

**EFFECTS OF DEMONSTRATION AND DISCUSSION METHODS ON SENIOR
SECONDARY SCHOOL STUDENTS' ACADEMIC PERFORMANCE IN
AGRICULTURAL SCIENCE IN KADUNA STATE, NIGERIA.**

By

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DECLARATION

I, DEBORAH Bulus Alkali declare that this dissertation titled: Effect of Demonstration and Discussion Methods on Senior Secondary School Students' Academic Performance in Agricultural Science in Kaduna State, Nigeria has been carried out by me in the Department of Educational Foundations and Curriculum and Instruction in the Faculty of Education, Ahmadu Bello University Zaria, Nigeria under the supervision of Prof Hannah. O. Yusuf and Prof Ayuba Guga. The information derived from the literature has been dully acknowledged in the text and a list of references provided. No part of this dissertation was previously presented for another degree or diploma at this or any other institution.

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CERTIFICATION

This dissertation Titled “Effects of Demonstration and Discussion Methods on Senior Secondary School Students’ Academic Performance in Agricultural Science in Kaduna State, Nigeria” has been read and approved as meeting the requirements for the award of Masters Degree in Education (Curriculum and Instruction) of the Ahmadu Bello University, Zaria, Nigeria.

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DEDICATION

This research work is dedicated to my beloved husband, Dr. Jean-Paul Musiba and my sons, Moise-Noel and Jérémie.

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ABSTRACT

The study was carried out to determine the “Effects of Demonstration and Discussion Methods on Senior Secondary School Students Academic Performance in Agricultural science in Kaduna State”. Five objectives, five research questions and five null hypotheses were raised to guide the study. Relevant literatures were reviewed on the key variables of the study. The study adopted quasi experimental design in which pre-test and post-test were used. The target population for the study was made up of forty-nine thousand five hundred and sixty-one (49,561) public Senior Secondary Schools Two (SSII) students who were offering Agricultural Science in the twelve (12) Educational Zones in Kaduna State. The sample size for the study was one hundred and thirty three (133) from three (3) intact classes of Senior Secondary Schools Two (II) Students offering Agricultural Science in Kafanchan Education Zone. The sample was arrived at using purposive sampling technique. The instrument that was used for data collection in this study was a 40-item “Agricultural Science performance Test” (ASPT) designed by the researcher. The validated ASPT was pilot tested and split half on Statistical Package for Social Science (SPSS) using Spearman Brown Formula and a reliability index of 0.78 was obtained. The data obtained from the study were analysed using descriptive and inferential statistics. At descriptive level, frequency and percentage was used to analyse the bio-data of the respondents while mean and standard deviation was used to answer the research questions. At inferential level, (T-test and ANOVA) were used to analyse the data. Findings from the study among others revealed that; The post-test Academic performance of Agricultural Science Students taught using demonstration method in Senior Secondary Schools in Kaduna State, was significantly higher than the pre-test performance. Similarly the study revealed that there is no significant difference between the academic performance of students taught vegetative propagation in plants using demonstration and discussion methods in senior secondary schools in Kaduna state. The researcher concluded from the findings of the study that, there is significant effect of demonstration method of teaching on academic performance in agricultural science among secondary school students. The researcher also concluded that there is significant differential effect of demonstration, discussion and conventional method on academic performance in digestive system among secondary school students. Recommendations were made to include that Teachers should make use of demonstration method of teaching in senior secondary schools to enhance academic performance of students in Agricultural Science. Preference should not be given to demonstration method of teaching than discussion method in teaching vegetative propagation in secondary schools so as to improve their performances.

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Operational Definition of Terms

Effect:The result or outcome of a cause.

Method: This refers to the overall plan for the orderly presentation of content or learning material.

Method of Teaching: This is the tactics teachers use to meet teaching objectives, including instructional organization and techniques, subject matter and the use of teaching tools and materials.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Agriculture is undeniably the mainstay of most developing countries including Nigeria and Kaduna State in particular. Agricultural science deals with the application of scientific principles for successful production of crops and livestock and other uses for man's benefit. Iwena (2007) in Peter, Ayorinde and Okeh (2016), defined agriculture as a deliberate effort made by man to till the soil, cultivate crops and rear animals for food and other purposes. Agricultural Education is concerned with the teaching of Agricultural Science and related disciplines within the School system as well as the design and implementation of meaningful teacher training programme for the provision and maintenance of pre-requisite manpower levels for manning these agricultural related disciplines. Fasasi (2013), indicated that Agricultural Science being a subject in Secondary School, seeks to teach students the principles of using scarce resources to produce crops and animals to feed the world's population and to service other related uses.

Agricultural Science is one of the core vocational subjects taught at both Primary and Junior Secondary Schools in Nigeria, but a vocational elective in Senior Secondary Schools. This is largely because of its promising role in promoting self reliance through the provision of employment opportunities and production of stable foods for the populace together with raw material supply for agro-allied industries (Federal Republic of Nigeria, 2014).

The method to be used for effective teaching and learning is a matter of great concern to teachers and educators. What students learn in schools in Agricultural Science is greatly influenced by how they are being taught. Teachers teaching Agricultural Science curricula have implemented a wide variety of teaching methods. Educators and researchers have repeatedly acknowledged the drawbacks of teaching with a strict lecture format. This format has been referred to as a method resulting in long periods of uninterrupted teacher centered, expository discourse which relegates students to the role of passive 'spectators' in the classrooms (Achor and Iloko, 2009). Adeyemi (2013), asserted that lecture method is inappropriate and ineffective for achieving the high objectives of Agricultural Science. This idea stressed further that there is a need to search for alternative strategies more suitable and efficient for promoting the level of achievement and retention in teaching Agricultural Science in Senior Secondary Schools beyond contemporary limits. Seweje (2010), explained that a teacher is expected to be a facilitator whose main function is to help learners to become active participants in their learning and thereby making meaningful connection between prior knowledge, new knowledge and the process involved in learning. Akinleye (2010), confirmed that if the children are been guided and given the opportunity to be listened to and to carry out activities on their own in a non-threatening atmosphere, they would perform wonders in Agricultural Science.

Agricultural Science is not being learnt as it ought to be in Nigeria because of inappropriate teaching methods. Students are mostly known to memorize and regurgitate facts and concepts without carrying out activities on which these goals and concepts are based. The urge to improve

Agricultural Science performance through more effective instructional strategies has increased the awareness of the importance of learner-centeredness in teaching. Learners therefore must be assisted to learn and understand concepts very well. Teaching of Agricultural Science at the senior secondary level requires a solid foundation in theory and practical aspects by the teacher of Agriculture. The 9-3-4 system of education which is currently implemented in Nigeria requires that Agricultural Science be taught as a compulsory pre-vocational elective at the Junior Secondary School, and as a vocational elective at the Senior Secondary School level (FRN, 2014).

The methods used in this research are demonstration and discussion methods which serve as the experimental groups and the conventional lecture method which serves as the control group. Demonstration method is generally effective in teaching Sciences, Mathematics and Mechanics as well as subjects within vocational and Technical Education because it can be very effective for illustrating concepts in class. Demonstration method involves various scientific procedures and processes that are shown or conducted by the teacher for the students to see. The discussion method has been widely accepted and recommended by some Agricultural educators as a good method of teaching Agricultural Science (Abdulhamid, 2010). Discussion, according to Wilkinson (2009), is a method of teaching which involves a group of people in a class who come together to exchange ideas, facts, opinions and expressions orally about a topic of mutual interest and concern under a guide. This implies that in discussion teaching method, the aim is to identify and solve problems collectively. Group discussion may take a variety of forms such as round table, panel discussion, and symposium (Rahman et al, 2011). Conventional approach to teaching according to Ogbonna (2003) in Ekeyi (2013), is an approach where older methods or ideas are followed rather than modern ones. In this approach, curricular activities rely heavily on textbooks and workbooks. Students are viewed as “blank slates” unto which information is entrenched by the teacher. The focus here is on what is being taught, rather than who is being taught and as such, it is a teacher or subject-centred approach. In conventional setting, success of students in school has very little to do with true understanding and much to do with coverage of the curriculum.

Academic performance is defined as the measure of what a person has accomplished after exposure to educational programmes. Students’ performance in Agricultural Science in Secondary Schools depends on many factors and stands out to show how well a student is doing. Festus (2007), contended that performance appears generally to be the fundamental goal behind every life struggle, but the positive platform has consequential effects of improving the worth of the students and can only be achieved through acquisition of positive learning attitudes. The poor performance of Students in Science subjects (Agricultural Science) inclusive has assumed a dangerous dimension. In light of this, Science educators need to seek suitable ways of tackling the current mass failure if they are to halt the drifts of students to Arts and Social Science subjects (West African Examination Council, (WAEC) Reports, 2017). The relevance and importance of Agricultural Science amongst the Science subjects and its importance to economic development cannot be overemphasized. Hence, the need for proper teaching of the subject in Senior Secondary Schools so that students’ scores in internal and external examinations will be high, thereby, making the candidates’ entrance into higher institutions easier and practicing some of the Agricultural skills at home for self dependence.

From the foregoing therefore, it becomes imperative to search for appropriate instructional approaches that would assist students to learn Agricultural Science in the Senior Secondary Schools in Kaduna State with ease. Hence the researcher intends to determine the effects of demonstration and discussion methods of teaching on Senior Secondary School Students' performance in Agricultural Science in Kaduna State.

