Only Social Skills were acquired in the previous study by the students. The present study compares with Ekon and Eni (2015) investigated Gender and Acquisition of Social Skills as well as gender issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the

present study differs in three dependent variables (Interest Retention and Performance); two independent variable (Field-trip and Inquiry-based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) level (S.S. 2), subject (Biology) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Field-trip, Inquiry-based Instruction, Interest, Retention and Performance among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Bassey and Amanso (2017) assessed the influence of gender and school type on skills acquisition among Chemistry 2 students in Calabar Education Zone of Cross River State, Nigeria. Two hypotheses were formulated to guide the study. Survey research design was adopted for the study using stratified random sampling technique, a sample of 413 science students was drawn from a population of 4212 for the study. The sample comprised 203 male and 210 females with 189 from private schools and 224 from public schools. A 32 items questionnaire was the instrument for data collection. the instrument was duly validated and the reliability estimated for the instrument was established through Cronbach alpha method ranged from .73 to 91. Independent t-test analysis was used to test the two null hypotheses at .05 alpha level of significant. The result revealed that male science students differ significantly from female counterparts in social skills acquisition favouring the males in skills of interpretation and listening. The study assessed the influence of gender and school type on skills acquisition among Chemistry 2 students in Calabar Education Zone of Cross River State, Nigeria. The present study compares with Bassey and Amanso (2017) assessed the influence of gender and school type on skills acquisition. It is

also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in three dependent variables (Interest Retention and Performance); two independent variable (Field-trip and Inquiry-based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) level (S.S. 2), subject (Biology) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Field-trip, Inquiry-based Instruction, Interest, Retention and Performance among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Adanyi (2019) investigated the impact of Process-Based Instruction on science skills acquisition, performance and retention among Basic Science students in Zaria Educational Zone, Kaduna, Nigeria. The research was quasi- experimental control group design that employed pre-test, post-test and post-posttest. The study population comprised 4,157 (2,615 males and 1,542 females) students from twenty-five co-education schools. Two schools comprising 75 students (44 males and 31 females) were randomly selected for the study, one was randomly assigned as experimental group while the other served as control group. The experimental group was taught using PBI while the control group was taught by LM. Both groups underwent pre-test treatment and post-test. Two instruments were used for gathering data, Basic Science Performance Test (BSPT) with reliability co-efficient of r=0.76 and Science Process skills Acquisition Test (SPSAT) with reliability co-efficient of r=0.71. The data obtained were analyzed using t-test statistic at $p \leq 0.05$ level of significance. Findings revealed that students taught by PBIS performed better and retained Basic Science concept learnt than those taught by LM. There was also difference in the

academic performance and process skills acquired by male and female students exposed to PBIS in favour of male. There was difference in observation, classification, measurement and experimentation skills in favour of female students while interpretation of Data was in favour of males. All the subjects however, performed the same in inferring skills. Among recommendation given was that PBIS be incorporated in science teacher training curriculum by the Ministry of Education in order to produce teachers who would handle PBIS technique effectively. Also, PBIS should be introduced in the first year of the secondary schools as means to reduce the gender related differences in science process skills acquisition between male and female students in schools. The research was conducted in zaria education zone using Basic Science as subject.The present study compares withAdanyi (2019) investigated the impact of Process-Based Instruction on science skills acquisition, performance, retention as well as gender related issues. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in two dependent variables (Interest and Social Skills Acquisition); two independent variable (Field-trip and Inquiry-based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) level (S.S. 2), subject (Biology) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (Kruskal-wallis). The present study shall therefore fill these gaps in the Field-trip, Inquiry-based Instruction, Interest and Social Skills Acquisition among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

Also, Anaso, (2008) in a study titled effect of class-size on academic achievement and retention of different ability groups among SSII Chemistry students in Zaria, Kaduna state. The research design was quasi-experimental design with 145 students as samples for the

study. Chemistry Achievement Test (CAT) and Retention Ability Test (RAT) was the instrument used. Mean and standard deviation were used to answer the research questions while ANCOVA was used to test the null hypotheses at 0.05 level of significance. The result revealed that students in the class-size of 25 achieve high retention ability than their counterpart in class of 50 and 70 students. The study was carried on the effect of class-size on retention and academic performance of SSII Chemistry students.The present study compares with Anaso, (2008) in a study titled effect of class-size on academic achievement and retention. It is also similar in the design and sampling technique. In contrast to the aforementioned study, the present study differs in two dependent variables (Interest and Social Skills Acquisition); one independent variable was used by Anaso 2008 (class-size), two independent variables (Field-trip and Inquiry-based Instruction), location (Lere Education Zone, Kaduna State, Nigeria); sample size (n = 163) level (S.S. 2), subject (Biology) and instrumentation Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questionnaire (ESSAQ) and Students Ecology Concept Interest Questionnaire (SECIQ) and in the tool employed for data analysis (ruskal-wallis). The present study shall therefore fill these gaps in the Field-trip, Inquiry-based Instruction, Interest Performance and Social Skills Acquisition among secondary school Biology students in Lere Education Zone, Kaduna State, Nigeria.

2.10 Implications of Literature Reviewed for the Present Study

The reviewed literature revealed that Field-trip and Inquiry-based methods has been found to improve and bring about meaningful learning as it helps students take charge for their own learning; it is found to be helpful in students' acquisition of social skills, retention,interest and performance.

Ekon and Eni (2015) investigated Gender and Acquisition of Social Skills among Junior Secondary School (JSS) 3 students in Calabar Municipality. Ibrahim; Hamza; Bello and Adamu, (2018). Investigated effects of inquiry and lecture methods of teaching on students' academic achievement and retention ability among N.C.E 1 Chemistry students.Wada (2016), Investigate the impact of Field-trip on motivation, retention and performance on plant adaptation among secondary school students.Amosa, (2018), investigated the effect of field trip on students' academic performance in learning social skills in Basic Technology.Iwuju, (2011) examined the effect of Activity Based Teaching Strategy (ABTS) on Academic Achievement in Basic Science among Junior secondary school students.Bassey and Amanso (2017) assessed the influence of gender and school type on skills acquisition among secondary school Chemistry 2 students and Ekon and Eni (2015) investigated Gender and Acquisition of Social Skills among Junior Secondary School (JSS) 3 students.

In some of the studies reviewed, researchers like Yakubu (2016) and Amosa (2018) reported differently on the use of Inquiry-based and Field-trip instructional methods in teaching some Biology concepts among students reported bettergain in academic performance. However, student interest, retention and social skills was not addressed leaving a vacuum. In the light of this literature reviewed, the researcher deemed it necessary to investigatethe effects of Field-trip and Inquiry-based Instruction on Interest, Retention, Performance and Acquisition of Social Skills.

From all the studies however, the researchers were trying to find out or compare inquiry method and lecture method, and Field-trip method on student's performance. The aspect of Field-trip, Inquiry-based Instruction onRetention, Interest, Performance and Acquisition of

Social Skills in ecology as a concept especially in Nigeria was not properly addressed in the literatures cited. Therefore, this study is conceived to fill this gap. As a result of these, this study is carried out to investigate the effects of Field-trip and Inquiry-based Instruction on Interest, Retention, Performance and Acquisition of Social Skills among Secondary School Biology Students in Lere education Zone, Kaduna -Nigeria.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

The main objective of this study is on Effects of Field-trip and Inquiry-based Instructions on Interest, Retention, Performance and Acquisition of Social Skills among Secondary School Biology Students in Lere Education Zone. In this chapter, the methodologyof the study was presented under the following sub-headings:

3.2 Research Design

3.3 Population of the Study

3.4 Sample and Sampling Techniques

3.5 Instrumentation

3.5.1 Validity of the Instruments

3.2 Research Design

The research design employed for this study was pretest, posttest and postposttest quasi experimental control group design. A pretest was administered to the groups to determine their equivalence using Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questions (ESSAQ) and Student Ecology Concept Interest Questionnaire (SECIQ). The experimental group I (EG_1) was taught ecology using field-trip methodand experimental group II (EG_2) was taught ecology using inquiry-based method while the control group was taught using lecture method. The three groups were of the same equivalence based on the pretest results. Both the experimental and control groups were taught for a period of six weeks. Thereafter, a post-test (O_2) was administered to determine the impact of field-trip and inquiry-based instructional methods on students'acquisition of social skills, interest andacademic performance in the concepts taught. After two weeks, a post-post-test (O_3) was administered to the students to determine their retention ability of

the concepts taught as proposed (Kerlinger, 1973).The design for the study is presented in Figure 3.1

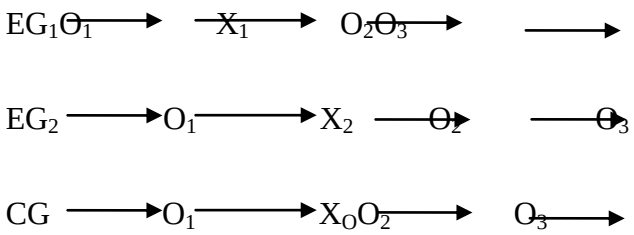

Figure 3.1 Research Design

Where:

EG_1= Experimental Group 1

EG_2= Experimental Group 2

CG = Control Group

X_1 =Experiment treatment (Field-study Method)

X_2 = Experiment treatment (Inquiry-based Method)

X_O= Control group (Exposed to Lecture Method)

O_1 = Pre-test Administration (to ascertain their equivalence)

O_2 = Post-test Administration (to ascertain their performance level)

O_3 =Postpost test Administration (to ascertain their retention level)

3.3 Population of the Study

The population for this studyconsisted of all SS II Biology students in the coeducational Government Senior Secondary School Studentsin Lere Educational Zone.Their total

number was1979 students; 1269 male and 711 females;the schools involved had similar conditions in terms of recruitment, and quality of staff, provision of equipment/chemicals, instructional materials, students' enrollment, curriculum and academic calendar among others. The detail of the population is presented in Table 3.1

Table 3.1: The Population of the Study

S/No	Schools	Boys	Girls	Total
1	Government Col. Saminaka	25	-	25
2	GSS Saminaka	33	17	50
3	GSS Garun Kurama	72	40	112
4	GSS Gure	99	106	205
5	GSS Lere	111	43	154
6	GSS Kahugu	34	19	53
7	GSS Ramin Kura	61	29	90
8	GSS Yarkasuwa	194	104	298
9	GSS Gurzan Mariri	117	57	174
10	GSS Geshere	33	23	56
11	GSS Kono	40	22	62
12	GSS Kayarda	71	25	96
13	GSS Ungwan Bawa	46	26	72
14	GSS Maigamo	52	30	82
15	GSS Bundu Kahugu	13	05	18
16	GSS Fadan Chawai	26	15	41
17	GSS Kusheka	20	05	25
18	GSS Kizakoro	17	18	35
19	GSS Federe	87	35	122
20	GSS Warsan Piti	08	03	11
21	GSS Dan Alhaji	38	06	44
22	GSS Damakasuwa	61	21	82

Total	**1268**	**711**	**1979**

Source: Lere Educational Zone, (2019).

3.4 Sample and Sampling Technique

From the twenty-two (22) public schools form the area of the study, six schools were randomly selected as the target population. The six schools were subjected to a pre-test and the results obtained were subjected to statistical analysis using ANOVA and Scheffe's test for homogeneity of mean (see Appendix VI). Three schools were chosen whose performance did not significantly differ, these schools were GSS Yarkasuwa (Snr), GSS Damakasuwa(Snr) and GSS Saminaka (Snr). Since the research requires two experimental groups and one control group, simple random technique of balloting was used to assign the three groups into experimental and control groups respectively.

Intact class was used in each of the three schools selected, GSS Yarkasuwa (Snr) comprising of fifty-five (55) participants were assigned the experimental group I, GSS Damakasuwa (Snr) comprising of fifty-six (56) subjects were assigned the experimental group 2 and GSS Saminaka (Snr) comprising of fifty-two (52) subjects were assigned to the control group. A sample size of one hundred and sixty-three (163) participants from the three intact classes was considered appropriate for an experimental research of this nature in line with the recommendation of Sambo (2008) that a minimum of 30 subjects is viable for experimental study. The detail of the sample for the study is presented in Table 3.2

Table 3.2: Sample for the Study

S/No	Type	School	Boys	Girls	Total

1	EG 1	A	34	21	55
2	EG 2	B	31	25	56
3	CG	C	29	23	52
	Total		**94**	**69**	**163**

3.5 Instrumentation

The instruments that was used for this study are;

1. Ecology Performance Test (EPT)
2. Ecology Social Skills Acquisition Questions (ESSAQ) and
3. Student Ecology Concept Interest Questionnaire (SECIQ).

1. **Ecology Performance Test (EPT).** The instrumentwas adapted by the researcher using WAEC 2014-2018 past questions. The Ecology Performance Test (EPT) comprised of forty choice objective test items each with four alternatives (A – D) from which the students selected the correct answer. Two marks were allocated for each question answered correctly. The test items covered the content units of the topics selected for the study (seeAppendix IV). The table of specification for Ecology Performance Test is based on Bloom's Taxonomy (1956) is presented in Table 3.4.

Table 3.3 Table of Specification on Ecology Performance Test (EPT)

Concepts	**Knowl**	**Compr**	**Appli**	**Analy**	**Synth**	**Evalu**	**Total**
Ecosystem	1,2	23	21,22	3,5	19	14	9
Habitat	4,32	28,33	25,29,39	24	10,15	16	11
Environment	17	27,30	9.38	6,20	7	8,34	10

Community	12	13,18	11,26,35	40	31,36	37	10
Total							**40**

Source: Researchers Work (2020)**.**

1. **Ecology Social Skills Acquisition Questions (ESSAQ).** The instrument was adapted from Johnson (2016) and Danjuma, (2017). The instrument consists of twenty (20) items (see appendix II) designed based on the six skills of Participation in group activities,Listening, Observation, Communication, Cooperation, and Problem solving. The items are to test the level at which studentsperform after acquiring social skills and it was administered to the two experimental and control group as pre-test, post-test and post posttest. For the purpose of this research, ESSAQ items were scored 5 marks and for the 20 questions a total score of 100 marks was obtained. Table 3.3 show detail of the questions formulated spread across the concepts.

Table 3.4Specification on Ecology Social Skills Acquisition Questions (ESSAQ) Based on Bloom's Taxonomy

Concepts	**Knowl**	**Compr**	**Appli**	**Analy**	**Synth**	**Evalu**	**Total**
Ecosystem	7	18	9	10	-	14	5
Habitat	11	8	14,6	-	12	-	5
Environment	13	15	16	1	2	5	6
Community	17	4	19	-	20	-	4
Total							**20**

Source: Adapted from Bloom's Taxonomy of Cognitive Domain (1957)

2. **Student Ecology Concept Interest Questionnaire (SECIQ).** This was adapted from Muoneme (2015), and the instrument consistsof twenty-five (25) items (Appendix III). The instrument was used to determine the interest level of subjects in ecology concept. For the purpose of this research the instrument was mark according to the ranking of the 25 items; each item is ranked 1-5 making a total of 125 marks.

3.5.1 Validity of the Instruments

The Instruments were given to experts who are Ph.D holders with minimum rank of senior lecturers in the Department of Science Education; Department of Biological Sciences and Psychology Department, Ahmadu Bello University, Zaria and twoexperienced Secondary School Biology teachers to validate the test items. The validators wererequested to critically examine and assess all the items of the instruments by looking at:

I. Whether the questions are clear, precise and free from ambiguity.
II. Determine whether the study is feasible or not
III. Whether the questions match the ability level of the students.
IV. To ascertain suitable time duration required by the students to complete the test items
V. Whether the test items conform with the subject matter.
VI. Ascertain the reliability of the instruments before use in the final study.

The experts made constructive suggestions and corrections on the basis of content and validity of the instrument. All the 40 items for EPT were retained with question 3, 7, 13, 22

and 26 modified while ESSAQ and SECIQ where accepted without corrections (Appendix IV) as follows:

Question 3. Which of the does not contribute to the biomass in an ecosystem? Modified to; which of the following does not contribute to the biomass in an ecosystem.

Question 7. Which of the following steps would not be taken to protect or conserve fishing grounds from over-exploitation? Modified to; which of the following step is not appropriate for conservation of fishing grounds from over-exploitation?

Question 13. The following are features of northern guinea savanna except. The question was modified to; which of the following is not a feature of northern guinea savanna.

Question 22. The distribution of organisms in a fresh-water habitat like a stream or pond is determined by the following except. The question was also modified to; the distribution of organisms in a fresh-water habitat is determined by the following except.

Question 26. Which of the following is an abiotic factor which affects a population? The question was also modified to; Which of the following is an abiotic factor that affects a population.

The lesson notes prepared for teaching the experimental groups and the control group as well the marking scheme for the EPT was validated by two senior lecturers from Department of Science Education, onefrom Department of Biological Sciences and also one lecturer from Department of Psychology all in Ahmadu Bello University, Zaria. Two senior secondary school Biology teachers from the study area were also given to determine the feasibility of the instruments. The expert's correction, criticism, and recommendations were

affected on the basis of content and construct validity of the instruments to produce a new draft of the items.

3.6 Reconnaissance Study

In planning for the field-trip, the researcher does the following:

i. Visit the field location and observe the environment to ensure it suitability for the study.

ii. Discuss the field-trip with the principal and obtain approval.

iii. Acquainted with the place to visit: this is due by visiting the place, interacting with people there and obtaining a date and time for the trip well in advance.

iv. Obtain permission from other teachers whose periods are to be taken up by the field-trip.

v. Define safety and behavior standards and also plan for appropriate dressing for trip condition.

3.6.1 Pilot Test

A pilot test was conducted involving students of Government Secondary School Ramin Kura which was part of the study population but not part of the sample schools. The twenty-five (25) item instruments on Students Ecology Concept Interest Questionnaire, twenty (20) item instruments on Ecology Social Skills Acquisition Questions (ESSAQ) and forty (40) item instruments on Ecology Performance Test were administered to the thirty (30) students with the assistance of Biology teachers of the school. The pilot testing was conducted to:

determine the reliability of the Ecology Social Skills Acquisition Questions (ESSAQ), Student Ecology Concept Interest Questionnaire (SECIQ) and Ecology Performance Test (EPT) before administration.

determine the appropriateness of the length of time required to take the test.

determine the correctness of the working of the instruments.

identify problems or difficulties that the subjects may encounter with the view to eliminating them in the final instrument. The data obtained from this pilot study were marked and used to determine reliability of each of the instrument.

3.6.2 Reliability of the Instruments

The reliability coefficient for Ecology Performance Test (EPT) was obtained using test-retest method. The scores were subjected to Pearson Product Moment Correlation Coefficient (PPMC) to obtain their reliabilities values. The reliabilities for EPT was found to be 0.87 respectively, the reliability coefficient of Student Ecology Concept Interest Questionnaire (SECIQ) was obtained using Cronbach's Alpha method and was found to be 0.72 and the reliability coefficient of Ecology Social Skills Acquisition Questions (ESSAQ) was found to be 0.82 using Cronbach'sAlpha.

3.7 Treatment Administration

The two groups were taught Ecology concept using different strategies; experimental group one was taught using field-tripinstruction, experimental group two was taught using Inquiry-based instruction.

3.7.1 Teaching the Experimental Group One

The experimental group 1 was taught using Field-trip instruction by the researcher, this was done by engaging the students in activities that foster the acquisition of social skills, interest, retention and academic performance as stated in the experimental lesson plan. Field-trip was used to teach the experimental group 1 concepts in Ecology by exposing them outside the laboratory or outside the four walls of the classroom using three major steps (Mayer, 2001);

Step I: The teacher introduced the concept

Step II: The students were allowed to carry out activities by observing, identifying and sorting outside the classroom and also discuss their findings by themselves and the teacher.

Step III: The teacher evaluates by asking questions and listens to answers and personal observation from the students.

These steps were used for the Field-trip activity method but in a modified version as seen in page 32, figure 2.1

Field-trip method was used in this study because it is useful in the teaching of the different aspects of Biology (Ecology) that have direct link with the environment. The active learning which characterizes much of the outdoor experiences help to set out complex Biological questions in an understandable and meaningful context and provide support and

opportunities for students who may not be brilliant in the classroom. Field-trip method allow students to be interactive with each other, the teacher, and the material in their natural settings and also bring abstract content to life.

Ecology Performance Test (EPT), Ecology Social Skills Acquisition Questions (ESSAQ) and Student Ecology Concept Interest Questionnaire (SECIQ) was used for both pre-test, post-test and postposttest. The experimental group 1 and 2 was taught ecology concept, involving the learners to foster their interaction with the environment, and the teacher. Lesson plans for the experimental groups and control group are the same in terms of contents, basic instructional objectives, and length of time for teaching and mode of evaluation except for the activities in the experimental groups.

At the end of six (6) weeks of six periods, the researcher administers the posttest and after a period of two weeks postposttest was given to the students in the experimental and control groups using Ecology Performance Test (EPT), the EPT was marked and scored over 80, each question carries two marks. The scripts from both pre-test, post-test and postposttest of the experimental groups was marked and scored using the marking guide. After marking the scripts of the three schools, and the questionnaire response collected, the scores was recorded accordingly based on the experimental group 1 and 2 as well as control group. After scoring, the data was subjected to inferential and descriptive statistical analysis using SPSS.

3.7.2 Teaching the Experimental Group Two

The experimental groups were taught the concepts of ecology, ecosystem, habitat, environment and community by the researcher for six weeks using the steps of the activities involved in the flowchart as shown in figure 2.2.

Inquiry-based instruction is a teaching method where the learner, with minimum guidance from the teacher seeks to discover and create answers to a recognized problem through procedure of making a diligent search (Callahan & Clark, 2010; Adedoyin, 2015).The flowchart was use to prepare lessons to teach the experimental group 2 because of the activities involved while the control group was taught using lecture method.

3.7.3 Teaching the Control Group

The control group was taught the same concepts by the researcher using lecture method alone. The lesson was presented by defining the concept then followed by the explanation and important points werewritten on the chalk board. The participants were referred to relevant Biology textbooks for more information.

3.8 Procedure for Data Collection

After teaching the experimental group 1 and 2 and the control group for a period of six weeks, a post testand Ecology Performance Test (EPT) was administer by the researcher. The EPT was marked and scored over 80 marks. After marking the scripts of the three schools, the scores were recorded accordingly based on their groups. After two weeks a postpost tests were administered to measure retention.

3.9 Procedure for Data Analysis

The null hypotheses are restated here along with the appropriate statistical tools to be used in testing them. The statistical tools include descriptive statistics mainly mean, standard

deviation and frequency used to answer the research questions and inferential statistics was used to test the null hypotheses at P≤ 0.05 level of significance.

Hypotheses Testing

The Statistical Package for Social Science (SPSS) version wasused as an application to analyze the data collected.

Data generated for this study was analyzed in the testing of hypothesis at P≤ 0.05 level of significance as follows:

Ho_1: There is no significant difference between social skills acquisition level mean rank among students taught ecology using Field-trip and Inquiry-based Instructions and Lecture Method.

This hypothesis was analyzed using Kruskal-wallis

Ho_2: There isno significant difference between the Interests level mean rank amongstudents taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method.

This hypothesis was analyzed using Kruskal-wallis

Ho_3: There is no significant difference between Retention ability mean scores among students taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method.

This hypothesis was analyzed using ANOVA

Ho_4: Thereis no significant difference between the mean performance scores among students taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method.

This hypothesis was analyzed using ANOVA

Ho_5: There is no significant difference between the social skills acquisition level mean rank among male and female students taught ecology using Field-trip and Inquiry-based Instructions.

This hypothesis was analyzed using Kruskal-wallis

Ho_6: Thereis no significant difference between the Interests level mean rank among male andfemale students taught ecology using Field-trip and Inquiry-based Instructions.

This hypothesis was analyzed using Kruskal-wallis

Ho_7: Thereis no significant difference between the mean Retention scores of male and female students taught ecology using Field-trip and Inquiry-based Instructions.

This hypothesis was analyzed using ANCOVAR

Ho_8: Thereis no significant difference between the meanperformance scores of male and female students taught ecology using Field-trip and Inquiry-based Instructions.

This hypothesis was analyzed using ANCOVAR

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This study investigates theEffects of Field-trip and Inquiry-based Instructions on Interest, Retention, Performance and Acquisition of Social Skills among Secondary School Biology Students in Lere Education Zone. The analysis essentially involved statistical testing of the hypotheses stated in chapter one and three. The level of significance adopted is $P \leq 0.05$ level which form the basis for retaining or rejecting each of the null hypotheses are stated and analyzed.

In this chapter, results and discussion are presented in the following sub-headings;

4.2 Analysis and Results Presentation

4.3 Summary of findings

4.4 Discussions of Results

4.2 Analysis and Results Presentation

Inferential statistics of parametric test of Analysis of variance (ANOVA) and the Analysis of Covariance (ANCOVAR) for all hypotheses involving performance and retention while

the Non parametric test of Kruskal Wallis was used to test hypotheses involving the interest.

i. Pretest data generated via Ecology Performance Test (EPT)to establish group equivalence before the experiment

ii. Posttest data generated via Ecology Performance Test (EPT) and Ecology Social Skills Acquisition Questions (ESSAQ) to establish performance and social skills acquisition after t t

iii. Post posttest data to measure retention ability of learner's concepts generated via EPT.

4.2.1 Answering Research Questions

Research Question One: What is the difference between the social skills acquisition level mean rank among students taught ecology using Field-trip and Inquiry-based Instructions and Lecture Method?

In order to answer this research question, Kruskal-wallis statistic was used.

Table 4.1a. Mean Rank difference on social skills acquisition levelbetweenstudents taught ecology using Field-Trip, Inquiry-Based Instruction and Lecture Method.

Groups	N	Mean Rank	Mean Rank
Experimental A	55	93.02	
			30.56
Experimental B	56	89.32	
			26.86
ControlGroup	52	62.46	

Table 4.1a reveal that difference exist between the mean scores on ecology social skills acquisition level by students taught ecology using Field-trip, Inquiry-based Instructions and

Lecture Method. The Mean Rank ESSAQ scores are 93.02, 89.32 and 62.46 by students exposed to Field-trip, Inquiry-based Instructions and Control group respectively. When the difference between their social skills acquisition level was computed, it was found to be 30.56 and 26.86 in favor of experimental groups. This clearly indicates that students exposed to Field-trip and Inquiry-based therefore, experimental group A and B showed more social skills acquisition level in Biology than the control group. To check for significant difference, a null hypothesis was tested and presented in Table 4.1b

Hypothesis One:

Ho_1: There is no significant difference between social skills acquisition level mean rank among students taught ecology using Field-trip and Inquiry-based Instructions and Lecture Method

Table 4.1b: Summary of Kruskal-Wallis on Difference between mean Rank of Social Skills Acquisition level of Students taught Ecology using Field-Trip, Inquiry-BasedInstruction andthose taught using Lecture Method

Groups	N	Mean Rank	Df	p	R
Field-Trip	55	93.02	2	0.001	S
Inquiry-based	56	89.32			
Lecture	52	62.46			
Total	163				

Significant at alpha P≤0.05 Level

Results of the Kruskal Wallis Non parametric statistics showed that significant difference exist between the mean rank of social skills acquisition by students taught ecology using Field-trip, Inquiry-based Instructions and those taught ecology using Lecture Method. This is because the p value of 0.001 is lower than the 0.05 alpha level of significance. Their computed Mean Rank are 93.02, 89.32 and 62.46 by Field-trip and Inquiry-based Instruction and Control group respectively. This indicates that the experimental group

students have significantly higher Mean Rank scores than those in control group. There is no significant difference between the mean scores on social skills acquisition of students taught ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Methodis hereby rejected.

Research Question Two: What is the difference between the Interests level mean rank among students taught using Field-trip and Inquiry-based Instructions and those taught using Lecture Method?

In order to answer this research question, Kruskal-wallis statistic was used.

Table 4.2a: Mean Rank Test Difference in the Interest Level by SSS Students in Experimental A, B and Control Group.

Groups	N	Mean Rank	Mean Rank
Experimental A	55	108.14	
			77.63
Experimental B	56	104.14	
			73.63
ControlGroup	52	30.51	

Table 4.2a revealed thatdifference exist between the mean Interest scores of students taught ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Method. Their computed Mean Rank Interest score are 108.14, 104.14 and 30.51 by students exposed to Field-Trip, Inquiry-based and lecture method respectively. When the difference between their interest rates was computed, it was found to be 77.63 and 73.63 in favor of experimental groups. This clearly showed that students exposed to Field-trip and Inquiry-based i.e experimental group A and B showed more interest in Biology than the control group. To check for significant difference, a null hypothesis was tested and presented in Table 4.2b

Hypothesis Two:

Ho_2: There isno significant difference between the Interests level mean rank amongstudents taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method

Table 4.2b:Summary of Kruskal-Wallison Difference Between theInterest level of Students Taught Ecology using Field-Trip, Inquiry-BasedInstruction and those Taught using Lecture Method

Groups	N	Mean Rank	Df	p	R
Field-trip	55	108.14	2	0.001	S
Inquiry-based	56	104.14			
Lecture	52	30.51			
Total	163				

Significant at alpha P≤0.05 Level

Outcome of the Non parametric test of Kruskal Wallis test showed that significant difference exists between the mean Interest level of students taught ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Method. This is because the calculated p value of 0.001 is lower than the 0.05 alpha level of significance. Their computed Mean Rank Interest score are 108.14, 104.14 and 30.51 by students exposed to Field-trip, Inquiry based and lecture method respectively. This shows that the two experimental groups of Field-trip and Inquiry-based have significantly higher Mean rank interest scores than those in lecture method. Therefore, the null hypothesis which state that There is no significant difference between the mean Interest scores of students taught ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Method, is hereby rejected.

Question Three: What is the difference between Retention ability mean scores among students taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method?

For the purpose of answering this research question, the data collected via post posttest score were analyzed using descriptive statistics. Means and standard deviation were computed and presented in Table 4.3a

Table 4.3a: Post-posttest Mean Scores, Standard Deviation and Mean Difference of Retention abilities of the Experimental A, B and Control Group

Groups	N	Mean	Std. Deviation	Mean D.
Experimental A	55	42.94	6.43	
				12.92
Experimental B	56	43.89	5.74	
				13.87
ControlGroup	52	30.01	5.85	

Table 4.3a shows that there is mean difference between the retention abilities of the experimental A, B and Control groups. The mean scores of 42.94, 43.89 and standard deviation of 6.43, 5.74 for the experimental group A and B respectively is higher than the mean of 30.01 and standard deviation of 5.85 for the control group. The mean difference was 12.92 and 13.87 in favor of the experimental groups. To check for significant difference, a null hypothesis was tested and presented in Table 4.3b.

Hypothesis Three:

Ho_3: There is no significant difference between Retention ability mean scores among students taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method

Table 4.3b: Results of One-Way ANOVA Analysis of Differences in Mean Retention

LevelofExperimentalA, B and Control Group.

Group	Sum of Squares (SS)	Df	Mean Square (MS)	F	p	Remark
Between Groups	6387.292	2	3193.646	88.113	0.01	S
Within Groups	5799.174	161	36.245			
Total	12186.466	163				

Significant at alpha P≤0.05

From Table 4.3b, the result shows that the p value 0.001 observed is less than the alpha p value of 0.05 at df 2, 161. Since the p value observed (0.001) is less than 0.05, the difference was significant. Therefore, the null hypothesis which says: There is no significant difference between the mean of retention scores of students taught ecology using Field-trip, Inquiry-based Instructions and those taught ecology using Lecture Method is rejected. Since the observed p value is less than p≤0.05 level of significance, this suggests that there exists evidence to conclude that there was significant difference among the teaching methods. To indicate the groups that show significant difference, a post hoc Scheffe's test was used and the result is presented in Table 4.3c

Table 4.3c: Results of Scheffee's Multiple Comparisons of Post PosttestRetention Levelof Experimental A, B and Control Group.

Groups (I)	Group (J)	Mean Differences (I-J)	Std Error	Sig.	Remark
1 Expl A	2 Expl B	-.94740	1.14290	.710	NS
	3 Ctrl	12.92622*	1.16448	.000	S
2 Expl B	1 Expl A	.94740	1.14290	.710	NS
	3 Ctrl	13.87363*	1.15942	.000	S
3 Ctrl	1 Expl A	-12.92622*	1.16448	.000	S
	2 Expl B	-13.87363*	1.15942	.000	S

Significant at alpha P≤0.05

From Table 4.3c a Scheffe's multiple comparisons test was conducted and the mean differences were significant at the 0.05 level among the three groups. Therefore, the post-hoc test confirmed the ANOVA result of significant differences between the groups. That is, the significant difference exists between experimental group A and Control, and also between group B and Control, but no significant difference between group A and B. the result thus implies that teaching with Field-trip and Inquiry-based improved students' retention ability in Ecology than lecture method.Therefore, the null hypothesis which state that There is no significant difference between the mean of retention ability scores of students taught ecology using Field-trip, Inquiry-based Instructions and those taught ecology using Lecture Method, is hereby rejected at $P \leq 0.05$.

Question Four: What is the difference between the mean Performance scores among students taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method?

In order to answer this research question, a descriptive statistic of mean scores and standard deviation were used.

Table 4.4a: Summary of Posttest Mean Score for the Academic Performance for Experimental A, B and Control Group.

Groups	N	Mean	Std. Deviation	Mean Diff
Experimental A	55	54.81	7.20	15.62
Experimental B	56	52.89	5.74	13.70
ControlGroup	52	39.19	5.36	

Table 4.4a reveals that there is difference between the mean academic performance scores of the experimental A, B and control groups when exposed to Field-trip, Inquiry-based

instructions and Lecture method respectively. The mean score of 54.81, 52.89 and standard deviation of 7.20, 5.74 respectively are higher than the mean score of 39.19 and standard deviation of 5.36 for the control group. The mean difference was 15.62 and 13.70 for experimental group A and B respectively in favor of experimental groups. In order to establish if the difference is statistically significant inferential statistics was used to test the null hypothesis.

Hypothesis Four:

Ho_4: Thereis no significant difference between the mean performance scores among students taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Method

To test this Null Hypothesis One, the Ecology Performance Test (EPT) post posttest scores of students taught using Field-trip and Inquiry-based Instructions and those taught using Lecture method were subject to One-way Analysis of Variance (ANOVA) was used.Summary of the analysis are shown in Table 4.4b

Table 4.4b: Results of ANOVA Analysis of Differences in Mean Academic Performance for Experimental A, B and Control Group.

Group	Sum of Squares (SS)	Df	Mean Square (MS)	F	pR	
Between Groups	7707.574	2	3853.787	101.322	0.01	S
Within Groups	6085.616	161	38.035			
Total	13793.190	163				

Significant at alpha P≤0.05

From Table 4.4b, the result shows that the p value 0.001 observed is less than the alpha p value of 0.05 at df 2, 161. Since the p value observed (0.001) is less than 0.05 the difference is significant. Therefore, the null hypothesis which says: Thereis no significant difference between the mean Academic Performance scores of students taught ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Method is rejected. Since the observed p value is less than P≤0.05 level of significance, this suggests that there exists evidence to conclude that there is a significant difference among the teaching methods. To indicate the groups that show significant difference, a post hoc Scheffe's test was used and the result is presented in Table 4.4c

Table 4.4c:ResultsofScheffee's Multiple Comparisons of Posttest Academic PerformanceScores of Experimental A, B and Control Group.

Groups (I)	Group (J)	Mean Differences (I-J)	Std Dev.	Sig.	Remark
1 Expl A	2 Expl B	1.92532	1.17079	.262	NS
	3 Ctrl	15.62587*	1.19289	.000	S
2 Expl B	1 Expl A	-1.92532	1.17079	.262	NS
	3 Ctrl	13.70055*	1.18770	.000	S
3 Ctrl	1 Expl A	-15.62587*	1.19289	.000	S
	2 Expl B	-13.70055*	1.18770	.000	S

Significant at alpha P≤0.05

From Table 4.4c a Scheffe's multiple comparisons test was conducted and the mean differences were significant at the 0.05 level among the three groups. Therefore, the post-hoc test confirmed the ANOVA result of significant differences between the groups. That is, the significant difference exists between experimental group A and Control, and also

between group B and Control, but no significant difference between group A and B. the result thus implies that teaching with Field-trip and Inquiry-based improved students' academic performance in Ecology than lecture method. Therefore, the null hypothesis which says: Thereis no significant difference between the mean Academic Performance scores of students taught ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Method is rejected. Since the observed p value is less than $P \leq 0.05$ level of significance.

Question Five: What is the difference between social skills acquisition level mean rank among male and female students taught ecology using Field-trip and Inquiry-based Instructions?

In order to answer this research question, Kruskal-wallis statistic was used.

Table 4.5a: Mean Rank Difference Between the Social Skills Acquisition level by Male and Female of Students in Experimental Group A and B.

Groups	Gender	N	Mean Rank	Mean D.
Experimental A	Male	34	60.61	
				1.51
	Female	21	59.10	
Experimental B	Male	31	58.84	
				1.28
	Female	25	57.56	

Table 4.5a indicates that there is no remarkable difference between the mean social skills acquisition level of male and female students taught ecology using Field-tripand Inquiry-based Instructions in Experimental A and B respectively. Their Mean rank social skills acquisition scores are 60.61, 59.10 and 58.84, 57.56 by male and female for the

experimental group A and Brespectively. The mean difference between the mean rank of male and female students in experimental group A was 1.51 while that of the experimental group B was 1.28. To check for the significant difference, a null hypothesis was tested and presented in Table 4.5b.

Hypothesis Seven:

Ho_5: There is no significant difference between the social skills acquisition level mean rank among male and female students taught ecology using Field-trip and Inquiry-based Instructions.