1.2 Statement of the Problem

The persistent poor academic performance of students in Agricultural Science in Senior Secondary Schools in Kaduna State has been a major concern to researchers. However, studies have revealed that, the use of effective instructional methods in Senior Secondary Schools will enhance students' academic performance. The teaching of Agricultural Science as a vocational subject cannot be achieved by rote learning or mere chalk and talk method (conventional method). It requires appropriate instructional methods, as their proper application is essential for facilitating the achievement of the set objectives. The instructional methods used by the teachers are inadequate to bring about desired level of academic performance and classroom participation among students. This hampers teacher-students interaction, encourages one-way communication and makes students to be spoon-fed with information which has its attending effects on students' performance (Dagnew, 2011).

According to the WAEC Chief Examiner's report 2016/2017, it was revealed that students had inadequate knowledge of the subject, Agricultural Science. The report showed that students lacked knowledge in topics like digestive and reproductive systems in birds, genetics, vegetative propagation in plants, knapsack sprayer, and some soil related experiments (porosity, capillarity and PH) based on the preliminary investigation. These identified problems could have arisen probably due to insufficient knowledge and teaching methods employed on the side of the teachers. Also this could be the reason behind students' poor performance as well as drifting away from the subject.

To improve on students' academic performance in Agricultural Science, Onimisi (2015) and Ibitoye (2017), suggested that, there is the need for the use of demonstrable, appropriate skill and practically oriented method. Apparently, demonstration and discussion methods are activity centered methods that engage students directly in the teaching-learning process (Orji, 2016 and Olaniyan, 2017). In view of the stated problem therefore, the researcher is prompted to carry out this study to ascertain the effectiveness of demonstration and discussion methods on senior secondary school students' performance in Agricultural Science in Kaduna State, Nigeria.

1.3 Research Objectives

The objectives of the study are to:

1. determine the pre-test and post-test academic performance of students taught Agricultural Science with the use of demonstration method in Senior Secondary Schools in Kaduna State, Nigeria;
2. assess the pre-test and post-test academic performance of students taught Agricultural Science with the use of discussion method in Senior Secondary Schools in Kaduna State, Nigeria;
3. find out if there is any difference in the academic performance of students taught Agricultural Science with the use of demonstration and discussion methods in Senior Secondary Schools in Kaduna State, Nigeria;
4. compare the academic performance of students taught vegetative propagation in plants with the use of demonstration and discussion methods in Senior Secondary Schools in Kaduna State, Nigeria; and
5. compare the academic performance of students taught digestive and reproductive systems in birds with the use of demonstration, discussion and conventional methods in Senior Secondary Schools in Kaduna state, Nigeria.

1.4 Research Questions

Based on this research, the following questions were formulated to guide the study;

1. What is the pre-test and post-test academic performance of students taught Agricultural Science with the use of demonstration method in Senior Secondary Schools in Kaduna State, Nigeria?
2. What is the pre-test and post-test academic performance of students taught Agricultural Science with the use of discussion method in Senior Secondary Schools in Kaduna State, Nigeria?
3. Is there any difference in the academic performance of students taught Agricultural Science with the use of demonstration and discussion methods in Senior Secondary Schools in Kaduna State, Nigeria?
4. What is the academic performance of students taught vegetative propagation in plants with the use of demonstration and discussion methods in senior Secondary Schools in Kaduna State, Nigeria?
5. What is the academic performance of students taught digestive and reproductive systems in birds with the use of demonstration, discussion and conventional methods in Senior Secondary Schools in Kaduna State, Nigeria?

1.5. Research Hypotheses

The following null hypotheses were raised based on this study;

H₀₁. There is no significant difference in the pre-test and post-test academic performance of students taught Agricultural Science with the use of demonstration method in Senior Secondary Schools in Kaduna State, Nigeria.

H0₂. There is no significant difference in the pre-test and post-test academic performance of students taught Agricultural Science with the use of discussion method in Senior Secondary Schools in Kaduna State, Nigeria.

H0₃. There is no significant difference between the academic performance of students taught agricultural science with the use of demonstration and discussion methods in Senior Secondary Schools in Kaduna State, Nigeria.

H0₄. There is no significant difference between the academic performance of students taught vegetative propagation in plants with the use of demonstration and discussion methods in Senior Secondary Schools in Kaduna State, Nigeria and

H0₅. There is no significant difference between the academic performance of students taught digestive and reproductive systems in birds with the use of demonstration, discussion and conventional methods in Senior Secondary Schools in Kaduna State, Nigeria.

1.6 Significance of the Study

The findings of this research will be of great benefit to the following categories of people; to the Agricultural Science teachers, the government of Kaduna State, Ministry of Education, the quality assurance department in the Ministry of Education, principals of Secondary Schools, Senior Secondary Schools examination bodies, curriculum planners, students studying Agricultural Science and to the researchers.

The findings of this research will be of great benefit to the teachers of Agricultural Science as it will enable them to select match able teaching methods and content in the teaching of the subject. With the right teaching method, there will be better academic performance of students in Agricultural Science in Senior Secondary Schools and subsequently in external examinations like WAEC, NECO and Joint Admissions and Matriculation Board (JAMB) examinations. The findings will equally help the teachers to evaluate their performance in the teaching of the various aspects of Agricultural Science curriculum contents. The result of the study will reveal the aspects of Agricultural Science curriculum content that are not properly implemented by teachers. This may lead to improvement in such aspects of the curriculum for greater performance among the students. It is also hoped that through the findings of this study Agricultural science teachers will be encouraged to plan sequence and organize properly, the contents of agricultural science in order to enhance and encourage students to avail themselves to the learning opportunities that are available in demonstration and discussion methods.

The findings from this research will be of great significance to the government of Kaduna State because it will point out their responsibilities in providing funds for the establishment of school farms and Agricultural Science laboratories in schools. This will enable the schools to have enough instructional materials for practical agriculture when teaching concepts that need to be practicalized on and in turn will enhance students' participation in practical Agricultural Science concepts.

The ministry of education will benefit from the findings of this research in that, the findings will excite them to provide a means of re-orienting the Agricultural Science teachers through organization of conferences, seminars and workshops on the effective use of demonstration and discussion methods in the teaching of some practical agricultural science concepts. This will enhance the quality of teaching and learning at the senior secondary school level.

The quality assurance department in the Ministry of Education will ensure that quality and standard in education is maintained through adequate monitoring, supervision, assessment and evaluation of all aspects of Agricultural Science curriculum in Senior Secondary Schools in Kaduna State. Similarly the supervisors and inspectors in the Ministry of Education will see the need and the importance of regular visits to schools to ensure teachers are up to date in carrying out their tasks. This will help in check-mating teachers in order to make them more active in their teaching performance and equally lead to improved academic performance of senior secondary school students in Agricultural Science.

The results from the study will help the principals of Secondary Schools to identify the relevance of practical demonstration in teaching Agricultural Science, hence try to encourage the Agricultural Science teachers to use the established school farms and laboratories for all the practical concepts in Agricultural Science.

The examination bodies like WAEC and NECO will also benefit from this findings, as the low academic performance of the students will be enough to trigger worry in the boards to begin to seek for remedies based on the sources of the prevailing situations. The boards may decide to redesign the curriculum if they discovered that the curriculum is actually voluminous.

Bodies like the Nigerian Educational Research and Development Council (NERDC) that carry out researches, discuss and disseminate research findings can use the result of this research to facilitate effective teaching and learning of Agricultural Science curriculum. This will lead to better way of improving the implementation by the teachers for greater academic performance among Agricultural Science students' performance.

The study will provide information for educational planners and curriculum designers, in that, they will support the use of demonstration and discussion methods in Agricultural Science in senior secondary schools by carrying out effective quality assurance for teachers so as to improve teaching/learning situations currently existing in senior secondary schools in Kaduna state.

Students at the Senior Secondary School (SSS) level in Kaduna state and other states can be encouraged and motivated based on the results from this research. The interest of students will be stimulated in Agricultural Science, because demonstration and discussion methods turns the students from passive information recipient to active, free-self learner and problem solver. This will therefore increase the chances of the students to choose Agricultural Science as a future career. It is hoped that the knowledge of the practical skills that the students will gain from the subject will make them find Agricultural Science very interesting as it will equip them for job opportunities in agro-allied industries in both private and public sectors. By means of demonstration and discussion methods, the attitudes of students will be affected positively in

terms of problem solving, thinking, group works, communication, information acquisition and information sharing with others.

Finally, the findings of the study might serve as a source of reference materials to other researchers who may embark on similar or related phenomena.

1.7 Scope of the Study

The study is concerned with determining the effect of demonstration and discussion methods on Senior Secondary School Students' academic performance in Agricultural Science in Kaduna State, Nigeria. Three methods were used in this study which are; demonstration, discussion and conventional lecture methods. The study covered three Senior Secondary School (SSII) students drawn from Kafanchan Educational Zone of Kaduna State. Kafanchan Educational Zone was chosen to serve as the sample zone because in Kaduna State, all the 12 Education Zones make use of the same curriculum, syllabus, schemes of work, examination questions and marking schemes. SSII was specifically chosen because they are more stable in terms of statistical sampling than SS1 and SS111. Five content areas in Agricultural Science were selected for the study. Vegetative propagation in plants (budding, grafting process and layering), Digestive and reproductive systems in birds, genetics, knapsack sprayer (uses, operation, maintenance), and some soil related experiments (porosity, PH and capillarity). These were the content areas identified to be difficult as contained in the WAEC Chief Examiner's report (2017).

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter presents the review of related studies. Attempts were made to review literature on: conceptual framework; concept of agricultural science, concept of demonstration method, concept of discussion method, teaching methods in Agricultural Science, concept of performance, concept of academic performance, theoretical framework and empirical studies.

2.2 Conceptual Framework

This study is built on the conceptual framework of Agricultural Science, Demonstration method, discussion method, conventional lecture method, teaching methods in Agricultural science and academic performance.

2.2.1 The Concept of Agricultural Science

Agriculture embraces health, nutrition and food consumption, the use and conservation of land, water resources, and environmental characteristics of the food and fibre system. Iwena (2007) in Peter et al (2016), defined Agriculture as a deliberate effort made by man to till the soil, cultivate

crops and rear animals for food and other purposes. Ndem (2013), defined Agricultural Science as the branch of science which deals with growing of crops and rearing of domestic animals for the benefit of man and raw materials for the industries. Agricultural Science is therefore, designed for inculcation of the necessary skills for the practice of agriculture for effective citizenship and contribution to food security for national sustainability. Izuchukwu (2011), pointed out that Agriculture has been the backbone of the Nigerian economy, providing employment and source of livelihood for the increasing population. It accounted for over half of the gross domestic product (GDP) of the Nigerian economy as at independence in 1960. Undoubtedly, one of the sources of national wealth and real income is essentially from agriculture. Consequently, development economists devoted much attention on how agriculture can best contribute meaningfully to aggregate economic expansion and modernization.

The Federal Republic of Nigeria (FRN) (2014), gave the roles of Agricultural Science among others things to be of the: provision of food, raw materials, shelter, rural development, employment, and foreign exchange to the nation and income to the farmers and their families.

Objectives of teaching Agricultural Science at the Secondary School level

The FRN (2014), in its attempt to achieve the laudable goals of Agricultural Science outlined the basic objectives of teaching Agricultural Science at the Secondary School level to;

1. Stimulate and sustain students' interest in agriculture.
2. Inculcate in students farming skills.
3. Enable students acquire basic knowledge and practical skills in agriculture.
4. Prepare students for future studies in agriculture and;
5. Produce prospective future farmers.

In order to achieve the aforementioned objectives, the Nigerian Educational Research and Development Council (NERDC) (2012), stated that Agricultural Science should be taught theoretically and practically in order to develop the right skills and values in agricultural production in the students. The document further explained that the final examination of the students at the senior secondary schools should be based on theory and practical examinations. This is to ensure that the students at their final year in secondary school level are exposed to both practical and theoretical aspects of Agricultural Science which will enable them further their education or become good farmers for effective food and fiber production.

The objectives of Agricultural Science is not only to produce professional and skilled manpower, but also to educate the rural community with the aim of ensuring complete transformation of agricultural production from the subsistence level to mechanized agriculture.

2.2.2 Teaching Methods in Agricultural Science

According to Ayeni (2011), teaching is a continuous process that involves bringing about desirable changes in learners through the use of appropriate methods. Adunola (2011), indicated that in order to bring desirable changes in students, teaching methods used by educators should be best for the subject matter. Chang (2010), sustained that teaching methods work effectively,

mainly if they suit learners' needs since every learner interprets and responds to questions in a unique way. As such, alignment of teaching methods with students' needs and preferred learning influence students' academic attainments.

Teaching methods are the means for helping students to study effectively. The teacher's experience and his adoption of appropriate methodology in teaching greatly help in promoting his effectiveness and consequently students' academic performance. Teaching methods concern the tactics teachers use to meet teaching objectives, including instructional organization and techniques, subject matter, and the use of teaching tools and materials. Ameh and Dantani (2012), observed that methodology is very vital in any teaching-learning situation and the method adopted by the teacher may promote or hinder learning. It may sharpen mental activities which are the bases of social power or may discourage initiatives and curiosity thus making self-reliance and survival difficult.

The teacher is recognized as the key factor in determining the quality and success of curriculum contents in agricultural education through proper instructional strategies and approaches. The teacher as an agent of change employs different learning strategies which go a long way to modify teachers and students' behaviour and academic performance. In order to improve academic performance in the students when teaching Agricultural Science, it is imperative for the teacher to give proper and adequate attention especially in the choice of methods(s) appropriate for the inculcation of knowledge, ideas and skills in students to facilitate a better understanding of the subject matter (Adah and Ameh, 2012).

However, there are many methods a teacher may use in the course of his work. None of the available method(s) can be the best which the teacher must use always. The teaching of Agricultural Science at the Senior Secondary School level is handled using the following methods as pointed out by Olaitan (1984) in Ekeyi (2013):- demonstration method, project method, discussion, lecture method, problem solving, seminar, concept mapping, play way method, field trips/excursion, role playing, exhibition, assignment and so on. Two of the teaching methods – demonstration and discussion were selected and used for the study based on the fact that they are activity and student-centered oriented.

For successful teaching of Agricultural Science in schools, the teachers must have the knowledge of the teaching methods that will most probably affect students learning, through the selection of the methods that will improve teaching quality, effectiveness and accountability to learners and the public. It may also help them keep up with information technology, globalization (Abdulhamid, 2010). Surprisingly, most teachers of Agricultural Science in Senior Secondary Schools today are still known to have difficulty in teaching some Agricultural Science concepts, thus leading to poor performance in such areas especially in Senior Secondary Certificate Examinations (Peter et al, 2016). In order to arrest students' attention, interest, curiosity and promote their performance, it is good to employ activity and student-centred approach of teaching like demonstration and discussion methods instead of using the conventional approach (Ekeyi, 2013). Thus, successful teaching of Agricultural Science in Senior Secondary Schools does not only depend on teacher's mastery of subject content but also on the teaching method employed. And that is why Ogbonna (2000) in Abdulhamid (2010) opined that the most influential factor in teaching is the teacher's method of teaching.

2.2.3 Demonstration method of teaching

Demonstration method of teaching is a traditional classroom strategy that is used in teaching and learning of Technical, Science and practical oriented subjects. The focus of demonstration is to achieve psychomotor and cognitive objectives (Farooq, 2013). Yusuf and Shaibu (2018), defined demonstration method as a teaching method where the teacher visually shows the students what is expected from them in a particular topic/lesson. The students in turn imitate the teacher as an affirmation that learning has taken place. Simply put demonstration means to clearly show. When students have a hard time connecting theories to actual practice, or when students are unable to understand application of theories, the teacher can then use demonstration method so as to make students have clearer view of the concept being taught.

Ekeyi (2013), defined demonstration method of teaching as the type of teaching method in which the teacher is the principal actor while the learners watch with the intention to act later. Here the teacher does whatever the learners are expected to do at the end of the lesson by showing them how to do it and explaining the Step-by-step process to them. This means that demonstration method involves showing by reasons or proofs, explaining or making use of examples or experiment. Dyer (2009), affirmed that Demonstration teaching is important in teaching Science, Vocational and Technical subjects, because Science and Vocational subjects are not only theoretical but have considerable portion of practical work also. This implies that by carrying out a successful demonstration activity in teaching-learning process, the teacher can provide concrete experience to students since they will get opportunity to play active role in the learning process.

Demonstrations in Science are useful alternatives to students' laboratory activities when materials and equipment may not be enough for students' use. It serves as useful illustration prior to a different and complicated experiment that the students would eventually be expected to carry out. Though it allows for very low interaction between students and materials in class, activities are retained for a long time in the learner. Peter, Ayorinde and Okey (2016), defined demonstration method as a practical session which makes the students and teachers to participate actively in the cause of lesson presentation, hence improves the ability of the students to acquire basic knowledge and skill required in that vocation. Demonstration means an act of showing something by proof or evidence. Koffey (2015), opined that demonstration method of teaching shows the learners how to do a task using sequential instructions with the end goal of having learners perform the tasks independently. From the definition, it can be seen that the purpose of demonstration is to show and to explain how something works or is accomplished, so that the audience get the message clearly since they listen, know, and see the steps of how something is done. Similarly Ameh, Daniel and Akus (2007), affirmed that demonstration method of teaching is a method of teaching in which the teacher is the principal actor, while the learners watch with the intention to act later. Here the teacher does whatever the learners are expected to do at the end of the lesson by showing them how to do it and explaining the step by step process to them. In the same vein Mundi (2006) in Ekeyi (2013), described demonstration as a display or an exhibition usually done by the teacher while the students watch with keen interest. Much of students learning occur during observing others. The professional success of any technologist is directly related to his/her ability to transfer knowledge gained in the academic environment to

real life situations. Agricultural Science which is a practically oriented subject and indeed other sciences cannot be effectively taught without the use of demonstration method, as this method will aid better understanding of concepts and also help learners to practically transfer knowledge to the field. Danjuma (2012), considered demonstration method as effective in teaching and learning process. It provides opportunity to both the teachers and students to put their views and ideas across because the students feel a sense of belonging in teaching-learning process. Dyer in Peter, Ayorinde and Okey (2016), affirmed that demonstration teaching method is important for science teaching as science is not only a theoretical subject but has a considerable portion of practical work also.

Nwachukwu (2009), traced two types of demonstration method in teaching science subjects, namely; Results and Method Demonstration. Results demonstration as explained by Nwachukwu (2009), is the type that shows the results of practices, while the Method demonstration illustrates how to do something in a successive step-by-step manner. Chikuni in Iline (2013), propounded two types of demonstrations, namely: the Step by Step and the whole process demonstration. In the whole process demonstration, the teacher demonstrates the full process from the beginning to the end without interruption by learners' participation. The step by step demonstration is done stage by stage with the teacher explaining each action as the operation proceeds.

Principles of Demonstration Teaching Strategy

Farooq (2013), identified three principles upon which the demonstration teaching strategy is based;

1. Learning by doing maxim is followed.
2. Skills can be developed by imitation.
3. The perception helps in imitation.

Framework for teaching using Demonstration Method

According to National Teachers' Institute (NTI) (2015), the steps taken in a guided demonstration are;

1. The teacher plans the lesson in such a way that all the materials needed for the lesson demonstration are made available. In the course of the preparation, the teacher should keep in mind the subject matter and the objectives of the lesson. The teacher should have a thorough knowledge of the matter or the subject for which he is to teach. He should therefore, not hesitate from going through the text book of the class. It is very important to make available everything needed for the demonstration in order to avoid interruption or any kind of problem in the course of the lesson demonstration.
2. Produce an outline based on the most suitable procedure identified.
3. Arrange and motivate the learners before starting the demonstration. Ensure that every learner can see and hear you clearly.