Table 4.5b: Summary of Kruskal Wallis on Difference Between the Mean Scores on Social Skills Acquisition level by Male and Female Students Taught Ecology using Field-Trip and Inquiry-Based Instruction

Groups	Gender	N	Mean Rank	Df	p	R
Field-Study	Male	34	60.61	3	0.750	NS
	Female	21	59.10			
Inquiry-based	Male	31	58.84			
	Female	25	57.56			
Total		111				

Significant at alpha P≤0.05

Results in Table 4.5b revealed that There is no significant difference between the mean scores on ecology social skills acquisition level by male and female students taught ecology using Field-trip and Inquiry-based Instructions. This is because the calculated p value of 0.750 is greater than the 0.05 alpha level of significance. Therefore, the null hypothesis which states that there is no significant difference between the mean scores on ecology social skills acquisition level by male and female students taught ecology using Field-trip and Inquiry-based Instructions, is hereby retained.

Question Six: What is the difference between the Interests level mean rank among male and female students taught ecology using Field-trip and Inquiry-based Instructions?

In order to answer this research question, Kruskal-wallis was used.

Table 4.6a: Mean Rank Test Difference Between the Interest Level of Male and Female Students inExperimental Group A and B.

Groups	Gender	N	Mean Rank	Mean D.
Experimental A	Male	34	61.19	
				1.40
	Female	21	59.79	
Experimental B	Male	31	57.63	
				1.29
	Female	25	58.92	

Table 4.6a indicates that thereis no remarkable difference between the mean Interest level of male and female students taught ecology using Field-trip and Inquiry-based Instruction in experimental group A and B respectively. Their Mean rank Interest scores are 61.19, 59.749 and 57.63 58.92 by male and Female for the experimental group A and B respectively.The mean difference between the mean scores of male and female students in experimental group A was 1.40 while that of the experimental group B was 1.29. To check for significant difference, a null hypothesis was tested and presented in Table 4.6b

Hypothesis Six:

Ho_6: Thereis no significant difference between the Interests level mean rank among male and female students taught ecology using Field-trip and Inquiry-based Instructions.

Table 4.6b: Summary of Kruskal-Wallis on Difference Between theInterest level of Maleand Female StudentsTaught Ecology using Field-Trip and Inquiry-Based Instruction.

Groups	Gender	N	Mean Rank	Df	p	R
Field-Study	Male	34	61.19	30.543	NS	
	Female	21	59.79			
Inquiry-based	Male	31	57.63			
	Female	25	52.14			
Total		111				

Significant at alpha P≤0.05

Results in Table 4.6b showed that Thereis no significant difference between the mean Interest scores of male and female students taught ecology concept using Field-trip and Inquiry-based Instruction. This is because the calculated p value of 0.543 is greater than the 0.05 alpha level of significance. Therefore, the null hypothesis which state that Thereis no significant difference between the mean Interest scores of male and female students taught ecology concept using Field-trip and Inquiry-based Instruction, is hereby retained.

Question Seven: What is the difference between the mean scores on Retention of male and female students taught ecology using Field-trip and Inquiry-based Instructions?

For the purpose of answering this research question, the data collected via post post-test score were analyzed using descriptive statistics. Means and standard deviation were computed and presented in Table 4.7a

Table 4.7a: Comparism Between Post-posttest Mean ScoresofRetention Level of Maleand Female Studentsin the Experimental Group A and B.

Groups	Gender	N	Mean	Std. Deviation	Mean D.
Experimental A	Male	34	42.61	6.05	
					0.85
	Female	21	43.47	7.13	
Experimental B	Male	31	43.70	6.19	
					0.41

Female	25	44.12	5.74	

Table 4.7a showed thatthere is mean difference between the retention abilities of the experimental group A and B. The mean scores of 42.61, 43.47 and standard deviation of 6.05, 7.13 for male and female in the experimental group A while the mean scores of 43.70, 43.47 and standard deviation of 6.19, 5.74 for male and female in the experimental groupB respectively. The mean difference was 0.85 and 0.41 for the experimental group A and B respectively. To check for significant difference, a null hypothesis was tested and presented in Table 4.7b

Hypothesis Seven:

Ho_7: Thereis no significant difference between the mean Retention scores of male and female students taught ecology using Field-trip and Inquiry-based Instruction.

Table 4.7b: Analysis of Covariance (ANCOVAR) Statistics on Difference Between the Mean Retention Scores of Male and Female Students Taught Ecology usingField-Trip andInquiry-Based Instruction

Sources of variation	Sum of Squares (SS)	Df	Mean Square (MS)	F	p	R
Corrected Model	36.804[a]	3	12.268	.325	.807NS	
Intercept	202623.194	1	202623.194	5366.114	.001 S	
Groups	20.183	1	20.183	.535	.466NS	
Sex	10.785	1	10.785	.535	.594NS	
Groups vis Sex	1.346	1	1.346	.036	.851 NS	
Error	4040.295	107	37.760			
Total	213378.000	111				
Corrected Total	4077.099	110				

Significant at alpha P≤0.05

From the result in Table 4.7b, it is clear that the observed p value under sex (gender) is 0.851. this value is greater than the alpha p≤0.05, which means that there is no significant

difference between the mean retention scores of male and female students exposed to ecology concept using Field-trip and Inquiry-based Instructions. Therefore, the null hypothesis seven which predicted no significant difference between the mean retention scores of male and female students taught ecology using Field-trip and Inquiry-based Instructions, is hereby retained.

Question Eight: What is the difference between the mean performance scores of male and female students taught ecology using Field-trip and Inquiry-based Instructions?

In order to answer this research question, a descriptive statistic of means and standard deviations were used.

Table 4.8a: Summary of Posttest Mean Score for the Academic Performance of Male andFemale Students in Experimental Group A and B.

Groups	Gender	N	Mean	Std. Deviation	Mean D.
Experimental A	Male	34	54.79	6.67	
					0.06
	Female	21	54.85	8.15	
Experimental B	Male	31	52.70	6.19	
					0.41
	Female	25	53.12	5.25	

The results in Table 4.8a revealed that there is mean difference in the academic performance of male and female in experimental group A and B. The mean performance scores of 54.79, 54.85 and standard deviation of 6.67, 8.15 for male and female respectively in the experimental group A while the mean scores of 52.70, 53.12 and standard deviation of 6.19, 5.25 for male and female in the experimental group B respectively. The mean difference was 0.06 and 0.41 for the experimental group A and B

respectively. To check for significant difference, a null hypothesis was tested and presented in Table 4.8b.

Hypothesis Eight:

Ho_8: Thereis no significant difference between the meanperformance scores of male and female students taught ecology using Field-trip and Inquiry-based Instructions.

Table 4.8b: Analysis of Covariance (ANCOVAR) Statistics on Difference Between the MeanPerformanceScores of Male and Female Students Taught Ecology using Field-Trip andInquiry-Based Instruction

Sources of variation	Sum of Squares (SS)	Df	Mean Square (MS)	F	p	R
Corrected Model	105.239[a]	3	35.080	.814	.489	NS
Intercept	311021.394	1	311021.394	7213.994	.001	S
Groups	97.827	1	97.827	2.269	.135	NS
Sex	1.501	1	1.501	.035	.852	NS
Groups vis Sex	.808	1	.808	.019	.891	NS
Error	4613.157	107	43.114			
Total	326561.000	111				
Corrected Total	4718.396	110				

Significant at alpha P≤0.05

From the result in Table 4.8b, it is clear that the observed p value under sex (gender) is 0.891. this value is greater than the alpha p≤0.05, which means that there is no significant difference between the mean performance scores of male and female students exposed to ecology concept using Field-trip and Inquiry-based Instructions. Therefore, the null hypothesis eight which predicted no significant difference between the mean performance

scores of male and female students taught ecology using Field-trip and Inquiry-based Instructions, is hereby retained.

4.3 Summary of Findings

Based on the results of this study, the following findings were made:

1. There is a statistically significant difference between the social skills acquisition level of students taught ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Method in favour of the experimental groups.
2. There is a statistically significant difference between the Interest level of students taught ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Method in favour of the experimental groups.
3. There is a statistically significant difference between Retention ability mean scores of students taught ecology usingField-trip, Inquiry-based Instructions and those taught using Lecture Method in favour of the experimental groups.
4. Thereis a statistically significant difference between the mean Academic Performance scores of students taught ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Method in favour of the experimental groups.
5. There is no statistically significant difference between the mean scores on ecology social skills acquisition level by male and female students taught ecology using Field-trip and Inquiry-based Instruction hence both male and female students acquire social skills equally thusField-trip, Inquiry-based Instructions are gender friendly.

6. Thereis no statistically significant difference between the mean Interest scores of male and female students taught ecology using Field-trip, Inquiry-based Instruction hence both male and female students show equal interest toward learning of Biology when exposed to Field-trip and Inquiry-based Instructions thus the two teaching methods are gender friendly.
7. Thereis no statistically significant difference between the mean Retention scores of male and female students taught ecology using Field-trip, Inquiry-based Instructions hence the retention ability of both male and female was enhanced thus the instructional methods used are gender friendly.
8. Thereis no statistically significant difference between the mean Performance scores of male and female students taught ecology using Field-trip, Inquiry-based Instruction hence the academic performance of both male and female students was enhanced thus Field-trip, Inquiry-based Instructions are gender friendly.

4.4 Discussion of Results

The main objective of this study is on the Effects of Field-trip and Inquiry-based Instructions on Interest, Retention, Performance and Acquisition of Social Skills among Secondary School Biology Students in Lere Education Zone. The findings of the study are discussed as follows:

The result of hypothesis one revealed that the students in the experimental A and B who were taught using Field-trip and Inquiry-based Instructions respectively performed significantly better than those taught using Lecture Method. This implies that the significant difference in the social skills acquisition is in favour of the experimental group

A and B suggesting a great impact ofFiled-trip and Inquiry-based Instructions. The findings of the study are in conformity with the findings of Cephas and Seoi-Sekgethelo (2009) who observed that learners acquire more social skills when exposed to activity-based teaching strategies. The study is also in line with that of Amosa, (2018) who worked on effect of fieldtrip on students' academic performance in learning social skills in Basic Technology in Ilorin, Nigeria. The result reveals that the learners taught using field-trip perform academically better than those taught using lecture method.

The result of hypothesis twotested significant difference in the interest level in ecology by SSS students when exposed to Field-study, Inquiry-based Instructions and Lecture Method. It was observed that students taught using Field-trip and Inquiry-based Instructions had more interest towards Biology than those taught Biology using lecture method. This indicated that the use of Field-trip and Inquiry-based Instructions enhanced/boosted students' interest towards learning of Biology. Increased interest towards learning of Biology recorded could be due to use of Field-trip and Inquiry-based Instructions and the general fun experienced during the lesson when Field-trip and Inquiry-based Instructions were used.

This support the findings of Yakubu (2016) who observed the effects of field-based teaching strategy raises the level of concentration and enhances learning because it is fun. Furthermore, other reasons that could be adduced to be behind enhancement and boosting of student's interest when taught with Field-based could be that students who learned with field-based method were more attentive and engaged in learning, participated more actively in the classroom, interacted much more with the teacher, their peers.

The findings also agreed with the research conducted by Danjuma (2017) who investigated the effects of Inquiry-based Instructions on Acquisition of Science Process Skills, Interest and Performance in ecology; the result revealed that there was significant difference in the interest shown by SSS students when exposed to Field-trip, Inquiry-based Instructions and Lecture Method. There was a marked increased difference in interest between experimental group and control group in favour of the experimental groups. The groups that were exposed to Field-trip and Inquiry-based instructions showed more interest than their counterpart taught using lecture method. The result disagreed with the findings of Nwokolo (2013) who state no significant difference in the interest shown when learners are exposed to Inquiry-based and those taught using Lecture Method.

Hypothesis three tested for significant difference between retention ability mean scores of students taught Ecology using Field-trip, Inquiry-based Instructions and those taught using Lecture Method. Students have significantly higher retention ability when exposed to Field-trip and Inquiry-based Instructions. The results of the findings showed that there was significant difference in retention ability when SSS students are exposed to Field-trip, Inquiry-based Instructions and Lecture Method. It was observed that retention ability of students who were taught using Field-trip and Inquiry-based Instructions outperformed others taught using Lecture Method in favour of the experimental groups. The result is also in agreement with that of Adanyi (2019) who reported on impact of Process-based Instruction on Acquisition of Science Skills, Performance and Retention and the result revealed that there was significant difference between the retention abilities mean scores of students taught Basic Science Concepts Using Process-based instruction and those taught using lecture method in favour of the experimental group.The finding is also in consonance

with the following researchers Maikano, (2010), Obadiora (2016), Yakubu (2016) and Mamudu, and Alairu, (2018) who in their findings discovered significant difference in the retention abilities in favour of the experimental groups that were engage with indoor and outdoor activity, virtual Field-trip, field-based teaching strategy and jurisprudential model of instruction respectively. This study therefore indicated that Field-trip and Inquiry-based Instructions was better than Lecture Method in improving students‟ retention abilities in Biology. Also, field-study and Inquiry-based Instruction is less teachers directed, more learners‟ centered and an activity-based for students to control their own action in the process of learning.

Hypothesis four showed that there was significant difference between the mean Academic Performance scores of students taught ecology using Field-Trip, Inquiry-Based Instructions and those taught using Lecture Method in favour of the experimental groups. The experimental group A and B performed significantly better than the control group. This means that the experimental had a greater impact of Field-trip and Inquiry-based instructionsover the control group that are exposed to Lecture Method in understanding of biology concept. This findings conform with that ofChukwuemeka (2008), Nnamonu and Joel (2009), Patrick (2010),Iwuju, (2011), Maikano (2010), Yakubu (2016), Danjuma (2017), Ibrahim; Hamza; Bello and Adamu, (2018) and Adanyi (2019) independently carry out their research using Activity-based Instruction and both find out that the learners under experimental group performed significantly better than the students in the control group.

Results of testing Hypothesis fiveshowed that there was no significant difference between the social skills acquisition level of students taught ecology using Field-trip and Inquiry-based Instructions and those taught using Lecture Methods in favour of the experimental groups.hence both male and female students acquired social skills equallythus the skills are

gender friendly. This is not in agreement with the findings of Omerand Gokmen (2017) investigated Gender and Acquisition of Social Skills among Junior Secondary School (JSS) 3 students in Cyprus Municipality and the results revealed that male and female students acquire social skills differently in favour of female students. The findings are in line with the research of Reetu (2016) and Amosa, (2018), who worked differently using Inquiry method and Field-tripInstructions respectively and came up with results in favour of both male and female students thus gender friendly.

Hypothesis sixshowed that there was no significant difference between the mean Interest level of male and female students taught ecology using Field-trip and Inquiry-based Instructions hence both male and female students show equal interest toward learning of Biology when exposed to Field-trip and Inquiry-based Instructions thus the two teaching methods are gender friendly. The result agrees with the findings of Nwokolo (2013) who state no significant difference in the interest shown by male and female students after exposure to experimental A and B. The finding is also in line with the studies of Muoneme (2015) who investigated the 'Impact of Enriched-Lecture Method with Interactive Multimedia Board on Academic Achievement and Interest of Students in Evolution Concepts and the findings revealed no significant difference in the interest shown by male and female students. the result is also in line with the research of Danjuma, (2017) who investigated Effects of Inquiry-Based Instruction on Acquisition of Skills, Interest and Performance in Ecology among Secondary School Students and the result show no significant difference in the interest shown by gender thus gender friendly.

Results of testing Hypothesis seven showed that therewas no significant difference between the mean Retention scores of male and female students taught ecology using Field-trip and Inquiry-based Instructions hence the retention ability of both male and female was

enhanced thus the instructional methods are gender friendly.This implies that students taught using field-study and inquiry-based instructions retained and learnt more concepts than those in the lecture method. This might be due to the fact that students‟ involvement in activities in Field-trip and Inquiry-based Instructions enhanced retention of the concepts learnt but using Lecture Method may have bored the students by not allowing them achieve maximally and retain the ecology concept learnt.This finding agrees with that of Obadiora (2016) who compared the effectiveness of virtual Field-study and real Field-trip on students' knowledge and retention ability in Social Studies in Osun State secondary schools and the results showed no significant difference in retention ability between male and female students. the findings conform with that of Yakubu (2016), Ibrahim; Hamza; Bello and Adamu, (2018), Sanusi, (2019) and Adanyi (2019) who worked differently using Activity-based Instruction and came up with results in favour of both male and female students thus gender friendly.In this study students exposed to Field-study and Inquiry-based Instructions learnt better and achieved academically when they were involved in Activity-oriented method hence improve their retention memory of ecology concept as reflected in the study.

Results of testing Hypothesis eight showed that therewas no significant difference between the mean Performance scores of male and female students taught ecology using Field-Trip and Inquiry-Based Instructions hence the academic performance of both male and female students was enhanced thus the instructional methods are gender friendly. The findings agreed with studies carried out by Maikano, (2010),Muoneme (2015), Wada (2016), Yakubu (2016) Yakubu (2016), Danjuma (2017), Sanusi, (2019) and Adanyi (2019) reported that field-study and inquiry-based instructions was more effective in enhancing academic performance than the lecture method. This may be that social skills acquired by

students were induced by the fact that they were able to interact with the teaching materials by Field-trip and Inquiry-based instructions. Their findings show no significant difference in academic performance between male and female students taught using either Field-trip or Inquiry-based Instructions. Therefore, with the empirical evidence in this study, it is shown that the use of Field-trip and Inquiry-based Instructions are gender friendly in learning Biology.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1Introduction

This chapter summarizes the study titled "Effects of Field-Trip and Inquiry-Based Instructions on Interest, Retention, Performance and Acquisition of Social Skills among Secondary SchoolBiology Students in Lere Education Zone, Kaduna Nigeria.

The chapter is presented under the following headings:

5.2 Summary of the Study

5.2.1 Summary of Major Findings

5.3 Conclusions

5.4 Contributions to Knowledge

5.5 Recommendations

5.6 Limitation of the Study

5.7 Suggestions for Further Studies

5.2 Summary of the Study

This study was carried out on Effects of Field-Trip and Inquiry-Based Instructions on Interest, Retention, Performance and Acquisition of Social Skills among Secondary School Students in Lere Education Zone, Kaduna Nigeria.The research was presented in five chapters. Chapter one presented the problem of this study which was prompted by poor acquisition of social skills, low interest, low retention ability and poor academic performance among secondary school Biology students. The study was guided by Ten research objectives.Ten research questions and Ten null hypotheses corresponding to the research objectives were also stated. Other aspects of the chapter are significant of the study, scope of the study and basic assumptions. The study was limited to only SSS II students of public secondary schools offe ology in Lere Education Zone of Kaduna State.

Chapter two of this study reviewed literatures that were relevant to the area. These includesImportance of Teaching Science and Biology in Particular, General Problems in the Teaching of Biology, Nature of Biology as Science Subject at Senior Secondary Level, Teaching Ecology concept at Senior Secondary level, Science Teaching Methods, Field-tripTeaching Strategy, Planning a Field-trip, Inquiry-based Teaching Strategy, The Concept of Social Skills and Learning of Science, Social Skills Acquisition and Academic Performance in Science, Interest in Teaching and Learning, Relevance of Interest in

Teaching and Learning Science, Retention Ability in Science, Gender and Academic Performance in Biology, Overview of Similar Studies, Implication of the Literature Reviewed on the Present Study.