4. The teacher introduces the lesson to the students. This step is important because it motivates students to learn the information as without it, they cannot be prepared to understand it. The teacher should introduce the lesson to the learners in a problematic manner so that they can understand the significance of the topic properly. Similarly the teacher can give the students a story or use his own personal experience that is related to the topic to introduce the lesson.
5. The next step is the full presentation of the lesson, that is conducting the demonstration devoid of distraction, taking each step at a time.
6. Monitor understanding by asking questions or calling on individuals to attempt the demonstration where possible.

Advantages of Demonstration Method

Some of the advantages of this method as outlined by Mundi (2006) and NTI (2015), include:

1. It saves time and facilitate material economy;
2. The students are able to see, feel and participate fully in the learning process.
3. The students are able to engage in self directed learning at a pace that suits the particular student
4. The method is an attention inducer and a powerful motivator in lesson delivery;
5. Students receive feedback immediately through their own products;
6. It gives a real-life situation of course of study as students acquire skills in real-life situations using tools and materials;
7. It helps to motivate students when carried out by skilled teachers and it is good in showing the appropriate ways of doing things.
8. Demonstration method can reduce hazards for example, breakage on accidents before students embark on individual or group work with materials involved. NTI (2015)

Disadvantages of Demonstration Method

Some of the disadvantages of the demonstration method of teaching are outlined below as:

- a. Problems of audibility and visibility may arise, when the classes are too large.
- b. Active participation is reduced as students/learners act mainly as observers; (Ombugus, Jatau and Kuzhe, 2009).
- c. Where the demonstration is restricted to the teacher alone, students will be denied the opportunity to acquire manipulative skills in handling of the materials (NTI, 2015).
- d. Sometimes it is not easy getting all the materials ready for use.

2.2.4 The Discussion Method of Teaching

The major thing about the discussion method of teaching is interaction. Aremu (2002) in Peter et al, (2016), defined discussion method of teaching as a strategy that is employed by the teacher where the students are grouped and appointed leaders and then each group given a topic to be discussed as the teacher goes round to supervise and correct errors. Okurumeh (2016), explained

that the discussion method works on the principle that the knowledge and ideas of several people are more likely to find solutions or answers to specified problems or topics. This is in line with the saying that "Two good heads are better than one". Discussion method of teaching engages both the teachers and students in thinking. It also develops in students skills of talking and listening. Discussion is a method of teaching that works on the principle that many people are to put heads together in terms of knowledge and ideas to find solutions to specified problems. According to Stephens and Stephens (2015), discussion is a process of giving and talking, speaking and listening, describing and witnessing which helps expand horizons and foster mutual understanding. The activities of the discussion group are to be regulated and directed by the teacher or an appointee of the class. Abdulhamid (2010), affirmed that in the process of discussion, students participate by identifying problems, analyzing the factors associated with the problems, develop possible solutions to the problems, placing the solution(s) into action and evaluating the results of the solution. On the whole, discussion method of teaching is more of an interactive session where students are fully in charge of the learning. The teacher is only passive and guides the discussion towards the achievement of the objectives of the lesson.

Discussion method of teaching is one of the most widely used and most popular methods of teaching in the modern schools. It is a learning process which requires team work among learners. The method is based on the principles that knowledge and ideas of many people have greater merit than that of a single person. Discussion approach is a predominantly interactive process involving a multiple - flow of communication between the teacher and the pupils and from one pupil to another. Interaction centers on problems and questions with the teacher directing affairs towards the lesson objectives. The teacher is a facilitator who encourages the pupils to discover things for themselves. Children learn through active participation and involvement in the lesson. It provides opportunities to clarify one's own values and make informed decisions about issues. Being an interactive process, it aids the teacher toward a better understanding of his pupils. The pupils on their own side gain knowledge and understanding as they see relationships among their learning experiences. This development of generalizations has several names in education such as insight, inquiry and discovery learning.

Elvis (2013), pointed out that, one of the most desirable aspects of the discussion method is that it helps the pupils to develop logic through comparison with their peers. By expressing concepts, asking for clarification and engaging in argumentation, their understanding becomes sharper and more accurate, this is the real value of discussion method. It also promotes inquiry and provides good practice for problem - solving. Discussion method teaches on two levels at the same time. The first is the learning of subject matter, and the second is the development of a skill in the pupils to learn on their own without constant help from the teacher. For discussion to yield any satisfactory results, it must be well planned. The teacher should moderate the discussion effectively; he needs to know the techniques of argument. Basically he should know what constitutes the major and minor premise and the conclusion. The concern of the teacher is not to inform but to lead the pupils to discover knowledge themselves through stimulating and rewarding divergent and critical thinking among the pupils.

Hyman (1980) in Rahman, Khalil, Jumani and Sharif (2011), highlighted that discussion is used to arrive at the solution of problems and its characteristics of democratic societies. It occurs in a group form and usually involves six to ten persons. These persons perform one of two roles:

leader-moderator who is typically the teacher, and participant: typically the students. Participants use the time to communicate with one another. Another student who becomes the group leader addresses his/ her remark to the whole group and each group member has the right to speak. A group member communicates with other members in the group by speech, and by facial expressions, gestures and body movement. Other members receive his / her message by listening and by seeing the non-verbal signs. These processes of listening, speaking, and observing are the bases of discussion method (Vedanayagam, 1994 in Rahman et al, 2011).

Types of Discussions

Discussion may take several forms depending on the objectives of the instruction, class - size and the ability of the pupils. Rahman et al (2011), gave the types of discussions to include: debate, Small group discussion, round table discussion, panel discussion, symposium etc.

(a) Debate: Debate is a formal discussion of an issue in a classroom, at a public meeting or in a State or National Assembly. In a debate two or more speakers express opposing views and then there is often a vote on the issue.

(b) Small Group Discussion: This is a number of people that are together in the same place as in a classroom or outside the classroom. For example, a number of students discussing the timetable for a semester examination in the classroom, a number of students could also be revising towards an examination under a shade of tree within the school compound.

(c) Round Table Discussion: It involves small number of persons nearly three to eight. It needs a moderator to introduce the members of the discussion group, present the problem to be discussed and keep the discussion moving. The leader's role is one of guiding the group rather than one of dominating it. The responsibilities of a moderator include the introduction of the topic, keep the discussion moving, avoid having the group become sidetracked, avoid quibbling over irrelevancies, summarize and draw conclusions. While the responsibilities of members of the discussion group are to be well informed on the topic, speak informally while avoiding arguing and quibbling, stay with the topic under discussion, have sources of information available, back up statements with facts, and help the group summarize its conclusions. In this type the responsibilities of the audience (students) are to listen attentively, withhold questions until presentation is completed, ask for clarification of ideas, ask for evidence on questionable statements, confine remarks to the topic under discussion, and extend customary audience courtesies to members of the round table.

(d) Symposium: This is a meeting at which experts have discussions about a particular subject. According to Maheshwari and Archana (2018), symposium is a series of speeches given by as many speakers as there are aspects of a problem or issue. The speakers are expected to talk for ten to twenty minutes, develop individual approaches or solutions to a problem or present aspects of a policy, process or programme. The speeches are followed by questions or comments from the audience, as in the panel. The speeches may be persuasive, argumentative, informative or evocative. Each speech proceeds without interruption. The chairman of the symposium introduces the topic, comments on its importance and sometimes indicates the general approaches.

Discussion, no matter the form it takes, the main objective is to ensure that it involves a healthy academic interaction between the teacher and the pupils and between pupils and pupils. Pupils are given the opportunity to build confidence, gain knowledge and discover things by themselves.

Teacher's roles in discussion method

The teacher must keep a balance between controlling the group and letting its members speak. The goal of a discussion is to get students to talk purposefully about the course material. Teacher's role becomes that of facilitator. He/she moderates the discussion rather than convey information. For a purposeful discussion, teacher should not do all the talking; or talk to one student at a time. It should be remembered that the discussion is not just a matter of teacher's communication with students; it is a chance for them to share ideas. Individual style will influence the amount of control a teacher will use, but in general the teacher's role in a discussion is not to dominate, but rather to get the discussion started, set goals, summarize, mediate, clarify, and allow all to be heard. Rahman et al (2011), has recommended some responsibilities of a teacher in discussion such as:

Make sure that everyone has a chance to contribute: It is emphasized that once a question is posed; teacher should wait long enough for someone to answer it. Teacher might occasionally try having students write down an answer first, which gives more reserved students a chance to think about their thoughts before speaking.

Organize, summarize, and synthesize: These help to structure the conclusions the class has reached and to keep them on track. A teacher should restate the correct portions of comments made by a student. He/she can show attention by building on a student's points, by withholding judgment until several students' responses, or by listing the multiple responses on the board and asking the students to group them. At the end of the class, summarize the points they have made and connect them to the original questions posed at the beginning of the class. It allows students to come to their own conclusions, and to help structure and analyze them.

Tolerate opposition: If students are disagreeing in interpretation or conclusion, but are backing their arguments up, that's the nature of discussion. Sometimes, finding out what students are thinking and how they will respond to a given question is more important than momentary control. Discussion is a reflective, educative, and structured group conversation with students. It emphasizes social intercourse between familiar people; encouraging students to think critically and creatively at higher cognitive levels; requires that the discussion is organized and conducted by a leader. In discussion the teacher plays his role as a model, as an enquirer, as a listener, and as a questioner.