The chapter three of this study presented the methodology employed in carrying out this study and this includes Research Design, Population of the Study, Sample and Sampling Techniques, Instrumentation, Validity of the Instruments, Reconnaissance Study, Pilot test, Reliability of the Instruments, Administration of Treatment as well as Data Collection Procedure and Procedure for Data Analysis.

Chapter four of the study presented the data analysis, results and discussion of the findings. Eight hypotheses were tested along the research objectives and questions. Data analysis was conducted using the Statistical Package for Social Science (SPSS) version 20.0. the discussion results and summary of findings were reported accordingly.

Chapter five summarizes the investigation on Effects of Field-trip and Inquiry-based Instructions on Interest, Retention, Performance and Acquisition of Social Skills among Secondary School Students in Lere Education Zone, Kaduna Nigeria. The chapter looked at the following sub-headings: Summary of Major Findings, Conclusions, Contributions to Knowledge, Recommendations, Limitations of the Study and Suggestions for further Studies.

5.2.1 Summary of the major findings

The following are the summary of the major findings of the study:

1. Students taught ecology using Field-trip, Inquiry-based Instructions and those taught ecology using Lecture Methods differ significantly in social skills acquisition levelin favour of the experimental groups.

2. Students taught ecology using Field-trip, Inquiry-based Instructions and those taught ecology using Lecture Methods differ significantly in the interest level towards learning of biology in favour of the experimental groups.
3. Students taught ecology using Field-trip, Inquiry-based Instructions and those taught ecology using Lecture Methods differ significantly in the retention ability in favour of the experimental groups.
4. Students taught ecology using Field-trip, Inquiry-based Instructions and those taught ecology using Lecture Methods differ significantly in performance in favour of the experimental groups.
5. There is no significant difference in gender when SSS students are exposed to Field-trip and Inquiry-based Instructions in acquisition of social skills. The male and female had the same mean acquisition of social skills when exposed to Field-trip and Inquiry-based instructions.
6. There is no significant difference in the interest shown between male and femalesecondary school students exposed to Field-trip and Inquiry-based Instructions. The male and female students show equal interest level toward learning of Biology when exposed to Field-trip and Inquiry-based Instructions.
7. Thereis no significant difference in the Retention ability between male and female students taught ecology using Field-tripand Inquiry-based Instructions. The male and female students show equal Retention ability toward learning Biology when exposed to Field-trip and Inquiry-based Instructions.
8. Thereis no significant difference in the academic Performance between male and female students taught ecology using Field-trip and Inquiry-based Instructions. The male and female students show equal level of academic

Performance in learning Biology when exposed to Field-trip and Inquiry-based Instructions.

5.3 Conclusion

On the basis of the findings from this study, the following general conclusions could be deduced:

1. Field-trip and Inquiry-based Instructions has the potential of enhancing social skills acquisition, interest, academic performance and retention of ecology concepts by learners.
2. Field-trip and Inquiry-based Instructions enhanced social skills acquisition, interest, academic performance and retention equally well in both Male and female students in ecology.

5.4 Contributions to Knowledge

The findings of the study have the following significant contributions to knowledge;

1. The study established that Field-trip and Inquiry-based Instructions promote acquisition of social skills among Secondary School Biology Students.
2. Participation inField-trip andInquiry-based Instructions enhances Senior Secondary Students' interest, performance and retention ability in learning of Biology
3. Field-trip and Inquiry-based Instructions was established to be gender friendly as it promotes the learning of Biology by both male and female students.

5.5 Recommendations

Based on the findings of the study the following recommendations were made:

1. The use of Field-trip and Inquiry-based Instructions should be encouraged among teachers of ecology to improve student's acquisition of social skills.

2. Both male and female senior secondary school students should be taught Biology with Field-trip and Inquiry-based Instructions as both acquire social skills when used.
3. Teachers of Biology should be sponsored by government/private school owners to attend regular courses, workshops, seminars and in-house training on the use of Field-trip and Inquiry-based Instructions for the maximum students' acquisition of social skills.
4. Field-trip and Inquiry-based Instructions should be encouraged by Science Teachers Association of Nigeria in the teaching and learning of Biology at Senior Secondary School as it is found to improve students'" academic performance, social skills acquisition, interest and retention.

5.6 Limitation of the Study

1. The students and research assistants were not too familiar with Field-trip, Inquiry-based instructions and social skills. A lot of explanations were done on them before commencement of the exercise.

5.7 Suggestions for Further Studies

Based on the findings of this study the following suggestion may be found useful:

1. A similar study be conducted elsewhere to see whether it will yield similar or different result with the present study

2. It is suggested that further studies be carried out on effects of process-based instruction on acquisition of social skills, interest, retention and performance towards ecology among secondary school students.
3. The study was carried out using senior secondary schools as the research population and sample. Other researchers may replicate this study by using tertiary institutions.
4. The composition of schools be changed to include both public and private Junior Secondary Schools

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APPENDICES

Appendix A: Letter of Introduction

DEPARTMENT OF SCIENCE EDUCATION

AHMADU BELLO UNIVERSITY, ZARIA

Vice Chancellor: ***Professor Ibrahim Garba*** *B.Sc, M.Sc(ABU) Ph.D DIC (London), FNMGS*
Head of Department: ***Professor Sani Sale Bichi*** *NCE, B.Ed, M.Ed, Ph.D(ABU), AKC. Lond*

Your Ref:
Our Ref: DSE/VRI/1/Vol.1

Date: 20/03/2019

PROF S.A LUKA
DEPT OF BIOLOGICAL SCIENCE,
A.B.U, ZARIA.

Research instrument has been validated by me on 2nd April, 2019
Luka 2/4/19

Dear Sir/Madam.

VALIDATING RESEARCH INSTRUMENT

This is to introduce the bearer, DANJUMA SUNDAY, as one of our POST GRADUATE students with registration number P17EDSC9022 in this department.

The above postgraduate student is about to go for pilot testing and pre-data seminar. He/She has an instrument for validation on a study topic: ACQUISITION OF SOCIAL SKILLS, INTEREST, RETENTION AND PERFORMANCE AMONG SECONDARY SCHOOL BIOLOGY STUDENTS THROUGH FIELD-TRIP AND INQUIRY-BASED INSTRUCTION IN LERE KADUNA-NIGERIA.

The instrument is for you to study and validate accordingly.

The objective of the study, the research question and hypotheses are attached herewith for your reference.

Thank you.

Yours faithfully,

Prof. S.S. Bichi
Head, Department of Science Education

APPENDICES

Appendix A: Letter of Introduction

DEPARTMENT OF SCIENCE EDUCATION

AHMADU BELLO UNIVERSITY, ZARIA

Vice Chancellor: ***Professor Ibrahim Garba*** *B.Sc, M.Sc(ABU) Ph.D DIC (London), FNMGS*
Head of Department: ***Professor Sani Sale Bichi*** *NCE, B.Ed, M.Ed, Ph.D(ABU), AKC. Lond*

Your Ref:
Our Ref: *DSE/VRI/I/Vol.1*

Date: 20/04/2019

Dr M. R. BAWA
DEPT OF SCI. EDUC
A.B.U, ZARIA.

Validated by:
Dr. Bawa, M.R.
ABU Zaria 17/04/2019

Dear Sir/Madam.

VALIDATING RESEARCH INSTRUMENT

This is to introduce the bearer, DANJUMA SUNDAY, as one of our POST GRADUATE students with registration number P17EDSC9022 in this department.

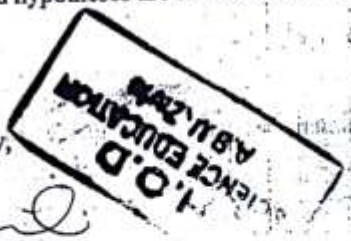
The above postgraduate student is about to go for pilot testing and pre-data seminar. He/She has an instrument for validation on a study topic: ACQUISITION OF SOCIAL SKILLS, INTEREST RETENTION AND PERFORMANCE AMONG SECONDARY SCHOOL BIOLOGY STUDENTS THROUGH FIELD-TRIP AND INQUIRY-BASED INSTRUCTION IN LERE KADUNA-NIGERIA.

The instrument is for you to study and validate accordingly.

The objective of the study, the research question and hypotheses are attached herewith for your reference.

Thank you.

Yours faithfully,



Prof. S.S. Bichi
Head, Department of Science Education

DEPARTMENT OF SCIENCE EDUCATION

AHMADU BELLO UNIVERSITY ZARIA

Vice Chancellor: **Professor Ibrahim Garba** B.Sc, M.Sc(ABU) Ph.D DIC (London), FNMGS
Head of Department: **Professor Sani Sale Bichi** NCE, B.Ed, M.Ed, Ph.D(ABU), AKC. Lond

Your Ref:
Our Ref: DSE/R/1/Vol.1

Date: 25-03-2019

THE DIRECTOR
LERE EDUCATION ZONE
KADUNA STATE

We will give him the necessary information required for the research.

Dear Sir/Madam,

PG INTRODUCTORY LETTER TO ACCESS RESEARCH DATA

This is to introduce the bearer, DANJUMA SUNDAY with registration number P17EDSC9022, is one of our POST GRADUATE students who is working on the topic: ACQUISITION OF SOCIAL SKILLS, INTEREST, RETENTION AND PERFORMANCE AMONG SECONDARY SCHOOL BIOLOGY STUDENTS THROUGH FIELD-TRIP AND INQUIRY-BASED INSTRUCTION IN LERE, KADUNA - NIGERIA

Please accord HIM every necessary assistance to enable HIM get access to data for HIS study.

Yours faith fully,

H.O.D SCIENCE EDUCATION ABU Zaria

Professor S.S. Bichi
Head, Science Education Department

Department of Science Education,
Faculty of Education,
Ahmadu Bello University,
Zaria-Kaduna.
25th March, 2019.

The Director,
Lere Educational Zone,
Ministry of Education, Science and Technology,
Kaduna State.

DIRECTOR
LERE ZONE
Date: 25/3/2019.

Principals of Senior Secondary School to cooperate and give him the maximum information

Sir,

PERMISSION TO VISIT SOME SCHOOLS TO COLLECT DATA

I write to seek for permission to visit some of the Secondary Schools under your zone in order to collect data from the learners for my Ph.D research work. Sir, I will be grateful if my application is given a favorable consideration.

Thanks, in anticipation for your usual co-operation.

Yours Faithfully

Danjuma Sunday
P17EDSC9022

APPENDIX II

STUDENT ECOLOGY CONCEPT INTEREST QUESTIONNAIRE (SECIQ)

Gender:

Male……..…. Female……...…….……

Instruction: Answer all questions Time allowed 30 minutes

S/no	ITEMS	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1	I enjoy learning ecological concepts.					
2	I find ecology lesson interesting					
3	I understand ecological better than other concepts in Biology					
4	I participate better in an ecology class					
5	I found it difficult to understand ecological concepts					
6	I don't concentrate in ecology class					
7	I participate actively in class discussion when ecology is taught					
8	Ecology should be removed in biology curriculum from secondary schools					
9	I enjoy discussing ecology concepts with my colleagues					
10	Ecology concepts are relevant to me					
11	There are less discipline problems in the class when ecology is taught					
12	Ecology concept of Biology distract me from the lesson					
13	Ecology concept of Biology is connected to my life					
14	I concentrate better in class when ecology concepts are taught					
15	Ecology class is boring					

16	I easily do my homework in ecology					
18	I invest less effort in learning ecology					
19	Less time is spent in explanation when ecology concept of Biology is taught					
20	I love ecology					
21	I like receiving instruction when the teacher teaches ecology concept of Biology					
22	Learning ecology makes me nervous					
23	Learning ecology is very frustrating					
24	I learn more when my teacher teaches ecology than other concepts					
25	I will study ecology related course when I go to higher institution					

Scale: 5- Strongly agree, 4-agree, 3-undecided, 2-disagree, 1-Strongly disagree

Source: Adapted from Muoneme (2015)

APPENDIX III

ECOLOGY PERFORMANCE TEST (EPT)

1. Ecology is best defined as the study of
   a) The characteristics of an environment
   b) The inter-relationship between living organism and the environment
   c) Living organisms in a particular area
   d) The habitats and wildlife
   e) Man and the environment.

2. Which of the following is based classified as terrestrial habitat?
   a) Forest
   b) Guinea savannah
   c) Alfro alphine
   d) Litoral zone
   e) Desert

3. Which of the following does not contribute to the biomass in an ecosystem?
   a) Producers
   b) Food chain
   c) Consumers
   d) Micro-organism
   e) Saprophytes

4. Which of the following is not a characteristic feature of tropical rainforest habitats?
   a) Trees with longer poles than those in savannah
   b) Fewer canopy strata than the savannah
   c) Many more trees and climbers than savannah
   d) Plenty of leaf litter on the ground
   e) More diverse communities than the savannah

5. Which of the following is not associated with aquatic habitat?
   a) Temperature
   b) Light intensity
   c) Humidity
   d) Turbidity
   e) Wave action

6. Which of the following statement is not true of a climax vegetation?
   a) It is an ecological phenomenon
   b) It is a stable community
   c) It eliminates competition
   d) It results from succession
   e) It involves the colonization of a habitat

7. Which of the following steps, is not appropriate for conservation of fishing grounds from over-exploitation?
   a) Use of nets with all sizes of mesh
   b) Use of net with a particular mesh size
   c) Ban on harvesting of some species
   d) Regulating the size of ships allowed into fishing grounds
   e) Limiting the period of fishing in the waters

8. Which of the following is not part of the objectives of conservation of natural resources?
   a) To eliminate wild animals in order to enable other plants and animals survive
   b) To use our resources on sustain yield basis
   c) To guard against indiscriminate killing of plants and animals
   d) To guard against the extinction and exhaustion of natural resources
   e) To protect the environment.

9. Which of the types of soil has the highest water retaining capacity?
   a) Clay
   b) Laterite
   c) Loam
   d) Gravel
   e) Sand

10. Which of the following is not a way of conserving natural resources?
    a) Controlling farming practice
    b) Establishing forest reserve
    c) Establishing of parks and gardens
    d) Encouraging poaching in game reserves
    e) Protecting the endangered species

11. Which of the following best describes a marine habitat?
    a) A large body of water which has no distinctive colour or taste
    b) A large body of water with high concentration of salt

c) A large body of water with little suspended materials
d) A large body of water with no water weeds
e) A large body of water which sustain no animal life.

12. The following are features of tropical rainforest except
    a) Abundant water supply
    b) Loose and moist soil
    c) Short trees growing beneath tall trees
    d) Scanty trees with small leaves
    e) Presence of many animals.

13. Which of the following is not a feature of northern guinea savanna?
    a) Presence of tall trees with thick bark
    b) Bare soil with very resistant trees
    c) Presence of fire-resistant trees
    d) Abundant herbivores
    e) Predominance of woody trees

14. Which of the following explains the term pyramid of numbers?
    a) The number of organisms in a trophic level
    b) The relationship between plant and different tropic level
    c) The number of saprophyte and parasites in a habitat
    d) The numbers of predators in a habitat
    e) Progressive decrease in the number of individuals from lower to high tropic level.

15. Which of the following is not a characteristic of overcrowding plant and animal community?
    a) Population outstripping available space
    b) Population exceeding available food
    c) Competition within the population
    d) Increase in primary production
    e) Population increasing at the same rate at the birth rate

16. A climax community is characterized by
    a) A stable composition of plants and animals
    b) Rapid changes in the composition of species
    c) Constant changes in the appearance of the habitat
    d) Different species occurring at different times
    e) Gradual change in animal population.

17. The following agencies are responsible for conservation in Nigeria except

a) Forestry departments
b) Nigerian conservation society
c) Game reserve authority
d) Nigerian red cross society
e) Ministry of agriculture and natural resource.

18. The largest game reserve in Nigeria is the
    a) Kainji game reserve in Niger State
    b) Zamfara forest reserve in Sokoto state
    c) Yankari game reserve in Bauchi state
    d) Borgu game reserve in Niger state
    e) Kamuku game reserve in Kaduna state.

19. All the following can illustrate the dynamic nature of the ecosystem **except**
    a) Nitrogen cycle
    b) Carbon cycle
    c) Water cycle
    d) Nutrient cycle
    e) Locomotion in organism

20. In complex food relationships in a community, the primary, secondary and the tertiary consumers are referred to as
    a) Symbiosis
    b) Omnivores
    c) Heterotrophs
    d) Autotrophs
    e) Carnivores

21. Which of these statements about food chain is not correct?
    a) Animals in the chain are consumers
    b) A food chain usually begins with a green plant
    c) All organisms in the food chain are animals
    d) Living things are dependent on one another
    e) The food chain involves energy transfer in an ecosystem

22. The distribution of organisms in a fresh-water habitat is determined by the following except
    a) Rainfall
    b) Temperature
    c) pH of soil
    d) light penetration

e) tidal movements

23. Which of the following ecological factors causes food shortage?
    a) Low rate of reproduction
    b) Emigration
    c) Drought
    d) Topography
    e) Wind direction

24. Density, mortality rate, birth rate are the factors that affect
    a) Population
    b) Dominance
    c) Cover
    d) Habitat
    e) Abiotic community

25. Which of the following is not an aquatic habitat?
    a) Estuaries
    b) Ponds
    c) Rainforest
    d) Swamps
    e) Salt Lake

26. Which of the following is an abiotic factor that affects a population?
    a) Predator
    b) Parasite
    c) Consumers
    d) Producers
    e) Temperature

27. Which of the following processes is not due to interaction between the biotic and abiotic components of an ecosystem?
    a) Soil nutrient depletion
    b) Condensation
    c) Decomposition
    d) Osmosis
    e) Photosynthesis

28. In any food chain, the first member must be a
    a) Carnivore
    b) herbivore

c) zooplankter
d) autotroph
e) consumers

29. The total amount of energy entering a food chain is that which is present in the
    a) Consumer
    b) Ecosystem
    c) Producer
    d) Decomposers
    e) Heterotroph

30. The difference between community and population is
    a) A community is made up of organism of the same species while a population is made up of organisms of different specie
    b) A community is made up of population of living organisms while a population is made up of organisms of the same species
    c) An ecological niche does not exist in the community but it does in a population
    d) A community attract competitions but a population does not
    e) Number of communities out way the numbers of population

31. Which of the following component makes up an ecosystem?
    a) Decomposers, animals, and non-living factors
    b) Living and non-living factors
    c) Plants, and non-living factors
    d) Plants, decomposers, and non-living factors
    e) Animals and non-living factors

32. The total amount of energy entering a food chain is that which is present in the
    a) Consumer
    b) Ecosystem
    c) Producer
    d) Decomposer
    e) Competition

33. Which of the following terms ensures the survival of an organisms in its environment?
    a) Hibernation
    b) Succession
    c) Adoption
    d) Competition
    e) Habitat

34. Which of the following would be the primary producer in a food chain?
    a) Saprophytes
    b) Herbivores
    c) Carnivores
    d) Green plants
    e) Parasites

35. The adaptations for water conservation in organisms include the following except
    a) Scales in fishes
    b) Scales on leaves
    c) Thick leaves
    d) Spine in plants
    e) Succulent stems

36. Which of the following best describes a marine habitat? A large body of water
    a) Which has no distinctive colour or taste
    b) With high concentration of salt
    c) With little suspended materials
    d) With no water weeds
    e) Which sustains no animals

37. Which of the following represents the correct order in a possible food chain?
    a) crustacea→diatom→fish→man
    b) fish→crustacea→man→diatom
    c) man→fish→crustacea→diatom
    d) diatom→crustacea→fish→man
    e) man→diatom→fish→crustacea

38. Which of the following is not a conservable natural resource?
    a) water
    b) sunlight
    c) forest
    d) soil
    e) air

39. Which of these materials is not required for insect collection in an ecological field-trip?
    a) Pooter
    b) Seechi disc
    c) Spreading board

d) Jar containing alcohol
e) Sweep net

40. Which of the following is the correct sequence for energy transfer and nutrient cycling among living things in an ecosystem?
    a) consumers→producers→decomposers
    b) producers→decomposers→consumers
    c) decomposers→producers→consumers
    d) producers→consumers→decomposers
    e) consumers→decomposers→producers

MARKING GUIDE FORECOLOGY PERFORMANCE TEST (EPT)

1. C
2. E
3. C
4. B
5. B
6. C
7. A
8. A
9. C
10. D
11. B
12. B
13. E
14. A
15. D
16. A
17. D
18. C
19. E
20. A
21. D
22. A
23. C
24. A
25. C
26. E
27. B
28. D
29. C
30. B
31. B
32. C
33. B
34. D
35. A
36. B
37. D
38. B
39. D
40. D

APPENDIX IV

ECOLOGY SOCIAL SKILLS ACQUISITION QUESTIONS (ESSAQ)

School……

Class…….. Age ……..