Framework for teaching using Discussion Method

Some of the steps in discussion method adopted by Dauda and Elisha (2015), are:

1. provide discussable topics to the pupils which presuppose some background information or knowledge by the pupils and within their intellectual ability.

2. inform the pupils about the topic in question including pre-discussion assignments so that they can be well prepared and make significant contributions.
3. well designed pre-determined questions to be asked to elicit more information on the topic.
4. arrangement of seats to be in circular or semi-circular formation that will allow a close interaction amongst the teachers and pupils.
5. discussion should not be dominated by the teacher or brighter pupils rather it should provide equal opportunities for all pupils.
6. the teacher should clarify points when the pupils wander away from the topic.
7. there should be positive reinforcement in form of praises for reasonable contributions while at the same time, irrelevant comments should be tactfully rejected.
8. summary of important points to be drawn largely from the pupils' correct contributions.
9. provision of adequate teaching aids is imperative.

Jarolimek (1986) in Rahman et al (2011), has described the guidelines for effective discussion as given below:

1. participants should come prepared for the discussion session and should listen attentively when others are speaking ;
2. participants need to remain objective, open-minded, avoid getting emotional and should contribute their ideas;
3. they should respect and accept the contributions of others but keep independent thinking;
4. they should not be offended in case the group rejects their ideas;
5. participants should speak loudly and clearly and should ask for clarification of ideas that are not understood;
6. one member or group should not be allowed to dominate the discussion. The group should have confidence in their ability to come to a satisfactory decision.

Advantages of Discussion Method of Teaching

Some of the disadvantages of discussion method of teaching are given by Ombugus, Jatau and Kuzhe (2009), to be:

1. discussion in the classroom makes a teacher to be well prepared and to organize the classroom for best results.
2. it gives the pupils good opportunity to participate fully in the lesson and contribute their ideas. By expressing their ideas about concepts, they are exposed to some clarifications, engage in argumentation thereby gaining more knowledge and confidence.
3. discussion method, being an interactive process, aids the teacher towards a better understanding of his pupils.
4. it can be used to promote inquiry mind and to provide good practice for problem-solving.
5. socially, pupils develop the spirit of accepting peers' ideas and views. Hidden talents are discovered while creativity and initiative are promoted.

Disadvantages of Discussion Method of Teaching

Slavin (1996) in Elvis (2013), highlighted the disadvantages of discussion method of teaching to be:

1. discussion method is a predominantly interactive process involving a multiple flow of communication between pupils and pupils and pupils and teacher, therefore takes a considerable length of time.
2. little ground is covered in the curriculum because of digressions. Teaching aids, such as recording and video equipment, and some agricultural equipment are sometimes not available to enhance the discussion.
3. some pupils may never participate either because they lack the knowledge of the background to the topic or they are not afforded the opportunity to do so.
4. slow learners feel shy to contribute or be part of the exercise because the brighter pupils may dominate the discussion.
5. since the discussion method is highly dependent upon intelligence and good communication skills, majority of the pupils may be cheated because they may shy away from the exercise.

2.2.5. Conventional Lecture Method

The conventional lecture method of teaching (CLM) in secondary schools is a common strategy teachers of secondary schools Agricultural Science adopt these days. Some authors like Gbamaja (1991), referred to conventional method of teaching as the “talk and chalk” or “textbook method”. It is a method where the teacher dominates the teaching with very little participation on the part of the learners. The teacher using this strategy is seen as the repository of all knowledge while the students are passive recipients of knowledge transmitted by the teacher in the process of learning. The curriculum is held as absolute in many schools, and teachers do not clearly understand important concepts. Rather than adapting the curriculum to students needs, the predominant instructional response in conventional setting is to view those who have difficulty in understanding the unaltered curriculum as slow learners.

Agwuagah (2009), termed it the “traditional strategy” while Kalejaiye (2010), referred to it as the conventional method. In conventional strategy, the teacher concentrates on the use of examples in the textbooks and the students are taught solution to the Agricultural Science problem with emphasis only on how to arrive at the solution or answer to the problem.

The advantage of this strategy is that it allows the Secondary School teachers of Agricultural Science to cover a wide scope of the curriculum within a limited time. Unlike the earlier discussed methods, it is not child centered, students do not gain mastery of concepts, the bright ones among them tend to forget whatever they have learnt after a few time interval. What then is the effect of this method on students’ achievement when the five difficult concepts identified in Agricultural Science are taught?

2.2.6 Concept of Performance

The concept of "performance" is pluralistic and demonstrates the ability to migrate from one semantic register to another. The fact that this concept is a mobile one is also suggested by the

new quantitative dimensions assigned by literature and practice. At a simple etymological analysis of this term we can find that this is a term with a large use, in a variety of areas (sports, mechanical, economics, education etcetera) which over time turned into a polysemantic term on a basis of the field of activity covered. Yet regardless of domain, the term performance leads us to success, competitiveness, action, effort, progress. This is because performance will always refer to the capacity of the subject (individual) to register progress as a result of the efforts aiming to achieve and even overcome the established goals (Pinteal, 2013). To perform is to take a complex series of actions that integrate skills and knowledge to produce a valuable result (Elger, 2014).

Performance is a fact of life. In work or in play, indeed in any activity where we input even momentary attention, performance can be felt. Performance assessment is the direct, systematic observation of an actual student's performance and rating of that performance according to the pre-established performance criteria (Angyaye, 2007). Students, when asked to perform a complex task or create a product, they are assessed on both the product and the end result of their work. Many performance assessments include real life task that calls for higher order thinking (Angyaye, 2007). Children who complete secondary education are expected to have acquired lifelong skills and be competitive in the global village when it comes to their employability (Molokomphale and Mhlauli, 2014). This therefore, calls for students to excel academically or hopefully perform to the satisfaction of the nation. Performance level is measured as one puts in more efforts to accomplish greater tasks.

The performance based approach to education enables students to use their knowledge and apply skills in realistic situations. It differs from the traditional approach to education in that it strives for mastery of knowledge and skills; it also measures these in the context of practical task. Furthermore, performance-based education focuses on the process students go throughout the learning process (Nichols and Suttons, 2013). In addition, performance-based education stimulates the development of other important dimensions of learning namely the affective, social and meta-cognitive aspect of learning. Performance- based education motivates students to participate in interesting and meaningful tasks. It helps students develop a sense of pride in their work, fostering confidence in the target language. The assessment thus enables students to demonstrate specific skills and competence by performing or producing something. Through performance- based teaching, teachers can track pupils, work on a task, show them the value of their work processes and help monitor them to use tools as periodic reflections working files and learning logs more effectively (Bell, 2013). The following are some of the advantages of performance assessment on students as given by (Strauss, 2013).

- i. It encourages problem solving and critical thinking skills.
- ii. It encourages divergent thinking.
- iii. It focuses on both product and process.
- iv. It promotes independent learning involving planning, revising and summation.
- v. It builds on pupils' prior experience.
- vi. It can include opportunities for peer interaction and collaborative learning.
- vii. It enables self-assessment and reflection.
- viii. It is interesting, challenging meaningful and authentic.
- ix. It requires time to complete.

Level of Performance

Performance, as the adage goes, is a “journey not a destination.” The location in the journey is labeled as “level of performance.” Each level characterizes the effectiveness or quality of a performance. Elger (2014), outlined below different levels of performance as it affects various fields:

- i. As a lawyer improves her level of performance, she can conduct legal research faster, more thoroughly, and more in-depth.
- ii. As an actor improves his level of performance, he is able to learn parts quicker, play more varied roles, and produce a deeper and more meaningful impact on audience.
- iii. As an academic department improves its level of performance, the members of the department are able to produce more effective student learning, more effective research, and a more effective culture.
- iv. As a manager advances his level of performances, he is able to organize people and resources more effectively and to get higher quality results in a shorter time.
- v. As a teacher advances his levels of performance, he is able to produce deeper levels of learning, improved levels of skill development, and more connection with the discipline for larger classes while spending less time doing this.

Factors that Influence Performance of Students

Educational institutions are mandated to use education as a tool for social transformation. The success of a school is measured by the quality of students it produces. The success of any educational institution is measured by the performance of its students in both academic and non-academic tests. This is supported by Yusuf (2012), when contending that the performance should not only be based in terms of test and examination results and students ability to apply what is learnt and the rate at which students move on to higher institution of learning, but should include other areas such as whether the students have acquired the survival skills. In spite of that, the use of students’ performance in academic work to assess the teacher’s effectiveness has gained ground. The measure of academic performance as a symbol of school success can be traced way back from the Victorian period (Bell, 2013). Since then, academic performance has been used to grade schools and most importantly to determine one’s career paths. The ‘good schools’ are acclaimed to be those that are able to groom the students well enough to achieve the set standards. This is measured by the use of students’ academic performance both at school level and nationally. The importance of students’ high performance has attracted the attention of the public, policy-makers, educators, learners and Ministry of Education alike. The level of students’ performance has an impact on the roles played by education stakeholders. Students’ performance is influenced by a number of factors. Such factors are: school leadership, teacher’s quality, parental support and students.

Research has indicated that school leadership, teacher’s quality, parental support and students are detrimental to students’ high or low academic performance (Molokomphale and Mhlauli, 2014). Collaboration between school leaders, teachers, students and parents can assist in promoting students learning.

School Leadership

The success of any school undoubtedly depends on the type of leadership that the school has. The current school leaders perform multiple functions as compared to the past leaders. They perform managerial, instructional, curriculum, counselor, arbitrator and in some cases advisory roles in the community. Researchers have argued tirelessly on the link between quality leadership and school performance for many years. The conclusions reached made some authors to believe that no schools can be greater than their leaders and that a school is as good as its leadership (Yusuf, 2012). Emerson & Goddard (1993) in Molokomphale and Mhlauli (2014), asserted that there is a strong link between the quality of a school and the quality of its leadership. The School Head is an overseer of all activities taking place in a school and answerable to activities within the school compound. His/her core business is the success of the school by making teaching and learning enjoyable and more effective. It is a wish for every School Head to be trusted, respected and praised by the community he serves. One of the factors that make school leaders to be belittled is when the school performs badly; and as such it is an area which the School Head will try to avoid at all cost. In order to sustain academic performance the leadership will have to create an academic achievement ethos, organize instruction throughout the school spectrum and aims to attain the target set by the supervisory department, thus becoming instructional leaders.

There are several ways in which school leaders have an impact on the students' academic performance. One of the ways is the school leader being an instructional leader. Instructional leadership involves setting goals, managing curriculum, monitoring lesson plans, allocating resources and evaluating teachers regularly to promote students' learning and growth (Tella, 2013). An effective instructional leadership is able to build the culture of learning, provide resources needed for quality teaching, and structure, the classroom environment to stimulate teachers and learners motivation. Effective instructional leadership behaviour of the school leader has been shown to be the most crucial role to improve teachers' performance and students' academic achievement (Strauss, 2013). Using his supervisory role the head should have time to check what happens in the classroom. He should spare some of his time to observe teachers teaching. After lesson observation his duty should be that of advisory than castigation. He should give feedback on the teachers' strong and weak points. Always giving praise for the good work makes teachers valued and motivated to work an extra mile. Where proper advice is given, it makes teachers happy and they will then work on their weaknesses to enhance their performance. In fact, teacher appraisal is part of the School Head duties. Another way is school leaders being excellent communicators. They should constantly remind teachers, parents and students of the schools vision, mission, values; and the core purpose of the school as to provide teaching and learning. They should assure teachers and students that nothing is impossible even in times of hardships. They should listen to everyone in the school, be it students, ancillary staff or teachers. The school leaders should practice the shared leadership, where decision – making involves other education stakeholders (Tella, 2013).

The ideas and opinions from the school community can help to improve students' academic performance; their communicative skills can inspire trust, motivation and confidence among teachers and students. This can instill a sense of effectiveness in teachers and ultimately have a positive impact on students' academic performance. In their capacity as collaborative leaders the

school leaders should encourage collaboration from teachers. Teachers should meet together as colleagues to share knowledge, experiences and as well as sharing the risks they face with regard to the teaching and learning process. This eliminates teachers' isolation so that discussions about students' performance become a collective effort. Coupling with his collaborative leadership the school leader should be accessible, visible and approachable by members of the school community. He should be seen to be always positive, be their role model and try to double individuals' effort to reinvent the process of teaching and learning and providing staff training and development. A successful instructional leader should possess excellent planning and observation skills as well as proficiency in research and evaluation of both teachers and students performance (Tella, 2013).

Teachers

Teachers for years have been regarded as the essential catalysts for school improvement and school development. They are the driving force and main resource in the development and academic growth of students as they are sources of knowledge and agents of change (Nichols and Suttons, 2013). Teacher effectiveness has been the interest of policy makers, educators and parents. The effectiveness is measured by students' academic performance in both internal and external examinations. It is a general feeling that students who fail the examinations are taught by ineffective teachers; on the other hand those who excel are taught by the very effective teachers. Research so far has shown that a teacher's effectiveness has an influence on the students' academic attainment (Afe (2001) in Molokomphale and Mhlauli, 2014). Logically it is so because teachers are the facilitators in the teaching and learning process. They interpret the subject matter and put theory into practice during their interaction with the students. The teacher is "increasingly becoming the focus of interest because of the key role that he or she plays in the delivery of quality education to the learners".

This seems to suggest that teachers are agents of change and as such are critical in the students' academic performance. Teachers are praised and rewarded for good performance. It is the responsibility of teachers to impart knowledge, skill and encourage students' social development. This is enshrined in the employment contract and explicitly defined in their job descriptions. In addition to cultivating knowledge, skills and attitudes teachers are expected to help the students to identify and develop their potentials. In the early stages of education teachers are charged with the responsibility to develop students' primary skills necessary for advancement. Teachers play a pivotal role in helping the students to direct their potential to achieve their destiny. Learners need to be prepared for these challenges that lie ahead of them. This is anchored in the idea that our world needs a generation of teachers who aim to "develop learners instead of teaching them, who help their pupils to become independent (learning to learn), who provide students with motivation and interest for life-long learning and urge them to become autonomous learners" (Elger, 2014). Teachers use several techniques to assist students improve their academic performance. They evaluate, assess and provide for students with special needs. Teachers are evaluators at classroom level for quality standard. They attend to students work during lessons, provide tutorials, mark students' homework and give feedback. If a disability is identified in a student, a teacher will work around the clock to assist the child to build confidence and recommend a remedy. This builds students competence and their academic performance

improves. In addition teachers evaluate the curriculum materials, education programs or initiatives that are in place for their suitability to students' learning.

Parents

Literature reviewed revealed that parental involvement in the activities of the school has a positive impact on students' academic achievement and the success of the school (Halsey, 2010; Christie, 2008). Parental involvement boosts the morale of teachers because of the partnership that will have been established between the school and the community. The most crucial practice would be school leadership creating a climate that will attract parents to participate in their children's learning. Parents should not only be consulted when there is a fund raising activity, but also for activities which might not be taken as important.

There are a number of things that parents can assist in their children's learning. Parents are capable of helping the students to do their homework, tutoring, supervision of afternoon study periods, coaching sports and motivational talks. As long as they know that their contribution is recognized and is vital for the achievement of their children, parents will be more than willing to value their children's education. Parents raised children with the hope of making them better citizens. One of the parents' aspirations is to see the children having succeeded in their schooling. In developing countries, Nigeria inclusive, where unemployment is rife parents care about their children's academic performance because the status quo is, good results means better opportunities for more career choices and white collar jobs. In a collaborative climate where there is a mutual relationship between parents and teachers, parents are accountable for their children's homework, provision of additional funds for students educational trips and school attendance. In Nigeria, government has endorsed parental involvement in the education and mandated schools to form Parent Teachers Associations (P.T.As). In this relationship parents assist the government in paying a small amount of money as P.T.A. levy and share the cost of students' tuition (Halsey, 2010).

Funds are used for school development and enhance students learning. In some schools, there is a book that the teachers communicate with the parents on daily basis concerning the students. Parents show interest in students' performance by conducting daily spot checks on their work. This ultimately motivates students to be serious with their school work, hence improve their academic performance. Parents therefore, have a major role in their children's education (Christie, 2008).

Students

The core business of schools is teaching and learning in order give students quality education. As an affirmation on the above, it is stated that; "one of the indicators of quality education being provided is cognitive achievement of learners" (Kimani, Kara and Njagi, 2013). It has been said previously that school leaders, teachers and parents have a critical role in providing quality

education for students. But it can be argued that for quality education to prevail all education stakeholders should take part in the translation, interpretation and implementation of policies regarding achievement of high standards of education, including students. Much is said about how to help students achieve their academic performance and little is mentioned about how the students themselves have impact on their own achievements. It should be noted that whatever effort that teachers exert to enhance students learning, the honour lay with the students. Hence the proverb ‘you can lead a horse to the river but you cannot force it to drink water.’ However, there is evidence from research which shows that students can play a critical role in improving academic performance (Nichols & Sutton, 2013; Tella, 2013).

There are several ways in which students can have an impact on their academic achievement. Among others is students study habits. Study habits can be positive and negative. The negative aspect of students study habits will be dealt with later in the article. The positive study habit is when students attend to their school work, read book to search relevant information, schedule time for doing homework, attend tutorials and ask teachers questions where they do not understand the concepts taught. After tests have been marked students who work on teachers’ feedback have high chances of improving their performance. Another positive habit is when the students work in groups when they are given an assignment or topics for discussion. The intelligent students will help the low achievers to upgrade their grades and enhance their confidence. In a mixed ability class it has been proven that if students are not streamed according to the students capability there is a higher overall attainment and equitable outcome (Elsworth, 2013).

The students involved in mixed-ability approach tend to have respect for one another. Students who value education as a means of obtaining survival skills normally take learning serious. They do extra work with the assistance of their teachers. This ultimately proves their academic performance. Negative study habit is when students have a negative attitude towards schooling, students’ reluctance to learn and not preparing work before classes begin. There are several factors which can contribute to students’ poor academic performance. One of such is language barrier, which greatly affects students’ academic performance in schools. Many students enter the classroom not fluent in the language of instruction. This language is used for testing students’ mastery of subject content and used in the examinations. The student might understand the concepts in their mother tongue but fails to express it in the language of examinations. At the end the student is rated a low achiever because of the language problem.

According to Elsworth (2013), children take years to master their native languages. Nigeria is a multi-national society with over twenty-five spoken languages. The national languages are Hausa, Igbo and Yoruba while English is the official language used. Students are expected to learn Hausa, Igbo or Yoruba pending on their regions until they finish secondary school while, English is a medium of instruction from primary four (4) up to university level. It is used for testing students’ mastery of subject content and used in instructions and examinations. The students might understand the concepts in their mother tongues but fail to express it in the language of communication in examinations. At the end the student is rated a low achiever because of the language problem.

Parenting styles

Parental involvement in the child's school improves his/her performance. But some of the ways in which parents groom their children can have a negative impact on students' academic performance. In real life situation, there are parents who are authoritative in terms of school work is concerned. Parenting styles have been shown by researchers that they can have a negative impact on their children's performance. Permissive and uninvolved styles cannot assist in making children value their education. The permissive style is when the strictness over the children has been lifted. The children have the freedom of choice in their study.