Male…….…. Female……...…….……

Instruction: Answer all questions *Time allowed: 1 hour*

Below is a record of the number of flowers found on pride of Barbados plants growing in two different sites, **A** and **B.**

Site **A** Sunny and dry	Site **B** Shady and damp
Number of flowers 7 12 9 5 9 7 18 7 8 3 7 11 4 15 11 9 7 6 9 5 6 8 13 4 8 7 18 15 9 7 8 18 13 9 9	Number of flowers 3 0 11 7 4 3 6 5 4 2 4 3 5 5 8 4 3 1 6 2 4 5 9 4 5 4 7 3 10 3 8 4 7 3 5

1. Complete the table below to show how the plant in the different sites flowered.

Number of flowers

Site	0-3	4-7	8-11	12-15	16-18
A B					

2. The most frequent number of flowers on a plant in site B is.....……...……

3. The percentage of plants with more than three flowers in site A is……

4. Define ecology

5. List the biotic component found in abandoned farmland habitat

*Select a suitable area in your school, Observe the area at regular intervals over a period of 3-5 days. Use what you have observed and answer question **6-9** below*

6. Record the plants and animals observed in the area

7. List the possible food sources

8. Collect any evidence of animal presence

9. Construct a possible food chain

10. Identify the characteristics of hill habitat

*Answer question **11-13** below as observed in the school pond in Biology garden*

11. List the animals found in pond habitat

12. Construct a food chain of the animals identified in pond habitat

13. Differentiate between aquatic habitat and terrestrial habitat

14. List the characteristics of abandoned farmland

15. What are marshes?

16. List the adaptations of organisms in marshes habitat

17. List the plants and animals that lives in marshes

*Given two different lower jaws **A** and **B** of frog and toad respectively. As observed.*

18. State two differences between the teeth in jaw **A** and those in jaw **B**

……

……

*The animals in **C** were collected in a school garden. They are grouped into two groups as shown below;*

Group C1	Group C2
Housefly, Clothe month, Beetle	Ant, Silver fish

19. List two differences you can see between these animal groups

……

……

Snail is a mollusk. Johnson collected 50 snails and measured the length of their shells. The results are shown below.

16 18 25 19 20 15 25 20 19 17 23 30 12 25

22 10 18 14 24 14 23 17 24 11 15 17 24 31

22 23 22 18 28 23 26 13 26 27 20 8 10 23

29 23 16 21 11 13 19 20

20. Complete the table below to show the number of snails with different shell lengths.

Shell length	8-11 cm	12-15 cm	16-19 cm	20-23 cm	24-27 cm	28-31 cm
Number of snails						

MARKING GUIDE FOR:

ECOLOGY SOCIAL SKILLSACQUISITION QUESTIONS (ESSAQ)

1.

Site	0-3	4-7	8-11	12-15	16-18
A	1	13	13	6	3
B	11	18	5	0	0

Any five points 1× 5 = 5 marks

Social Skills: Listening, Observation,Participation in group activities, Problem solving, Communicating with others.

2. The most frequent number of flowers on a plant in site B is = between 4-7 = 18

Good answer = 5 marks

Social Skills: Observation,Problem solving, Communication.

3. The percentage of plants with more than three flowers in site A is =

35 × 100/ 36 =97.2 %

Clear and good working = 5 marks

Social Skills: Problem solving.

4. Ecology is defined as the study of inter-relationship between organisms and their external environment.

Any relevant definition = 5 marks

Social Skill: Listening, Communication, Listening.

5. Biotic components found in abandoned farmland habitat include; Lizard, grasses, insect, rat, trees, worms, larvae, dormant seeds etc

Any relevant example 1× 5 = 5 marks

Social Skills: Listening, Cooperation, Communication, Participation in group activities.

6. Plants and animals observed in the area: plants; iroko trees, palm tree, grasses; animals: toad, earthworm, snail, bird etc

Any five examples 1× 5 = 5 marks

Social Skills: Listening, Observation, Communication, Problem solving.

7. Food source in the area are: berries, flowers, leaves, insects, and water source.

Any five examples 1× 5 = 5 marks

Social Skills: Participation in group activities, Communication.

8. Evidence of animal presence in the area include: feathers, shell, birds dropping and remains of animals etc.

Any five examples 1× 5 = 5 marks

Social Skills: Listening, Observation, Problem solving, Participation in group activities.

9. The possible food chain: Grass → grasshopper → Toad

Any good example = 5 marks

Social Skills: Observation, Communication, Participation in group activities.

10. Characteristics of the Hill habitat

- Presence of ant, toad, rat, snake, lizard, birds, chameleon
- Presence of grasses, shrubs
- Presence of iroko trees, palm tree, rainforest occur on the slopes of mountains

Any five examples 1× 5 = 5 marks

Social Skills: Observation,Problem solving, Communication, Participation in group activities.

11. Animals found in pond habitat include:

Crabs, insect, tree frog, water snake, beetles etc

Any five examples 1× 5 = 5 marks

Social Skills: Observation, Communication, Participation in group activities.

12. Food chain of animals identified in pond habitat

Insect → tadpole → fish → water snake

Any good example = 5 marks

Social Skills: Observation, Problem solving, Cooperation.

13. Differences between aquatic and terrestrial habitat are:

AQUATIC HABITAT	TERRESTRIAL HABITAT
Aquatic habitat is a water living place of organisms	Terrestrial habitat is a land-living place of organisms
Examples of aquatic habitat include marine-salt water and fresh water	Examples of terrestrial habitat include trees (arboreal) surface of the soil and even holes.

Any good example = 5 marks

Social Skills: Observation,Cooperation, communication, Problem solving.

14. Characteristics of abandoned farmland;

i. Animals like insect's eggs, larvae, worms, dominant seeds and some rhizomes are present from the outset.

ii. Grasses take over followed by hatched insects and herbs.

iii. Reptiles and herbivores emerge

i. Shrubs are seen, followed by trees.

ii. Higher animals like carnivores and some omnivores eg monkey are seen

iii. At a point, climax vegetation is reached.

Any five examples 1× 5 = 5 marks

Social Skills: Observation,Cooperation, Communication.

15. Marshes is a low, flat, land completely or partly covered by shallow water with silt frequently deposited.

Any good definition = 5 marks

Social Skills: Listening, Observation, Communication, Cooperation, Listening.

16. Animals eg worm, crabs and bivalves burrow into the soft mud to avoid high temperature and drying up; Insect larvae, beetles and frogs come near the surface to gulp atmospheric air to survive the low oxygen content in water.

Plants; the grasses grow large branches to avoid being wash away by water movement; their leaves are long narrow and held above water for atmospheric gaseous exchange to compensate for poor aeration of the logged soil.

Any good example = 5 marks

Social Skills: Listening, Observation,Communication, Problem solving.

17. Animals in the marshes habitat are: Frogs, crabs, worm, beetles, and tadpole's larvae

And the plants include water lettuce, water lily, azolla algae duckweed etc.

Any five examples 1× 5 = 5 marks

Social Skills: Observation, Communication, Helpfulness, Cooperation.

18. The two differences between the lower jaw of frog and toad are:

i. Frog has longer jaw while the toad has a shorter jaw compare to that of frog

ii. Lower jaw of frog is longer than the upper jaw while the lower jaw of toad is same with upper jaw in terms of length.

Any good example = 5 marks

Social Skills: Helpfulness, Participation in group activities, Cooperation.

19. Differences between C_1 and C_2

C_1- can fly

- Has wings

C_2- Cannot fly

- Has no wings

Any good point that correspond = 5 marks

Social Skills: Observation, Problem solving, Communication.

20.

Shell length	8-11 cm	12-15 cm	16-19 cm	20-23 cm	24-27 cm	28-31 cm
Number of snails	5	7	11	14	9	4

Any five points $1 \times 5 = 5$ marks

Social Skills: Observation,Problem solving, Communicating, Participation in group activities, Helpfulness, Cooperation.

APPENDIX V

LESSON PLAN FOR EXPERIMENTAL GROUP ONE (FIELD-TRIP)

Week 1:

Subject: Biology

Topic: Habitat (fresh water- pond)

Class: SSII

Time: 40 Minutes

Behavioral Objectives: At the end of the lesson, student should be able to

i. Observe and record the characteristics of ponds habitat,

ii. Identify and arrange (order) the food chain in the pond habitat

iii. Observe, identify and name animals and plants that can be found in pond habitat

Previous Knowledge: The students already know the meaning of Ecology, biotic and abiotic components

Introduction: The teacher introduces the lesson by asking question on the previous knowledge e.g. what is ecology?

Presentation

Step 1: The teacher takes the students to the pond and requires them to bring and use the guided sheet. Also tell them to record what they observed in their KWL chart.

Step II: These teacher asks the students to identify and arrange/construct (order) food chain of the biotic component observed e.g Insect ⟶ Tree frog ⟶ Water snake.

Step III: The teacher asks students to observe the pattern of distribution of the biotic components of the pond and their adaptive features. He then takes students to identify and take sample where possible of (plants and Animals) component in the pond habitat e.g tad pole, water lettuce, tree frog, water lily, water Snake, arrow head e.t.c

The teacher guide students to take reading of temperature, relative humidity and estimate light intensity of the pond.

Evaluation: The teacher evaluates the lesson by asking questions based on the lesson presented e.g

1. What are the characteristic of pond habitat?
2. What are the examples of plants and animals that can be found in pond habitat?
3. Observe, identify and construct a food chain of the biotic components observed

Conclusion: The teacher concludes lesson by summarizing a topic learnt e.g define pond, some characteristics of pond habitat, naming some of plants and animals that can be found in pond habitat.

Students Activities: The student would use the possible sample collected and what they have observed and write report.

Week2: Experimental Group (Field-Trip)

Subject - Biology

Topic - Hill (Terrestrial Habitat)

Class - SS II

Time - 1½ hours

Behavioral objectives: It is expected that at the end of the lesson, students should be able to:

I. Observe and name the characteristics of Hill habitat

II. Classify the adaptation of plants and Animals in the Hill habitat.

III. Identify the food chain in the hill habitat.

IV. Identify and name some biotic component in the hill.

Previous knowledge: The students observe pond, characteristics and the types of plants and animals found in the pond habitats.

Introduction: The teacher introduces the lesson by questions on the previous knowledge e.g. what is pond? What are the characteristics of pond what are the biotic component found in the pond habitat,What is aquatic habitat?

Presentation

STEP I: The teacher takes the students to Kudaru Hill and requires the students to jot important points as he was explaining the characteristics of the habitat.The teacher defines Hills e.g. Hills are regarded as small high land areas exposed out due to agent of denudation.The teacher, name and explain characteristics of Hill e.g hill is social mass of intrusive Igneous rock which are undergoing modification due to weathering process in the area. Because of humid, climate condition of savanna (guinea savanna) both physical, chemical and biological weathering are active in the environment. Which consequently lead to fragmentation of rock materials to form soil at based and hill top.

STEP II: The teacher explains and asks students to observe pattern of distribution of biotic components of the Hills and their adaptive features. He then takes the students round to observe and sample where possible of the biotic component of the hill habitat e.g. Rat, insect, Birds, frogs, snake, chameleon, lizard, grasses, shrubs free etc.

STEP III: The teacher asks students to construct food chain of the biotic component that can be found in Hill habitat. e.g Grasses → Rat → Snake

The teacher guides students to take reading of temperature, relative humidity and estimate light intensity of the Hill.

Evaluation: The teacher evaluates the lesson by asking question base on the lesson presented e.g.

1. What are the characteristics of hill habitat?
2. What are the biotic of components found in the hill habitat?
3. What are the adaptive features observed on the biotic component in the hill?

Conclusion: The teacher concludes the lesson by summarizing the lesson by defining Hill, list some characteristics of hill habitat and naming some of the biotic component found in the hill.

Students Activities: The students would use the possible Sample Collected and what they have observed and write report.

Week 3: Experimental Group (Field-Trip)

Subject - Biology

Topic - Abandoned farm land (terrestrial) habitat

Class - SSII

Time - 1½ hours

Behavioral objectives: It is expected that at the end of the lesson the students should be able to:

i. Observe, Identify and name the characteristics of abandoned farm land habitat

ii. Identify the adaptive feature of biotic component of the abandoned farm land habitat,

iii. Identify and name some of the biotic component found or observed in the abandoned farm land habitat.

Previous knowledge: The students know Hill habitat, they know the meaning of Hill, characteristics of hill, the adaptive features of Hill and biotic component of the hill.

Introduction: The teacher introduces the lesson by asking questions on the previous knowledge e.g what is Hill? What are the characteristics of Hill habitat? What are the

adaptive features of the biotic component of the hill habitat? What are the biotic components found in the Hill habitat?

Presentation

Step I: The teacher defines abandoned farm land while students are observing e.g this is the type of farm land that is left unfarmed or no crops planted for some years (2 and above years).

The teacher name and explain while students are observing the characteristics of abandoned farm land e.g. in the abandoned farm land, the pioneers are weeds and underground stems, seeds of plant, eggs and Larvae of insect and worms. These pioneers derived their food from the left-over nutrients of the old farm. Animal such as mice, rats and cane rat's lizard are also found.

STEP II: He then takes the students round to observe and collect sample where possible of the biotic component of the abandoned farm land e.g. grasses, insect rat, lizard, trees etc.

STEP III: The teacher explains food chain and guide to construct food chain of the biotic component observed in the abandoned farm land. E.g ~~Grass →~~ ~~Grasshopper~~ Snake

Evaluation: He evaluates the lesson base on what the student has been observed on the abandoned farm land habitat e.g.

1. What are characteristics of abandoned farm land?

2. What are the adaptive features of the biotic component that can be found in the abandoned farm land?
3. What are the biotin components found in the abandoned farm land habitat?

Student's activities: The students would use what they have observed and the possible sample collected to write report

Week 4: Experimental Group (Field-Trip)

Subject - Biology

Topic - Marshes Habitat

Class - SS II

Time - 1 ½ hours

Behavioral objectives: the students should be able to:

1. Classify the types of marshes
2. Observe and identify the adaptations of organisms in habitat.
3. Identify the plants and animals that live in marshes.

Previous Knowledge: - The students know the meaning of pound; the characteristics of pond, the adaptive features of plants and animals in the pond.

Introduction: - The teacher introduces the lesson by asking some questions on the previous knowledge e.g.

1. What are the adaptive features of plants in the pond?

2. What are the general characteristics of pond habitat?

Presentation;

Step I:- The teacher would take the students to the marsh habitat he then defines and explain marsh habitat while the students are observing e.g Marsh is a low, flat, land completely or partly covered by shallow water with silt frequently, deposited. The water is about knee deep in most parts while is less in many other places.He then name and explains while students are observing the types of marshes: temporary marshes are seasonal occurring during the rainy season drying up in the dry season, while permanent marshes: contains water throughout the year. They are close to the rivers or seas which serve permanent water source.

Step II :- He identify and explains the characteristics of marsh habitat e.g low and habitat covered with water (if permanent) but dry up during the dry season (if temporary). Soils is soft making difficult for big animal vegetation is normally dominated by grasses, the contents of mineral salts is high and dissolved oxygen content is low.

The teacher also classifies and show adaptive features of plants and animals e.g animals; warm, crabs and bivalves burrow into the soft mud to avoid high temperature and drying up, insect larvae, beetles and frogs come near the surface to gulp atmospheric air to survive the low oxygen content in the water. Plants. The grasses grow large branches or tussocks to avoid being washed away by water movement. Their leaves are long narrow and held high above water for atmospheric gaseous exchange to compensate for poor aeration of the logged soil.

Step III :- He also name and show plants and animals that lives in marsh habitat. Plants: vossia cuspidate, duckweed, water lily, water lettuce, salvina, azolla algae etc. animals: water snake, tad pole, frogs, larvae, insects'e.t.c.The teacher explains how to take reading of temperature, relative humidity and estimate light intensity the marsh.

Evaluations: - The teacher evaluation by asking questions on lesson presented e.g. what are the plants and animals found in marsh habitat?

Conclusion: The teacher concludes the lesson by summarizing the whole lesson e.g by defining marsh. Naming the characteristic of marsh adaptive features e.t.c.

Week 5: Experimental Group (Field-Trip)

Subject: Biology

Topic: Community

Class: SSII

Time: 40 Minutes

Behavioral Objectives: At the end of the lesson, student should be able to

Observe and record the number of flowers found on pride of Barbados plant growing in two different sites, **A** and **B**.

Site **A**	Site **B**
Sunny and dry	Shady and damp

Number of flowers	Number of flowers
7 12 9 5 9 7 18 7 8 3 7 11 4 15 11 9 7 6 9 5 6 8 13 4 8 7 18 15 9 7 8 18 13 9 9	3 0 11 7 4 3 6 5 4 2 4 3 5 5 8 4 3 1 6 2 4 5 9 4 5 4 7 3 11 3 8 4 7 3 5

1. Complete the table below to show how the plant in the different sites flowered.

Number of flowers

Site	0-3	4-7	8-11	12-15	16-18
A B					

2. Identify and name the adaptation of the plants and animals in the pond habitat, Identify and arrange (order) the food chain in the pond habitat

3. Observe, identify and name animals and plants that can be found in pond habitat

Previous Knowledge: The students already know the meaning of Ecology, biotic and abiotic components

Introduction: The teacher introduces the lesson by asking question on the previous knowledge e.g. what is ecology?

Presentation Step 1: The teacher takes the students to the field and direct them on how to fill table.

Site	0-3	4-7	8-11	12-15	16-18
A	1	13	13	6	3
B	11	18	5	0	0

The teacher defines and explains pond while the students are looking at the pond e.g pond is a small body of shallow water having no or feeble current. Ponds vary in size depending upon age and location.The teacher asks the students to identify and arrange/construct (order) food chain of the biotic component observed e.g Insect → Tree frog → Water snake.

Step II: The teacher asks students to observe the pattern of distribution of the biotic components of the pond and their adaptive features. He then takes students to identify and take sample where possible of (plants and Animals) component in the pond habitat e.g tad pole, water lettuce, tree frog, water lily, water Snake, arrow head e.t.c

Step III: The teacher guide students to take reading of temperature, relative humidity and estimate light intensity of the pond.

Evaluation: The teacher evaluates the lesson by asking questions based on the lesson presented e.g

1. What are the characteristic of pond habitat?
2. What are the examples of plants and animals that can be found in pond habitat?
3. Observe, identify and construct a food chain of the biotic components observed

Conclusion: The teacher concludes lesson by summarizing a topic learnt e.g define pond, some characteristics of pond habitat, naming some of plants and animals that can be found in pond habitat.

Students Activities: The student would use the possible sample collected and what they have

Observed and write report.

Week 6: Experimental Group (Field-Trip)

Subject - Biology

Topic - Hill (Terrestrial Habitat)

Class - SS II

Time - 1½ hours

Behavioral objectives: It is expected that at the end of the lesson, students should be able to:

Snail is a mollusk. Johnson collected 50 snails and measured the length of their shells. The results are shown below.

1. Observe carefully

16 18 25 19 20 15 25 20 19 17 23 30 12 25

22 10 18 14 24 14 23 17 24 11 15 17 24 31

22 23 22 18 28 23 26 13 26 27 20 8 10 23

29 23 16 21 11 13 19 20

Complete the table below to show the number of snails with different shell lengths.

Shell length	8-11 cm	12-15 cm	16-19 cm	20-23 cm	24-27 cm	28-31 cm
Number of snails						

1. Classify the adaptation of plants and Animals in the Hill habitat.

2. Identify the food chain in the hill habitat.

3. Identify and name some biotic component in the hill.

Previous knowledge: The students observe pond, characteristics and the types of plants and animals found in the pond habitats.

Introduction: The teacher introduces the lesson by questions on the previous knowledge e.g. what is pond? What are the characteristics of pond what are the biotic component found in the pond habitat? What is aquatic habitat?

Presentation

STEP I: The teacher takes the students to Kudaru Hill and requires them to bring and use the guided sheet and also advise them to record what they would observe as follow;

Shell length	8-11 cm	12-15 cm	16-19 cm	20-23 cm	24-27 cm	28-31 cm
Number of snails	5	7	11	14	9	4

The teacher defines Hills e.g. Hills are regarded as small high land areas exposed out due to agent of denudation.

STEP II: The teacher, name and explain characteristics of Hill e.g hill is social mass of intrusive Igneous rock which are undergoing modification due to weathering process in the area. Because of humid, climate condition of savanna (guinea savanna) both physical, chemical and biological weathering are active in the environment. Which consequently lead to fragmentation of rock materials to form soil at based and hill top.

STEP III: The teacher explains and asks students to observe pattern of distribution of biotic components of the Hills and their adaptive features.He then takes the students round to observe and sample where possible of the biotic component of the hill habitat e.g. Rat, insect, Birds, frogs, snake, chameleon, lizard, grasses, shrubs free etc.The teacher asks students to construct food chain of the biotic component that can be found in Hill habitat. e.gGrasses Rat Snake

The teacher guides students to take reading of temperature, relative humidity and estimate light intensity of the Hill.

Evaluation: The teacher evaluates the lesson by asking question base on the lesson presented e.g.

1. What is Hill and the characteristics of hill habitat?
2. What are the biotic of components found in the hill habitat?
3. What are the adaptive features observed on the biotic component in the hill?

Conclusion: The teacher concludes the lesson by summarizing the lesson by defining Hill, list some characteristics of hill habitat and naming some of the biotic component found in the hill.

Students Activities: The students would use the possible Sample Collected and what they have observed and write report.

LESSON PLAN FOR EXPERIMENTAL GROUP TWO (Inquiry-Based Instruction)

Week 1:

Subject: Biology

Topic: Habitat (fresh water- pond)

Class: SSII

Time: 40 Minutes

Behavioral Objectives: At the end of the lesson, student should be able to

i. Observe and record the characteristics of ponds habitat,

ii. Identify and name the adaptation of the plants and animals in the pond habitat.

iii. Identify and arrange (order) the food chain in the pond habitat

iv. Observe, identify and name animals and plants that can be found in pond habitat

Previous Knowledge: The students already know the meaning of Ecology, biotic and abiotic components

Introduction: The teacher introduces the lesson by asking question on the previous knowledge e.g. what is ecology?

Presentation

Step 1: The teacher takes the students to the pond and requires them to bring and use the guided sheet. Also tell them to record what they observed in their KWL chart.

The teacher defines and explains pond while the students are looking at the pond e.g pond is a small body of shallow water having no or feeble current. Ponds vary in size depending upon age and location.

Step II: The teacher asks the students to identify and arrange/construct (order) food chain of the biotic component observed e.g Insect → Tree frog → Water snake.

Step III: The teacher asks students to observe the pattern of distribution of the biotic components of the pond and their adaptive features. He then takes students to identify and

take sample where possible of (plants and Animals) component in the pond habitat e.g tad pole, water lettuce, tree frog, water lily, water Snake, arrow head e.t.c

Step IV: The teacher guide students to take reading of temperature, relative humidity and estimate light intensity of the pond.

Evaluation: The teacher evaluates the lesson by asking questions based on the lesson presented e.g

1. What are the characteristic of pond habitat?
2. What are the examples of plants and animals that can be found in pond habitat?
3. Observe, identify and construct a food chain of the biotic components observed

Conclusion: The teacher concludes lesson by summarizing a topic learnt e.g define pond, some characteristics of pond habitat, naming some of plants and animals that can be found in pond habitat.

Students Activities: The student would use the possible sample collected and what they have observed and write report.

Week2: Experimental Group (Inquiry-Based Instruction)

Subject - Biology

Topic - Hill (Terrestrial Habitat)

Class - SS II

Time - 1½ hours

Behavioral objectives: It is expected that at the end of the lesson, students should be able to:

i. Observe and name the characteristics of Hill habitat

ii. Classify the adaptation of plants and Animals in the Hill habitat.

iii. Identify the food chain in the hill habitat.

iv. Identify and name some biotic component in the hill.

Previous knowledge: The students observe pond, characteristics and the types of plants and animals found in the pond habitats.

Introduction: The teacher introduces the lesson by questions on the previous knowledge e.g. what is pond? What are the characteristics of pond what are the biotic component found in the pond habitat? What is aquatic habitat?

Presentation

STEP I: The teacher takes the students to Kudaru Hill and requires the students to jot important points as he was explaining the characteristics of the habitat.The teacher defines Hills e.g. Hills are regarded as small high land areas exposed out due to agent of denudation.

STEP Il: The teacher, name and explain characteristics of Hill e.g hill is social mass of intrusive Igneous rock which are undergoing modification due to weathering process in the area. Because of humid, climate condition of savanna (guinea savanna) both physical, chemical and biological weathering are active in the environment. Which consequently lead to fragmentation of rock materials to form soil at based and hill top.

STEP III: The teacher explains and asks students to observe pattern of distribution of biotic components of the Hills and their adaptive features.He then takes the students round to observe and sample where possible of the biotic component of the hill habitat e.g. Rat, insect, Birds, frogs, snake, chameleon, lizard, grasses, shrubs free etc.

STEP IV: The teacher asks students to construct food chain of the biotic component that can be found in Hill habitat. e.g Grasses ⟶ Rat ⟶ Snake. The teacher guides students to take reading of temperature, relative humidity and estimate light intensity of the Hill.

Evaluation: The teacher evaluates the lesson by asking question base on the lesson presented e.g.

i. What is Hill?

ii. What are the characteristics of hill habitat?

iii. What are the biotic of components found in the hill habitat?

iv. What are the adaptive features observed on the biotic component in the hill?

Conclusion: The teacher concludes the lesson by summarizing the lesson by defining Hill, list some characteristics of hill habitat and naming some of the biotic component found in the hill.

Students Activities: The students would use the possible Sample Collected and what they have observed and write report.

Week 3: Experimental Group (Inquiry-Based Instruction)

Subject - Biology

Topic - Abandoned farm land (terrestrial) habitat

Class - SSII

Time - 1½ hours

Behavioral objectives: It is expected that at the end of the lesson the students should be able to:

i. Observe, Identify and name the characteristics of abandoned farm land habitat
ii. Identify the adaptive feature of biotic component of the abandoned farm land habitat,
iii. Identify some of the biotic component found or observed in the abandoned farm land habitat.
iv. Name some of the biotic component found or observed in the abandoned farm land habitat.

Previous knowledge: The students know Hill habitat, they know the meaning of Hill, characteristics of hill, the adaptive features of Hill and biotic component of the hill.

Introduction: The teacher introduces the lesson by asking questions on the previous knowledge e.g what is Hill? What are the characteristics of Hill habitat? What are the adaptive features of the biotic component of the hill habitat? What are the biotic components found in the Hill habitat?

Presentation

Step I: The teacher defines abandoned farm land while students are observing e.g this is the type of farm land that is left unfarmed or no crops planted for some years (2 and above years).

STEP II: The teacher name and explain while students are observing the characteristics of abandoned farm land e.g. in the abandoned farm land, the pioneers are weeds and underground stems, seeds of plant, eggs and Larvae of insect and worms. These pioneers derived their food from the left-over nutrients of the old farm. Animal such as mice, rats and cane rat's lizard are also found.

STEP III: He then takes the students round to observe and collect sample where possible of the biotic component of the abandoned farm land e.g. grasses, insect rat, lizard, trees etc.

STEP IV: The teacher explains food chain and guide to construct food chain of the biotic component observed in the abandoned farm land. E.g

Grass ⟶ Grasshopper ⟶ Snake

Evaluation: He evaluates the lesson base on what the student has been observed on the abandoned farm land habitat e.g.

4. What are characteristics of abandoned farm land?
5. What are the adaptive features of the biotic component that can be found in the abandoned farm land?
6. What are the biotin components found in the abandoned farm land habitat?

Student's activities: The students would use what they have observed and the possible sample collected to write report.

Week 4: Experimental Group (Inquiry-Based Instruction)

Subject - Biology

Topic - Marshes Habitat

Class - SS II

Time - 1 ½ hours

Behavioral objectives: the students should be able to:

i. Classify the types of marshes

ii. Observe the adaptations of organisms in habitat.

iii. Identify the plants and animals that live in marshes.

iv. Identify the adaptations of organisms in marshes habitat.

Previous Knowledge: - The students know the meaning of pound; the characteristics of pond, the adaptive features of plants and animals in the pond.

Introduction: - The teacher introduces the lesson by asking some questions on the previous knowledge e.g.

3. What are the adaptive features of plants in the pond?
4. What are the general characteristics of pond habitat?

Presentation;

Step I:- The teacher would take the students to the marsh habitat he then defines and explain marsh habitat while the students are observing e.g Marsh is a low, flat, land completely or partly covered by shallow water with silt frequently, deposited. The water is

about knee deep in most parts while is less in many other places.He then name and explains while students are observing the types of marshes: temporary marshes are seasonal occurring during the rainy season drying up in the dry season, while permanent marshes: contains water throughout the year. They are close to the rivers or seas which serve permanent water source.

Step II :- He identify and explains the characteristics of marsh habitat e.g low and habitat covered with water (if permanent) but dry up during the dry season (if temporary). Soils is soft making difficult for big animal vegetation is normally dominated by grasses, the contents of mineral salts is high and dissolved oxygen content is low.

Step III :- The teacher also classify and show adaptive features of plants and animals e.g animals; warm, crabs and bivalves burrow into the soft mud to avoid high temperature and drying up, insect larvae, beetles and frogs come near the surface to gulp atmospheric air to survive the low oxygen content in the water. Plants. The grasses grow large branches or tussocks to avoid being washed away by water movement. Their leaves are long narrow and held high above water for atmospheric gaseous exchange to compensate for poor aeration of the logged soil.

Step IV:- He also name and show plants and animals that lives in marsh habitat. Plants: vossia cuspidate, duckweed, water lily, water lettuce, salvina, azolla algae etc. animals: water snake, tad pole, frogs, larvae, insectse.t.c.The teacher explains how to take reading of temperature, relative humidity and estimate light intensity the marsh.

Evaluations: - The teacher evaluate by asking questions on lesson presented e.g.

i. what are the plants and animals found in marsh habitat?

ii. What are the types of marshes habitat?

iii. List the type of adaptations of organisms in marshes habitat.

iv. Identify the plants and animals that live in marshes.

Conclusion: The teacher concludes the lesson by summarizing the whole lesson e.g by defining marsh. Naming the characteristic of marsh adaptive features e.t.c.

Week 5: Experimental Group (Inquiry-Based Instruction)

Subject: Biology

Topic: Community

Class: SSII

Time: 40 Minutes

Behavioral Objectives: At the end of the lesson, student should be able to

Observe and record the number of flowers found on pride of Barbados plant growing in two different sites, **A** and **B**.

Site **A** Sunny and dry	Site **B** Shady and damp
Number of flowers 7 12 9 5 9 7 18 7 8 3 7 11 4 15 11 9 7 6 9 5 6 8 13 4 8 7 18 15 9 7 8 18 13 9 9	Number of flowers 3 0 11 7 4 3 6 5 4 2 4 3 5 5 8 4 3 1 6 2 4 5 9 4 5 4 7 3 v. 3 8 4 7 3 5

i. Complete the table below to show how the plant in the different sites flowered.

Number of flowers

Site	0-3	4-7	8-11	12-15	16-18
A B					

ii. Identify and name the adaptation of the plants and animals in the pond habitat.

iii. Identify and arrange (order) the food chain in the pond habitat

iv. Observe, identify and name animals and plants that can be found in pond habitat

Previous Knowledge: The students already know the meaning of Ecology, biotic and abiotic components

Introduction: The teacher introduces the lesson by asking question on the previous knowledge e.g. what is ecology?

Presentation Step 1: The teacher takes the students to the field and direct them on how to fill table.

Site	0-3	4-7	8-11	12-15	16-18
A	1	13	13	6	3
B	11	18	5	0	0

Step II: The teacher defines and explains pond while the students are looking at the pond e.g pond is a small body of shallow water having no or feeble current. Ponds vary in size depending upon age and location.

Step III: The teacher asks the students to identify and arrange/construct (order) food chain of the biotic component observed e.gInsect ⟶ Tree frog ⟶ Water snake.

Step IV: The teacher asks students to observe the pattern of distribution of the biotic components of the pond and their adaptive features. He then takes students to identify and take sample where possible of (plants and Animals) component in the pond habitat e.g tad pole, water lettuce, tree frog, water lily, water Snake, arrow head e.t.cThe teacher guide students to take reading of temperature, relative humidity and estimate light intensity of the pond.

Evaluation: The teacher evaluates the lesson by asking questions based on the lesson presented e.g

i. What are the characteristic of pond habitat?
ii. What are the examples of plants and animals that can be found in pond habitat?
iii. Observe, identify and construct a food chain of the biotic components observed

Conclusion: The teacher concludes lesson by summarizing a topic learnt e.g define pond, some characteristics of pond habitat, naming some of plants and animals that can be found in pond habitat.

Students Activities: The student would use the possible sample collected and what they have

Observed and write report.

Week 6: Experimental Group (Inquiry-Based Instruction)

Subject - Biology

Topic - Hill (Terrestrial Habitat)

Class - SS II

Time - 1½ hours

Behavioral objectives: It is expected that at the end of the lesson, students should be able to:

Snail is a mollusk. Johnson collected 50 snails and measured the length of their shells. The results are shown below.

Observe carefully

16 18 25 19 20 15 25 20 19 17 23 30 12 25

22 10 18 14 24 14 23 17 24 11 15 17 24 31

22 23 22 18 28 23 26 13 26 27 20 8 10 23

29 23 16 21 11 13 19 20

i. Complete the table below to show the number of snails with different shell lengths.

Shell length	8-11 cm	12-15 cm	16-19 cm	20-23 cm	24-27 cm	28-31 cm
Number of						

snails						

ii. Classify the adaptation of plants and Animals in the Hill habitat.

iii. Identify the food chain in the hill habitat.

iv. Identify and name some biotic component in the hill.

Previous knowledge: The students observe pond, characteristics and the types of plants and animals found in the pond habitats.

Introduction: The teacher introduces the lesson by questions on the previous knowledge e.g. what is pond? What are the characteristics of pond what are the biotic component found in the pond habitat? What is aquatic habitat?

Presentation

STEP I: The teacher takes the students to Kudaru Hill and requires them to bring and use the guided sheet and also advise them to record what they would observe as follow;

Shell length	8-11 cm	12-15 cm	16-19 cm	20-23 cm	24-27 cm	28-31 cm
Number of snails	5	7	11	14	9	4

The teacher defines Hills e.g. Hills are regarded as small high land areas exposed out due to agent of denudation.

STEP II: The teacher, name and explain characteristics of Hill e.g hill is social mass of intrusive Igneous rock which are undergoing modification due to weathering process in the area. Because of humid, climate condition of savanna (guinea savanna) both physical,

chemical and biological weathering are active in the environment. Which consequently lead to fragmentation of rock materials to form soil at based and hill top.

STEP III: The teacher explains and asks students to observe pattern of distribution of biotic components of the Hills and their adaptive features.

STEP IV: He then takes the students round to observe and sample where possible of the biotic component of the hill habitat e.g. Rat, insect, Birds, frogs, snake, chameleon, lizard, grasses, shrubs free etc.The teacher asks students to construct food chain of the biotic component that can be found in Hill habitat. e.g Grasses → → Rat Snake. The teacher guides students to take reading of temperature, relative humidity and estimate light intensity of the Hill.

Evaluation: The teacher evaluates the lesson by asking question base on the lesson presented e.g.

i. What is Hill?
ii. What are the characteristics of hill habitat?
iii. What are the biotic of components found in the hill habitat?
iv. What are the adaptive features observed on the biotic component in the hill?

Conclusion: The teacher concludes the lesson by summarizing the lesson by defining Hill, list some characteristics of hill habitat and naming some of the biotic component found in the hill.

Students Activities: The students would use the possible Sample Collected and what they have observed and write report.

LESSON PLAN FOR CONTROL GROUP

Week 1: Control Group

Subject: Biology

Topic: Habitat (fresh water- pond)

Class: SSII

Time: 40 Minutes

Behavioral objectives: It is expected that at the end of the lesson, students should be able to:

i. Observe and defines a ponds habitat.

ii. Observe and name the adaptation of the plants and animals in pond habitat.

iii. Identify and name animals and plants that can be found pond habitat

iv. Identify and construct a food chain found in the pond habitat

Previous Knowledge: The students known the meaning of Ecology biotic and a biotic component

Introduction: The teacher introduces the lesson by asking question(s) based on the previous knowledge e.g what is ecology?