Children living under this style often neglect their studies in favour of immediate and entertaining achievements (Verial, 2013). All in fairness, it should be remembered that if you spare the rod you spoil the child. The uninvolved style has been revealed as the worst parenting style which contributes to low students' performance. Similarly the parents give their children control over their school work. They do not help children in their homework or even giving them emotional support when children have personal problems. This results in students' demotivation and lack of interest in schooling.

Poor study habits could be another contributing factor in poor students' performance. Students' lack of study skills and commitment to achievement has a negative impact on academic performance. Negative attitudes towards schooling, students' reluctance to learn and preparation of work before classes begin make students not ready for tests and examinations. Other related factors such students' intelligence, socio-economic status and lack of resources are determinant of students' academic achievements (Radzka, 2010).

The deficiency in the above means low students' academic performance. (Verial, 2013), believes in the authoritative style as it does less harm to the child's self-esteem and ability to think autonomously as opposed to uninvolved style where parents give their children control over their school work. Home background and socio-economic status of the students have also been attributed to students' academic performance. Yinusa and Basil (2008), suggest that the students' home background influence academic and educational success, while socio-economic status reinforces the activities and functioning of the teachers and students.

Lack of academic motivation has also been attributed to students' low achievement. Ramsdal, Gioerum & Wynn (2013), attest that lack of academic motivation seems to be a prominent problem for numerous high school students. Further researches have indicated that an individual student's intelligence has the most significant impact on his ability to perform well academically (O'cala, 2010; Radzka, 2010), Without mental capacity to understand and retain the imparted knowledge and skills, students will not enjoy the teaching and learning. It has also been observed that intelligent students normally help the low achievers to upgrade their grades and enhance their confidence (O'cala, 2010). Other related factors include resources, behavioural problems, friend's factors, drugs or alcohol abuse, diet and physical activities (O'cala, 2010; Radzka, 2010). The above factors are determinant of the students' academic performance.

2.2.7 Students' Academic Performance

The task of improving the academic performance of secondary school students presents a complex challenge to teachers who are the principal actors in meeting the diverse learning needs

of every student in the classroom. The search for instructional methods to help teachers meet this challenge has attracted much attention from many researchers in the recent past. The academic performance of students has been linked to the method(s) of instruction used by the teachers (Ameh and Dantani, 2012). Performance can be described as an act of accomplishing or executing a given task. It could also be described as the ability to combine skillfully the right behavior and the achievement of organizational goals and objectives.

Students' academic performance refers to the observable and measurable behaviour of a student in a particular situation. It is the yardstick through which students' progress, teachers' effectiveness and the overall educational standard is determined. For example, the academic performance of a student in Agricultural Science includes the observable and measurable behaviour of a student at any point in time during the course. (Olaniyan, 2017). This implies that, it is the reflection of their ability in academic work.

According to Sikhwari (2014), academic performance can be measured through some instruments such as; examination and test, and the marks, scores, grades or percentages obtained are given as the results. It is this result that determines the students' progress, teachers' effectiveness and the general standard of education. Therefore, it implies that the scores of students in Agricultural Science obtained from a teacher made test is their academic performance.

Peter et al, (2016), opined that students' academic performance is a situation in which students obtain certain marks whether low, average or high in any teacher made-test or any examination depending on the students' Intelligent Quotient (IQ) and depending on the standard that is set. Students score that meet the standard or above the standard, is said to be good or excellent performance and score below standard is a poor performance. Students' performance will also determine whether the students will be due for admission, promotion and transition and the effectiveness of the teacher.

2.2.9 Students Attitudes and Performance in Agricultural Science

Students' performance in Agricultural Science depends on many factors and stands out to show how well a student is doing. Festus (2007), contended that achievement appears generally to be the fundamental goal behind every life struggle, but the positive platform has consequential effects of improving the worth of the students and can only be achieved through acquisition of positive learning attitudes. The attitude of a student triggers his behavior. Attitudes are antecedents which serve as inputs or stimuli that trigger actions.

Attitude is an emotional state of individual towards an object or situation. Blair, Sola and Ojo (2009), saw attitude as a propensity of an individual to respond in a certain way to a stimulus. Flowers (2017), defined attitude as a particular feeling about an object or thing and therefore involves a tendency to behave positively or negatively in situations that involves the

object or thing. From the above definition, it reveals that an attitude is directed toward an object and this may be an individual, school policy subject or even idea or any material object. Wilson and Soyibo (2015), in their studies reported that students' positive attitudes to science correlate highly with their science performance. In order to solve Agricultural Science problems in an acceptable manner, the problem solver must have both conceptual scientific and procedural knowledge (Ektepe, 2016). According to Greenwald (2012), the best way for students to learn Agricultural Science is to experience challenging problems and the thoughts and actions associated with solving them.

2.3 Theoretical Framework

This study is aligned to the theories of cognitive science particularly that of John Dewey's (1938) theory of experimental learning or learning by doing and Jean Piaget's (1936) cognitive theory of learning.

2.3.1 John Dewey's Cognitive Learning Theory

Learning by doing refers to a theory of education expounded by an American philosopher John Dewey. He theorized that learning should be relevant and practical, not just passive and theoretical. Dewey (2009), viewed learning by doing to be a practical or demonstrative type of learning process because it gives the students the opportunity to participate in the teaching-learning process which can give the students experiences and improve their academic performance. Dewey states that "knowledge emerges only from situations in which learners have to draw meaningful learning". Therefore, students should be given something to do, not something to learn as doing is of such nature as to demand thinking which includes games, play and constructive occupation because the students would be more engaged in what they are doing (Dewey, 2009). Peter, Ayorinde and Okey (2016), discussed that Dewey did not agree with one-way delivery style of authoritarian schooling, because it does not provide a good model for life in a democratic society. Instead students need educational experiences which enable them to become valued, equal and responsible members of the society. He believed that students thrive well in an environment where they are allowed to experience and interact with the environment, and that all students should have the opportunity to take part in their own learning. Dewey (2009) in Peter, Ayorinde and Okey (2016), was of the opinion that an educator must take into account the unique difference between each student because each person is different genetically and in terms of past experiences. Even when a standard curriculum is presented using established pedagogical methods, each student will have a different quality of experience. Thus teaching and curriculum must be designed in ways that allow for such individual differences.

Dewey in his theory of learning by doing postulated that;

1. Curriculum should be based on students' interest and should involve them in active experience.

2. Students should be actively involved in real-life tasks and challenges, because knowledge emerges only in situation which learners' have to draw them out of meaningful experiences.

These situations have to be embedded in social context such as classroom where students can take part in manipulating material and thus forming a community of learners who construct their knowledge. And students cannot learn by memorization but can learn by directed living where by concrete activities are combined with theory. Dewey's theory of learning by doing viewed that true education comes through the stimulation of the child's power by the demand of social situation which he finds himself. This theory of learning by Dewey (2009), also stated that it is not enough just to do, and neither is it enough just to think, nor is it enough simply to do and to think, but learning from experience must involve link between the doing and the thinking.

This led Dewey to develop four-stage models of learning by doing which are concrete experiences, reflective observations, abstract conceptualization and active experimentation which are highly interlocked with one another. Based on this four-stage learning by doing identified by Dewey, it is placed in sequence and form experimental learning cycle on which the learner can enter at any point, but the stages must be followed in sequential order.

The theory of learning by doing which Dewey called experimental learning identified five steps of learning as follows:

1. Taking note about a type of reaction
2. Designing and running an experiment to test whether this type of reaction occurs
3. Gaining experiences of seeing what happens in the experiment
4. Looking at the results and comparing these with other results
5. Discussing possible explanation of these results.

These steps go on and on until adequate understanding of the nature of the reaction has been arrived. Students should be actively involved in real-life tasks and challenges and curriculum should be based on students' interests, and should involve them in active experience. Active curriculum according to Dewey (2009), should be integrated rather than subject matter fragments. Teachers are responsible for achieving the goals of the school but specific topics to meet these goals cannot be determined in advance because the topics should be of interest to the students.

Dewey (2009) in Peter, Ayorinde and Okey (2016), categorized life skills that can be acquired through experimental or learning by doing as follows;

1. Enhancement of learning skills such as capitalizing on curiosity, coping with changes, identifying sources of knowledge and developing psychomotor skills.
2. Strengthen and use decision making skills such as assessing needs and interest using resources like time, energy, talents and money wisely, establishing goals and priorities.
3. Development of positive self-concept which is emerging belief about oneself that contributes to one's ability to cope successfully with issues on one's life and eventually making positive impacts on the lives of others.

4. Communication and relationship with other people because the students involve in learning by doing, which can lead to development of communication skills and enhance the ability to understand and respect what was said with the openness to develop another point of view. This includes verbal and non-verbal communication such as record keeping, making friends and negotiations.
5. Response to the needs of others and the community in which the students live to become aware of the concern of the people who live there and take appropriate action. Dewey (2009), traced some overview points to help clarify what experimental or learning by doing is, and they are as follows:
 - a. Learners are involved in an active exploration of experience because experience is used to test out ideas and assumption rather than to obtain practice passively. Practice can be important but it is greatly influenced by reflection.
 - b. Learners must selectively reflect on their experience in a critical way rather than take experience for granted and assume that the experience on its own is sufficient.
 - c. The experience must matter to the learners because it must be committed to the process of exploring and learning.
 - d. There must be scope for the learners to exercise some independence from the teachers. This is because teachers have an important role in devising appropriate experiences and facilitate reflection. However, the transmission of information is but a minor element and the teachers cannot experience what the learners experience or reflect for the learners.
 - e. Experimental or learning by doing is not the same with discovery learning because learning by doing is not simply a matter of letting learners loose and hoping to discover things for themselves in a haphazard way through sudden burst of inspirations. The nature of the activity may need to be carefully reviewed and analyzed afterward for learning to take place.