Presentation

Step 1: The teacher defines and explains pond e.g pond is a small body of shallow water having no or feeble current Ponds vary in size depending upon age and location.

Step Il: The teacher then lists and explain the characteristics of pond habitat. E.g the water is stagnant it, has little or no salt in them, lack waves and tides etc.

Step III: The teacher explains plants and animals adaptive feature to pond: Plants: Well developed numerous fibrous roots system for firm anchorage into the soft mud, Numerous root hairs for absorption of nutrient from the soil, there are numerous spines on the long petioles. These spines are protective in function Animals: the body is long and flexible which help to locomotion, protective coloration, and the scales are smooth and water repellent for easy locomotion in water.

Step IV: He also list the plants and Animals that can found in pond habitat e.g plants: Water lettuces, water fern, Duck weed, water lily. Animals: Tree frog, dragon flies, Bird e.t.c. The teacher explains the possible food chain found in pond environment e.g insect tree frog water snake

Evaluation: The teacher evaluates the lesson by asking questions base on the lesson presented e.g what are the characteristics habitat? What are the examples of plants and animals that can be found in pond habitat?

Conclusion: The teacher concludes the lesson by summarizing the lesson e.g defining pond, some characteristics of pond habitat. Naming some of plants and animals that can be found in pond habitat.

Week 2: Control Group

Subject - Biology

Topic - Hill (Terrestrial Habitat)

Class - SS II

Time - 1 ½ hours

Behavioral objectives: It is expected that at the end of the lesson, student should be able to:

i. Observe, identify and name the characteristics of hill habitat.

ii. Identify and name the adaptation of the plants and Animals in the hill habitat.

iii. Identify and name some biotic component in the hill

iv. Construct (order) a food chain of the organisms found in Hill habitat.

Previous knowledge: The students know pond characteristics and the types of plants and animals found in the pond habitats.

Introduction: The teacher introduces the lesson by asking questions on the previous knowledge e.g what is pond? What are the characteristics of pond? What arc biotic components found in the pond habitat? What is aquatic habitat?

Presentation:

STEP I: The teacher defines hills e.g. hills are regarded as small high land areas exposed out due to agent of denudation.

STEP II: The teacher, name and explain the characteristics of hill i.e. it's characterized as social mass of intrusive igneous winch we undergoing modification due to weathering process in the area, Because of humid, climate condition of savanna (guinea savanna) physical, Chemical and biological weathering are active in the environment. Which consequently lead to fragmentation of rock materials to form soil at base and hill top.

STEP III: The teacher explains the pattern of distribution of biotic components of the Hills and their adaptive features.He then name the biotic component of the Hill habitat e.g. Rat, insect, Birds, frogs, snake chameleon, frogs, lizard, grasses, shrubs free etc.

STEP IV: The teacher construct food chain of the biotic component that can be found in Hill habitat. e.g Grasses → Rat → snake. The teacher explains to the students how to take reading of temperature, relative humidity and estimate light intensity of the Hill.

Evaluation: The teacher evaluates the lesson by asking questions base on the lesson presented e.g.

i. what is hill?
ii. What are the characteristics of hill habitat?
iii. What are the biotic components found in the hill habitat?
iv. What are the adaptive features observed on the biotic component in the hill?

Conclusion: The teacher concludes the lesson summarizing the lesson by defining Hill, list some characteristics of hill habitat and naming some of the biotic component found in hill.

Students Activities: The students will copy note in their exercise books.

Week 3: Control Group

Subject - Biology

Topic - Abandoned farm land (terrestrial) habitat

Class - SS II

Time - 1½ hours

Behavioral objectives: it is expected that at the end of the lesson the student should be able to:

1. Observe, identify and name the characteristics of abandoned farm land habitat
2. Identify the adaptive features of the biotic component of the abandoned farm land habitat.
3. Identify some of the biotic component found or observed in the abandoned farm land habitat.
4. Name some of the biotic component found or observed in the abandoned farm land habitat.

Previous knowledge: The students know hill, they know the meaning of Hill, characteristics of hill, the adaptive features of Hill and biotic component of the Hill.

Introduction: The teacher introduces the lesson by asking questions on the previous knowledge e.g. what is Hill? What are the characteristics of Hill habitat? What are the

adaptive features of the biotic component of the hill habitat? What are biotic components found in the Hill habitat?

Presentation;

STEP I: The teacher defines abandoned farm land e.g. this is the type of farm land that is left unfarmed or no crops planted for some years (2 and above years).

STEP II: The teacher explains and names the characteristics of abandoned farm land, E.g. in the abandoned farm land, the pioneers are weeds and underground stems, seeds of plant, eggs and larvae of insect and worms. These pioneers derived their food from the left-over nutrients of the old farm. Animal such as mice, rats, and cane rats, lizard is also found.

STEP III: He then names the biotic component of the abandoned farm land e.g. grasses, insect rat, lizard, trees etc.

STEP IV: The teacher explains food chain and guide students to construct food chain of the biotic component observed in the abandoned farm land. e.g. Grass → Grasshopper → lizard → Snake

Evaluation: He evaluates the lesson base on what the lesson has been presented on the abandoned farm land habitat e.g. what are the characteristics of abandoned farm land? What are the adaptive features of the biotic component that can be found in the abandoned farm land? What is the biotic component found in the abandoned farm land habitat?

Student's activities: The students would copy note into their exercise books.

Week 4: Control Group

Subject - Biology

Topic - Marshes Habitat

Class - SS II

Time - 1½ hours

Instruction materials: - chart showing marshy areas.

Behavioral objectives: the students should be able to:

1. Classify the types of marshes
2. Observe and identify the adaptations of organisms in marshes habitat.
3. Identify the plants and animals that live in marshes.
4. Identify features of organism adaptation in marshes habitat

Previous Knowledge: - The students know the meaning of pond the characteristics of pond the adaptive features of plants and animals in the pond.

Introduction: - The teacher introduces the lesson by asking some questions on the previous knowledge e.g. what the adaptive features of plants in the pond are? what arc the general characteristics of pond habitat.

Presentation: The teacher presents the lesson in steps as follow;

STEP I :-The teacher define and explain marsh habitat e.g. Marsh is a low, flat land completely or partly covered by shallow water with silt frequently, deposited. The water is about knee deep in most parts while is less in many other places.He then name and explains the types of marshes Temporary marshes are seasonal occurring during the rainy season drying up in the dry season while permanent marshes: contains water throughout the year, They are close to the rivers or seas which serve as permanent water source.

STEP II :- He also names, and explains the characteristic of marsh habitat e.g low and habitat covered with water (if permanent), but dry up during the dry season (if temporary) soils is soft making difficult for big animal to move, the vegetation s normally dominated by grasses, the contents of mineral salt is high and dissolved oxygen content is low.

STEP III: The teacher also name adaptive features of plants and animals e.g Animals warm, crabs and bivalves burrow into the soft mud to avoid high temperature and drying up, insect larvae, beetles and frogs come near the surface to gulp atmospheric air to survive the low oxygen content in the water, Plants: the grasses grow in large branches or tussocks to avoid being washed away by water movement, their leaves are long narrow and held high above water for atmospheric gaseous exchange to compensate for poor aeration of the water logged soil.

STEP IV:- He also name plants and animals that lives in marsh habitat. Plants: vossia cuspidate, duckweed. water lily, water lettuce, salvina, Azolla, algae etc. Animals: water snake, tad pole, frogs, larvae, insect's e.t.c.The teacher tells students how take reading temperature, relative humidity and estimate light intensity of the marsh.

Evaluations: - The teacher evaluate by asking questions on lesson presented e.g what are the plants and animals found in marsh habitat?

Conclusion: The teacher concludes the lesson by summarizing the whole lesson e.g by defining marsh, naming the characteristics of marsh, adaptive feature of the marsh.

Week 5: Control Group

Subject: Biology

Topic: Habitat (fresh water- pond)

Class: SSII

Time: 40 Minutes

Behavioral objectives: It is expected that at the end of the lesson, students should be able to:

The teacher observes and record the number of flowers found on pride of Barbados plant growing in two different sites, **A** and **B**.

Site **A** Sunny and dry	Site **B** Shady and damp
Number of flowers 7 12 9 5 9 7 18 7 8 3 7 11 4 15 11 9 7 6 9 5 6 8 13 4 8 7 18 15 9 7 8 18 13 9 9	Number of flowers 3 0 11 7 4 3 6 5 4 2 4 3 5 5 8 4 3 1 6 2 4 5 9 4 5 4 7 3 iv. 3 8 4 7 3 5

i. The teacher completes the table below to show how the plant in the different sites flowered.

Number of flowers

Site	0-3	4-7	8-11	12-15	16-18
A B					

ii. The teacher identifies and name the adaptation of the plants and animals in the pond habitat.

iii. The teacher identifies and arrange (order) the food chain in the pond habitat

iv. List the plants and animals that are found in pond habitat

Previous Knowledge: The students known the meaning of Ecology biotic and a biotic component

Introduction: The teacher introduces the lesson by asking question(s) based on the previous knowledge e.g what is ecology?

Presentation — step 1: The teacher record what they have observe as follow;

Shell length	8-11 cm	12-15 cm	16-19 cm	20-23 cm	24-27 cm	28-31 cm
Number of snails	5	7	11	14	9	4

Step Il: The teacher then lists and explain the characteristics of pond habitat. E.g the water is stagnant it, has little or no salt in them, lack waves and tides etc.

Step III: The teacher explains plants and animals adaptive feature to pond: Plants: Well developed numerous fibrous roots system for firm anchorage into the soft mud, Numerous

root hairs for absorption of nutrient from the soil, there are numerous spines on the long petioles. These spines are protective in function Animals: the body is long and flexible which help to locomotion, protective coloration, and the scales are smooth and water repellent for easy locomotion in water.

Step IV: He also list the plants and Animals that can found in pond habitat e.g plants: Water lettuces, water fern, Duck weed, water lily. Animals: Tree frog, dragon flies, Bird e.t.c

The teacher explains the possible food chain found in pond environment e.g insect tree frog water snake

Evaluation: The teacher evaluates the lesson by asking questions base on the lesson presented e.g

i. what are the characteristics habitat?
ii. What are the examples of plants and animals that can be found in pond habitat?

Conclusion: The teacher concludes the lesson by summarizing the lesson e.g defining pond, some characteristics of pond habitat. Naming some of the plants and animals that can be found in pond habitat.

Week 6: Control Group

Subject - Biology

Topic - Abandoned farm land (terrestrial) habitat

Class - SS II

Time - 1½ hours

Behavioral objectives: it is expected that at the end of the lesson the student should be able to:

Snail is a mollusk. Johnson collected 50 snails and measured the length of their shells. The results are shown below.

The teacher observes carefully

16 18 25 19 20 15 25 20 19 17 23 30 12 25

22 10 18 14 24 14 23 17 24 11 15 17 24 31

22 23 22 18 28 23 26 13 26 27 20 8 10 23

29 23 16 21 11 13 19 20

i. Complete the table below to show the number of snails with different shell lengths.

Shell length	8-11 cm	12-15 cm	16-19 cm	20-23 cm	24-27 cm	28-31 cm
Number of snails						

ii. The teacher classifies the adaptation of plants and Animals in the Hill habitat.

iii. The teacher identifies the food chain in the hill habitat.

iv. The teacher identifies and name some biotic component in the hill.

Previous knowledge: The students know hill, they know the meaning of Hill, characteristics of hill, the adaptive features of Hill and biotic component of the Hill.

Introduction: The teacher introduces the lesson by asking questions on the previous knowledge e.g. what is Hill? What are the characteristics of Hill habitat? What are the adaptive features of the biotic component of the hill habitat? What are biotic components found in the Hill habitat?

Presentation;

STEP I: The teacher takes the students to Kudaru Hill and record what he has observe while the student are watching at him;

Shell length	8-11 cm	12-15 cm	16-19 cm	20-23 cm	24-27 cm	28-31 cm
Number of snails	5	7	11	14	9	4

STEP II: The teacher defines Hills e.g. Hills are regarded as small high land areas exposed out due to agent of denudation. The teacher, name and explain characteristics of Hill e.g hill

is social mass of intrusive Igneous rock which are undergoing modification due to weathering process in the area. Because of humid, climate condition of savanna (guinea savanna) both physical, chemical and biological weathering are active in the environment. Which consequently lead to fragmentation of rock materials to form soil at based and hill top.

STEP III: The teacher explains and asks students to observe pattern of distribution of biotic components of the Hills and their adaptive features.He then takes the students round to observe and sample where possible of the biotic component of the hill habitat e.g. Rat, insect, Birds, frogs, snake, chameleon, lizard, grasses, shrubs free etc.

STEP IV: The teacher construct food chain of the biotic component that can be found in Hill habitat. e.g Grasses → Rat → Snake. The teacher takes reading of temperature, relative humidity and estimate light intensity of the Hill.

Evaluation: He evaluates the lesson base on what he has presented on the abandoned farm land habitat e.g.

i. what are the characteristics of abandoned farm land?
ii. What are the adaptive features of the biotic component that can be found in the abandoned farm land?
iii. What is the biotic component found in the abandoned farm land habitat?

Student's activities: The students copy note into their exercise books.

APPENDIX VII

Students Ecology Concept Interest Questionnaire (SECIQ)

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items

7284	.809	25

Item Statistics

	Mean	Std. Deviation	N
I enjoy learning ecology concept of Biology	3.4000	1.45270	30
Studies are interesting when ecology concept is taught	3.4333	1.04000	30
I understand better the learning of ecology concept in Biology	3.1333	1.30604	30
I participate better in the lessons of ecology concept	3.0667	1.46059	30
Learning ecology concept of Biology is difficult for me	3.5000	1.07479	30
I am not focus when ecology concept of Biology is taught	2.8333	1.53316	30
The teacher involves me more in class discussion when ecology concept of Biology is taught	2.8000	1.34933	30
Ecology concept of Biology should be removed in biology curriculum from secondary schools	3.6333	1.15917	30
I enjoy discussing ecology concept of Biology with my colleagues	3.1333	1.52527	30
Ecology concept of Biology is relevant to me	2.8000	1.34933	30
There are less discipline problems in the class when ecology concept of Biology is taught	3.5667	1.19434	30
Ecology concept of Biology distract me from the lesson	3.5667	1.47819	30
Ecology concept of Biology is connected to my life	3.2000	1.44795	30
I concentrate better in class when ecology concept is taught	2.9333	1.14269	30
I am bored during the lesson involving ecology concept of Biology	3.5667	1.47819	30
I easily do my homework on ecology concept of Biology	2.8000	1.06350	30
Ecology concept of Biology is easily comprehended and understood	3.8000	1.27035	30
I invest less effort in learning ecology concept of Biology	2.7667	1.38174	30
Less time is spent in explanation when ecology concept of Biology is taught	2.8000	1.06350	30

I feel like the lesson on ecology concept of Biology shouldn't end quickly	3.6667	1.34762	30
I like receiving instruction when the teacher teaches ecology concept of Biology	3.6333	1.37674	30
Learning ecology concept of Biology makes me nervous	2.9000	1.32222	30
Learning ecology concept of Biology is very frustrating	2.9333	1.08066	30
I can learn many things when my teacher teaches ecology concept of Biology	3.6333	1.37674	30
I will study ecology as a course when I go to higher institution	3.7000	1.46570	30

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.248	2.767	3.800	1.033	1.373	.131	25

Ecology Performance Test (EPT)

Test and Re-Test reliability using PPMC

Raw scores of the two sets of tests for determining the coefficient of reliability of the test instrument

S/NO	X	Y	X^2	Y^2	XY
1	75	75	5625	5625	5625
2	72	73	5184	5329	5256
3	78	80	6084	6400	6240
4	75	75	5625	5625	5625
5	63	64	3969	4096	4032
6	57	59	3249	3481	3363
7	54	56	2916	3136	3024
8	72	74	5184	5476	5328
9	60	60	3600	3600	3600
10	57	59	3249	3481	3363
11	69	71	4761	5041	4899
12	81	82	6561	6724	6642
13	66	68	4356	4624	4488
14	69	71	4761	5041	4899
15	72	71	5184	5041	5112
16	78	79	6084	6241	6162
17	78	80	6084	6400	6240
18	66	68	4356	4624	4488
19	63	64	3969	4096	4032
20	51	53	2601	2809	2703
21	57	59	3249	3481	3363
22	63	64	3969	4096	4032
23	75	77	5625	5929	5775
24	63	60	3969	3600	3780

25	54	52	2916	2704	2808
26	78	77	6084	5929	6006
27	72	70	5184	4900	5040
28	69	69	4761	4761	4761
29	60	61	3600	3721	3660
30	63	61	3969	3721	3843
N=30	∑**X**=2010	∑**Y=2032**	∑**X2**=136728	∑**Y2**=139732	∑**XY=138189**

Note: x and y are first and second tests scores for performance of students

N=30	∑**X**=2010	∑**Y=2032**	∑**X2**=136728	∑**Y2**=139732	∑**XY=138189**

The formula for Pearson Product Moment Correlation test re test is given below:

$$\mathbf{R = \frac{N(\sum xy) - (x)\sum Y}{((N(X^2) - (NY^2) - (Y)^2)}}$$

N=Number of respondents

X is test scores at pre-test

Y is test scores at post test

∑x is scores at pretest is summed

∑y is scores at Post test is summed

$\sum x^2$ is scores at pre-test is squared and summed

$\sum Y^2$ is scores at post test is squared and summed

$(\sum x)^2$ is scores at pre-test is summed and squared

$(\sum Y)^2$ is scores at post-test is summed and squared, Where:

N=30	∑**X**=2010	∑**Y=2032**	∑**X2**=136728	∑**Y2**=139732	∑**XY=138189**

Pearson Product Moment Correlation formula is:

$$r = \frac{N(\sum xy) - \sum (x)\sum Y}{((N(\sum X^2) - (N*\sum Y^2) - (\sum Y)^2}$$

Substituting the values in the formulae:

$$= \frac{30*138189 - 20102032}{}$$

$30*(136728)^2 - 30*139732-(2032)^2$

=.873

r=.87

Ecology Social Skills Acquisition Questions (ESSAQ)

Test and Re-Test reliability using PPMC

Appendix VIII: Raw scores of the tests for determining the coefficient of reliability of the test instrument

S/NO	X	Y	X^2	Y^2	XY
1	77	78	5929	6084	6006
2	74	75	5476	5625	5550
3	80	81	6400	6561	6480
4	77	76	5929	5776	5852
5	65	66	4225	4356	4290
6	59	61	3481	3721	3599
7	56	57	3136	3249	3192
8	74	75	5476	5625	5550
9	62	64	3844	4096	3968
10	59	60	3481	3600	3540
11	71	73	5041	5329	5183
12	83	83	6889	6889	6889
13	68	68	4624	4624	4624
14	71	72	5041	5184	5112
15	74	75	5476	5625	5550
16	80	80	6400	6400	6400
17	80	81	6400	6561	6480
18	68	69	4624	4761	4692
19	65	66	4225	4356	4290
20	53	52	2809	2704	2756
21	56	57	3136	3249	3192
22	65	64	4225	4096	4160
23	77	76	5929	5776	5852
24	65	63	4225	3969	4095

25	56	55	3136	3025	3080
26	80	80	6400	6400	6400
27	74	76	5476	5776	5624
28	71	70	5041	4900	4970
29	62	61	3844	3721	3782
30	65	65	4225	4225	4225
N=30	∑**X**=2067	∑**Y=2079**	∑**X2**=144543	∑**Y2**=146263	∑**XY=145383**

Note: x and y are first and second tests scores for acquisition of students

The formula for Pearson Product Moment Correlation test re test is given below:

$$\mathbf{R = \frac{N(\sum xy) - (x)\sum Y}{((N(X^2) - (NY^2)-(Y)^2)}}$$

N=Number of respondents

X is test scores at pre-test

Y is test scores at post-test

∑x is scores at pretest is summed

∑y is scores at Posttest is summed

$\sum x^2$ is scores at pre-test is squared and summed

$\sum Y^2$ is scores at post-test is squared and summed

$(\sum x)^2$ is scores at pre-test is summed and squared

$(\sum Y)^2$ is scores at posttest is summed and squared, Where:

N=30	∑**X**=2067	∑**Y=2079**	∑**X2**=144543	∑**Y2**=146263	∑**XY=145383**

Pearson Product Moment Correlation formula is:

$$r = \frac{N(\sum xy) - \sum (x)\sum Y}{((N(\sum X^2) - (N*\sum Y^2)-(\sum Y)^2}$$

Substituting the values in the formulae:

$$= \frac{30*145383 - 2067*2079}{30*(144543)^2 - 30*146263-(2079)^2}$$

=.816

r=.82

- the use of Field-trip and Inquiry-based Instructional methods.

APPENDIX VIII

Pre test

One-way

Descriptive

Performance

	N	Mean	Std. Deviation	Std. Error
GSS Yarkasuwa	54	29.5556	6.35927	.86539
GSS Damakasuwa	57	30.8596	6.22334	.82430
GSS Saminaka	52	29.8846	6.31417	.87562
GSS Kono	52	20.6731	6.44653	.89397
GSS Lere	59	21.7119	6.17294	.80365
GSS Garun Kurama	51	21.0784	6.35561	.88996
Total	325	25.6615	7.71138	.42775

ANOVA

Performance

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6572.021	5	1314.404	33.029	.000
Within Groups	12694.748	319	39.795		
Total	19266.769	324			

Post Hoc Tests
Multiple Comparisons

Dependent Variable: Performance
Scheffe

GSS Yarkasuwa	GSS Damakasuwa	-1.30409	1.19796	.946
	GSS Saminaka	-.32906	1.22566	1.000
	GSS Kono	8.88248*	1.22566	.000
	GSS Lere	7.84369*	1.18805	.000
	GSS Garun Kurama	8.47712*	1.23177	.000
GSS Damakasuwa	GSS Yarkasuwa	1.30409	1.19796	.946
	GSS Saminaka	.97503	1.20974	.985
	GSS Kono	10.18657*	1.20974	.000
	GSS Lere	9.14778*	1.17161	.000
	GSS Garun Kurama	9.78122*	1.21592	.000
GSS Saminaka	GSS Yarkasuwa	.32906	1.22566	1.000
	GSS Damakasuwa	-.97503	1.20974	.985
	GSS Kono	9.21154*	1.23717	.000
	GSS Lere	8.17275*	1.19992	.000
	GSS Garun Kurama	8.80618*	1.24322	.000
GSS Kono	GSS Yarkasuwa	-8.88248*	1.22566	.000
	GSS Damakasuwa	-10.18657*	1.20974	.000
	GSS Saminaka	-9.21154*	1.23717	.000
	GSS Lere	-1.03879	1.19992	.980
	GSS Garun Kurama	-.40535	1.24322	1.000
GSS Lere	GSS Yarkasuwa	-7.84369*	1.18805	.000
	GSS Damakasuwa	-9.14778*	1.17161	.000
	GSS Saminaka	-8.17275*	1.19992	.000
	GSS Kono	1.03879	1.19992	.980
	GSS Garun Kurama	.63343	1.20615	.998
GSS Garun Kurama	GSS Yarkasuwa	-8.47712*	1.23177	.000
	GSS Damakasuwa	-9.78122*	1.21592	.000
	GSS Saminaka	-8.80618*	1.24322	.000
	GSS Kono	.40535	1.24322	1.000
	GSS Lere	-.63343	1.20615	.998

*. The mean difference is significant at 0.05 level.

Homogeneous Subsets

Performance

Scheffe[a,b]

School	N	Subset for alpha = 0.05	
		1	2
GSS Kono	52	20.6731	
GSS Garun Kurama	51	21.0784	
GSS Lere	59	21.7119	
GSS Yarkasuwa	54		29.5556
GSS Saminaka	52		29.8846
GSS Damakasuwa	57		30.8596
Sig.		.981	.949

Means for the groups in homogenous subsets are displayed.

Uses Harmonic Mean Sample Size = 54.015

The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

From the Table testing it was found out that the three schools of Yarkasuwa, Damakasuwa and Saminaka that have the same mean are selected for this study.

APPENDIX IX

Posttest and Post Posttest Result Outputs

Frequency Table

Groups

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Field Trip	55	33.7	33.7	33.7
	Inquiry Based	56	34.4	34.4	68.1
	Lecture	52	31.9	31.9	100.0
	Total	163	100.0	100.0	

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	94	57.7	57.7	57.7
	Female	69	42.3	42.3	100.0
	Total	163	100.0	100.0	

Tests

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Pretest	163	50.0	50.0	50.0
	Posttest	163	50.0	50.0	100.0
	Total	326	100.0	100.0	

Cross tabs

groups * Gender Cross tabulation

Count

		Gender		
		Male	Female	Total
groups	Field Trip	68	42	110
	Inquiry Based	62	50	112
	Lecture	58	46	104
Total		188	138	326

Oneway

Descriptives

social skill score

	N	Mean	Std. Deviation	Std. Error	Maximum
Field Trip	55	57.7273	5.79736	.78172	70.00
Inquiry Based	56	59.3750	7.58123	1.01308	87.00
Lecture	52	51.3846	2.92490	.40561	57.00
Total	163	56.2699	6.71746	.52615	87.00

ANOVA

social skill score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1897.781	2	948.890	28.051	.000
Within Groups	5412.342	160	33.827		
Total	7310.123	162			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: social skill score

Scheffes

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.
Field Trip	Inquiry Based	-1.64773	1.10413	.331
	Lecture	6.34266*	1.12497	.000
Inquiry Based	Field Trip	1.64773	1.10413	.331
	Lecture	7.99038*	1.12008	.000
Lecture	Field Trip	-6.34266*	1.12497	.000
	Inquiry Based	-7.99038*	1.12008	.000

*. The mean difference is significant at the 0.05 level.

Homogeneous Subsets

social skill score

Scheffe[a,b]

Groups	N	Subset for alpha = 0.05	
		1	2
Lecture	52	51.3846	
Field Trip	55		57.7273
Inquiry Based	56		59.3750
Sig.		1.000	.339

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 54.279.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

```
NPAR TESTS
  /K-W=Interrest BY groups(1 3)
  /MISSING ANALYSIS.
```

NPar Tests

Kruskal-Wallis Test

Ranks

	Groups	N	Mean Rank
Interest	Field Trip	55	108.14
	Inquiry Based	56	104.14
	Lecture	52	30.51
	Total	163	

Test Statistics[a,b]

	Interest
Kruskal-Wallis H	91.676
Df	2
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: groups

Oneway

Descriptives

Retention

	N	Mean	Std. Deviation	Std. Error	Maximum
Field Trip	55	42.9455	6.43606	.86784	56.00
Inquiry Based	56	43.8929	5.74513	.76772	56.00
Lecture	52	30.0192	5.85274	.81163	42.00
Total	163	39.1472	8.67324	.67934	56.00

ANOVA

Retention

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6387.292	2	3193.646	88.113	.011
Within Groups	5799.174	160	36.245		
Total	12186.466	162			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Retention

Scheffe

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.
Field Trip	Inquiry Based	-.94740	1.14290	.710
	Lecture	12.92622*	1.16448	.000
Inquiry Based	Field Trip	.94740	1.14290	.710
	Lecture	13.87363*	1.15942	.000
Lecture	Field Trip	-12.92622*	1.16448	.000
	Inquiry Based	-13.87363*	1.15942	.000

*. The mean difference is significant at the 0.05 level.

Homogeneous Subsets

Retention

Scheffe[a,b]

groups	N	Subset for alpha = 0.05	
		1	2
Lecture	52	30.0192	
Field Trip	55		42.9455
Inquiry Based	56		43.8929
Sig.		1.000	.715

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 54.279.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

```
ONEWAY Performance BY groups
  /STATISTICS DESCRIPTIVES
  /MISSING ANALYSIS
  /POSTHOC=SCHEFFE ALPHA(0.05).

ONEWAY Performance BY groups
  /STATISTICS DESCRIPTIVES
  /MISSING ANALYSIS
  /POSTHOC=SCHEFFE ALPHA(0.05).
```

Oneway

Descriptives

Performance

	N	Mean	Std. Deviation	Std. Error	Maximum
Field Trip	55	54.8182	7.20106	.97099	68.00
Inquiry Based	56	52.8929	5.74513	.76772	65.00
Lecture	52	39.1923	5.36890	.74453	51.00
Total	163	49.1718	9.22730	.72274	68.00

ANOVA

Performance

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	7707.574	2	3853.787	101.322	.000
Within Groups	6085.616	160	38.035		
Total	13793.190	162			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: Performance

Scheffe

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.
Field Trip	Inquiry Based	1.92532	1.17079	.262
	Lecture	15.62587*	1.19289	.000
Inquiry Based	Field Trip	-1.92532	1.17079	.262
	Lecture	13.70055*	1.18770	.000
Lecture	Field Trip	-15.62587*	1.19289	.000
	Inquiry Based	-13.70055*	1.18770	.000

*. The mean difference is significant at the 0.05 level.

Homogeneous Subsets

Performance

Scheffe[a,b]

		Subset for alpha = 0.05	
groups	N	1	2
Lecture	52	39.1923	
Inquiry Based	56		52.8929
Field Trip	55		54.8182
Sig.		1.000	.269

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 54.279.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

```
USE ALL.
COMPUTE filter_$=(test=2 and groups=1 or 2).
VARIABLE LABELS filter_$ 'test=2 and groups=1 or 2 (FILTER)'.
VALUE LABELS filter_$ 0 'Not Selected' 1 'Selected'.
FORMATS filter_$ (f1.0).
FILTER BY filter_$.
EXECUTE.
```

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Gender	1	Male	34
	2	Female	21
Groups	1.00	Field Trip	55

Descriptive Statistics

Dependent Variable: social skill score

Gender	Groups	Mean	Std. Deviation	N
Male	Field Trip	58.0000	6.27646	34
	Total	58.0000	6.27646	34
Female	Field Trip	57.2857	5.04126	21
	Total	57.2857	5.04126	21
Total	Field Trip	57.7273	5.79736	55
	Total	57.7273	5.79736	55

Tests of Between-Subjects Effects

Dependent Variable: social skill score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6.623[a]	1	6.623	.194	.661
Intercept	172538.696	1	172538.696	5057.028	.000
Gender	6.623	1	6.623	.194	.661
Groups	.000	0	.	.	.
Gender * groups	.000	0	.	.	.
Error	1808.286	53	34.119		
Total	185099.000	55			
Corrected Total	1814.909	54			

a. R Squared = .004 (Adjusted R Squared = -.015)

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Groups	1.00	Field Trip	55
	2.00	Inquiry Based	56
GenderGroup	1.00	male Field Trip	34
	2.00	Female Field Trip	21
	3.00	male Inquiry	31
	4.00	Female inquiry	25

Descriptive Statistics

Dependent Variable: social skill score

Groups	GenderGroup	Mean	Std. Deviation	N
Field Trip	male Field Trip	58.0000	6.27646	34
	Female Field Trip	57.2857	5.04126	21
	Total	57.7273	5.79736	55
Inquiry Based	male Inquiry	58.9032	5.67071	31
	Female inquiry	59.9600	9.53275	25
	Total	59.3750	7.58123	56
Total	male Field Trip	58.0000	6.27646	34
	Female Field Trip	57.2857	5.04126	21
	male Inquiry	58.9032	5.67071	31
	Female inquiry	59.9600	9.53275	25
	Total	58.5586	6.77654	111

Tests of Between-Subjects Effects

Dependent Variable: social skill score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	97.414[a]	3	32.471	.701	.553
Intercept	367245.888	1	367245.888	7932.108	.000
Groups	.000	0	367245.888	1.108	.900
Gender Group	22.079	2	11.039	.238	.788
groups * Gender Group	.000	0	45.888	1.218	.700
Error	4953.955	107	46.299		
Total	385682.000	111			
Corrected Total	5051.369	110			

a. R Squared = .019 (Adjusted R Squared = -.008)

Post Hoc Tests

GenderGroup

Multiple Comparisons

Dependent Variable: social skill score

Scheffe

(I) GenderGroup	(J) GenderGroup	Mean Difference (I-J)	Std. Error	Sig.
male Field Trip	Female Field Trip	.7143	1.88850	.986
	male Inquiry	-.9032	1.68974	.963
	Female inquiry	-1.9600	1.79267	.754
Female Field Trip	male Field Trip	-.7143	1.88850	.986
	male Inquiry	-1.6175	1.92307	.871
	Female inquiry	-2.6743	2.01411	.624
male Inquiry	male Field Trip	.9032	1.68974	.963
	Female Field Trip	1.6175	1.92307	.871
	Female inquiry	-1.0568	1.82906	.953
Female inquiry	male Field Trip	1.9600	1.79267	.754
	Female Field Trip	2.6743	2.01411	.624
	male Inquiry	1.0568	1.82906	.953

Based on observed means.
The error term is Mean Square(Error) = 46.299.

Homogeneous Subsets

social skill score

Scheffe[a,b,c]

GenderGroup	N	Subset 1
Female Field-Trip	21	57.2857
male Field-Trip	34	58.0000
male Inquiry	31	58.9032
Female Inquiry	25	59.9600
Sig.		.560

NPar Tests

Kruskal-Wallis Test

Ranks

	GenderGroup	N	Mean Rank
Interest	male Field-Trip	34	61.19
	Female Field-Trip	21	49.79
	male Inquiry	31	57.63
	Female Inquiry	25	52.14
	Total	111	

Test Statistics[a,b]

	Interest
Kruskal-Wallis H	2.144
Df	3
Asymp. Sig.	.543

a. Kruskal Wallis Test
b. Grouping Variable: Gender Group

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Groups	1.00	Field Trip	110
	2.00	Inquiry Based	56
Tests	1.00	Pretes	55
	2.00	Posttes	111
Gender	1	Male	99
	2	Female	67

Descriptive Statistics

Dependent Variable: social skill score

Groups	Tests	Gender	Mean	Std. Deviation	N
Field Trip	Pretes	Male	48.6471	6.52214	34
		Female	48.9048	7.21044	21
		Total	48.7455	6.72810	55
	Posttes	Male	58.0000	6.27646	34
		Female	57.2857	5.04126	21
		Total	57.7273	5.79736	55
	Total	Male	53.3235	7.90889	68
		Female	53.0952	7.46638	42
		Total	53.2364	7.70908	110
Inquiry Based	Posttes	Male	58.9032	5.67071	31
		Female	59.9600	9.53275	25
		Total	59.3750	7.58123	56
	Total	Male	58.9032	5.67071	31
		Female	59.9600	9.53275	25
		Total	59.3750	7.58123	56
Total	Pretes	Male	48.6471	6.52214	34
		Female	48.9048	7.21044	21
		Total	48.7455	6.72810	55
	Posttes	Male	58.4308	5.96597	65
		Female	58.7391	7.84697	46
		Total	58.5586	6.77654	111
	Total	Male	55.0707	7.70536	99
		Female	55.6567	8.88061	67
		T-otal	55.3072	8.17881	166

Tests of Between-Subjects Effects

Dependent Variable: social skill score

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3639.802[a]	5	727.960	15.745	.000
Intercept	445620.045	1	445620.045	9638.246	.000
groups	85.730	1	85.730	1.854	.175
test	2041.332	1	2041.332	44.152	.000
Gender	5.438	1	5.438	.118	.732
groups * test	.000	0	.	.	.
groups * Gender	21.011	1	21.011	.454	.501
test * Gender	6.132	1	6.132	.133	.716
groups * test * Gender	.000	0	.	.	.
Error	7397.530	160	46.235		
Total	518813.000	166			
Corrected Total	11037.331	165			

a. R Squared = .330 (Adjusted R Squared = .309)

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Groups	1.00	Field Trip	55
	2.00	Inquiry Based	56
Gender	1	Male	65
	2	Female	46

Descriptive Statistics

Dependent Variable: Retention

Groups	Gender	Mean	Std. Deviation	N
Field Trip	Male	42.6176	6.05537	34
	Female	43.4762	7.13175	21
	Total	42.9455	6.43606	55
Inquiry Based	Male	43.7097	6.19243	31
	Female	44.1200	5.25452	25
	Total	43.8929	5.74513	56
Total	Male	43.1385	6.09784	65
	Female	43.8261	6.11848	46
	Total	43.4234	6.08807	111

Tests of Between-Subjects Effects

Dependent Variable: Retention

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	36.804[a]	3	12.268	.325	.807
Intercept	202623.194	1	202623.194	5366.114	.000
groups	20.183	1	20.183	.535	.466
Gender	10.785	1	10.785	.286	.594
groups * Gender	1.346	1	1.346	.036	.851
Error	4040.295	107	37.760		
Total	213378.000	111			
Corrected Total	4077.099	110			

a. R Squared = .009 (Adjusted R Squared = -.019)

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Groups	1.00	Field Trip	55
	2.00	Inquiry Based	56
Gender	1	Male	65
	2	Female	46

Descriptive Statistics

Dependent Variable: Performance

Groups	Gender	Mean	Std. Deviation	N
Field Trip	Male	54.7941	6.67778	34
	Female	54.8571	8.15037	21
	Total	54.8182	7.20106	55
Inquiry Based	Male	52.7097	6.19243	31
	Female	53.1200	5.25452	25
	Total	52.8929	5.74513	56
Total	Male	53.8000	6.48604	65
	Female	53.9130	6.70928	46
	Total	53.8468	6.54939	111

Tests of Between-Subjects Effects

Dependent Variable: Performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	105.239[a]	3	35.080	.814	.489
Intercept	311021.394	1	311021.394	7213.994	.000
groups	97.827	1	97.827	2.269	.135
Gender	1.501	1	1.501	.035	.852
groups * Gender	.808	1	.808	.019	.891
Error	4613.157	107	43.114		
Total	326561.000	111			
Corrected Total	4718.396	110			

a. R Squared = .022 (Adjusted R Squared = -.005)