John Dewey's theory is very important in this study because the theory supports the view that learners should be allowed to interact with the environment. Demonstration and discussion methods are activities centered methods of teaching that emphasized students' activeness in order to acquire practical skills in Agricultural Science among secondary school students.

2.3.2 Jean Piaget's Cognitive Learning Theory

Jean Piaget was a psychologist that worked on cognitive development of children. In his theory, he believed that the developing of children builds mental maps for understanding and responding to physical experiences within his or her environment. He categorized cognitive development into four major stages which include:

Sensory motor stage (0-2 years): It is characterized by the idea that infants "think" by manipulating the world around them. This is done by using all five senses: seeing, hearing, touching, tasting, and smelling. Children figure out ways to elicit responses by "doing", such as pulling a lever on a music box to hear a sound, placing a block in a bucket and pulling it back out, or throwing an object to see what happens. Between 5 and 8 months old, the child develops *object permanence*, which is the understanding that even if something is out of sight, it still exists (Bogartz, Shinsky, & Schilling, 2000 in Baken, 2014). For example, a child learns that

even though his mother leaves the room, she has not ceased to exist; similarly, a ball does not disappear because a bucket is placed over it. By the end of this stage, children are able to engage in what Piaget termed deferred imitation. This involves the ability to reproduce or repeat a previously witnessed action later on; rather than copying it right away, the child is able to produce a mental representation of it and repeat the behavior later on. By 24 months, infants are able to imitate behaviors after a delay of up to three months.

Pre-operational intuitive stage (2-7 years): During this stage, children can use symbols to represent words, images, and ideas, which is why children in this stage engage in pretend play. A child's arms might become airplane wings as he zooms around the room, or a child with a stick might become a brave knight with a sword. Language development and make-believe play begin during this stage. (Kendra, 2014). Logical thinking is still not present, so children cannot rationalize or understand more complex ideas. Children at this stage are very egocentric, meaning they focus on themselves and how actions will impact them, rather than others. They are not able to take on the perspective of others, and they think that everyone sees, thinks, and feels just like they do (Kendra, 2014).

Concrete operational stage (7-11 years): The concrete operational stage occurs from age 7 to age 11. It is characterized by the idea that children's reasoning becomes focused and logical. Children demonstrate a logical understanding of conservation principles, the ability to recognize that key properties of a substance do not change even as their physical appearance may be altered. For example, a child who understands the principles of conservation will recognize that identical quantities of liquid will remain the same despite the size of the container in which they are poured (Lazarus, 2010). Children who do not yet grasp conservation and logical thinking will believe that the taller or larger glass must contain more liquid. Children begin to organize objects by classes and subclasses, and they can perform mathematical operations and understand transformations, such as addition is the opposite of subtraction and multiplication is the opposite of division. By the end of this stage, children will develop true mental operations and master the concepts of reversibility, transitivity, and assimilation.

Formal operational stage (11-14/15 years): At the formal operational stage of Piaget, the stage that stretches to adulthood, individuals are said to reason abstractly and highly too. As a result, Papalia, Olds and Feldman (2011) referred to this stage as a major shift in intellectual capacity. According to them, students at this stage can understand historical time and extraterrestrial space. This shift in intelligence, Piaget attributed to a combination of brain maturation and expanding environmental opportunities. This is because prior to this stage of formal reasoning, children in middle childhood can according to Roediger III Rushton, Capaldi and Paris in Oche (2016) solve problems strategically and master many games but do not think abstractly. This stage represents the zenith of human thinking. The individual at this stage can imagine the future and contemplates implications of events not directly experienced.

Piaget (2004), in his contribution to the theory of learning by doing or experimental learning suggested that curriculum should be based on students' interest and should involve them in active experience. Piaget recognized that human beings are born as active exploratory information processing organisms and actively construct their own ways of thinking about things based on their current level of maturation, actual experiences with objects, people and ideas

(Ukamaka, 2014). Piaget's theory emphasizes on the cognitive development of learners. It observes that learning is usually in sequence based on the intellectual development and maturation of the learners.

Jean Piaget's cognitive learning theory is important to this study because it emphasizes on the cognitive development of the learners. The teachers of Agricultural Science should ensure to adequately arrange the learning tasks to tally with the level of maturation along side with the appropriate methodology(s) to be adopted so as to effectively promote understanding of ideas, facts concepts etcetera by students.

Demonstration and discussion methods of teaching can effectively be handled by the teachers of Agricultural Science if the learning environment (classroom) is made stimulating and conducive. Advisably, for teachers of Agricultural Science to perform, teaching materials/facilities should be made available. It is only with this that can make the objectives of the above teaching methods (demonstration and discussion) to be accomplished with ease.

The two theories discussed above are all learning theories, as they deal with the pattern through which learning processes takes place. It can be observed from the theories that learning occurs through the interactive processes of the teachers and the learners that is to say that certain methodologies must have to be employed in a hierarchical order (simple to complex). This stage shows a dramatic improvement in intellectual operations. The individual's explorative tendencies at this stage enable him or her to manipulate facilities available in and around the environment. It is now the sole responsibilities of the teachers of Agricultural Science to improve on teaching approaches like demonstration and discussion, so that these skills and knowledge can be fully imparted in the learners. Memory or intelligence needs nurturing for it to grow. Apart from what they thought could increase intelligence, Bruce and Carolyn (2005), suggested that children could grow their intelligence if they experience a stimulating environment. To them, a stimulating environment encourages thinking out ideas as well as emotional intelligence. They advocated that formal reasoning can only be attained through appropriate environmental stimulation. And as noted by Nwachukwu (2009), "children are born with inherited potentialities for intellectual growth but that they must develop into that potential through interaction with the environment". There are advantages inherent in creating a stimulating environment and this should be encouraged and guided for positive and meaningful learning to be achieved. In school learning, the interest of the learners is very paramount and should be sought after and be encouraged. This is why teachers are also encouraged to vary their methods of teaching so as to ensure that learners' interest and attention are guaranteed for effective and meaningful learning to take place. Well demonstrated and discussion based lessons could enhance learning as students interest and attention span are secured. This happens because students play with materials and are also engaged with exercises under a conducive classroom environment.

Based on this research, the theory of John Dewey was chosen to serve as the theory that guided this work. This is because the theory emphasized on experimental learning or learning by doing. Demonstration and discussion methods are activities centered methods of teaching that emphasized students' activeness in order to acquire practical skills in Agricultural Science among secondary school students.

2.4 Empirical Studies

Several studies regarding the effect of demonstration and discussion methods of teaching as they affect students' academic performance in Agricultural Science in secondary schools have been carried out. Much of the researches conducted so far focused on two or three methods of teaching as they affect students' performance in an aspect in Agricultural Science, chemistry, social studies and other related subjects.

Abdulhamid (2010), conducted a research on the effect of two teaching methods (demonstration and discussion) on secondary school students' Agricultural Science performance in secondary schools in Bauchi metropolis. The design for this study is pretest-posttest non-equivalent control group design. The area for the study was Bauchi Local Government in Bauchi State. The target population of the study was all SS II students studying Agricultural Science in the selected secondary schools in Bauchi Local Government. Random sampling technique was employed in selecting the sample schools. There were 60 students from three sampled schools that served as sample for the study; two schools were experimental schools while the other one was a control school. In each school, one class was randomly selected as the sample from the set of SSII classes. The instrument used for data collection was a 20-item multiple choice Agricultural Science Achievement Test (ASAT). The instrument was pilot tested and the results obtained from the pilot study were analysed using Kuder Richardson coefficient formul (K-R21). The reliability index obtained was 0.71. The findings from the study revealed that though both teaching methods had significant effect on students' performance in Agricultural Science, the demonstration method was found to be more effective than the discussion method. This research is similar to the present research as it looked at the effect of the two teaching methods (demonstration and discussion) on the performance of students in Agricultural Science in Senior Secondary Schools, also both studies employed quasi experimental design, and the concepts used are similar too. However the geographical scope is different, while Abdulhamid conducted his study in Bauchi State, this present study was conducted in Kaduna State.

Olatoye and Adekoya (2010), also conducted a research on the effect of project based, demonstration and lecture teaching strategies on senior secondary students' achievement in an aspect of Agricultural Science (pasture and forage crops). A 3X2X2 pre-test, post-test experimental design with a control group was used. The population for the study comprised of all Senior Secondary School two (SS II) Agricultural Science students in Ijebu-Ode Local Government Area of Ogun State. A hundred and fifty (150) randomly selected Senior Secondary School Two (SSS II) Agricultural Science students were drawn from three schools. Fifty two students (representing the number in a group) were selected from each school. The schools were purposively selected so that they would be far apart enough not to allow interference. The instruments used for the study were, teaching manual on pasture and forage crops, common grasses and legumes samples, grasses and legumes album, self-concept questionnaire as well as a twenty-item select response questions used for the pretest, post-test tagged Agricultural Achievement Test (AAT). The test re-test reliability was used to obtain a reliability index of 0.78 for the achievement test. Similarly, a test-retest reliability co-efficient of the self-concept questionnaire is 0.714. In the study, it was found out, that, there is a significant mean effect of treatment on students' achievement in an aspect of Agricultural Science that is, pasture and forage crops. Also, students performed significantly at different levels in the three groups. The

study conducted by Olatoye and Adekoya is similar to the present study in that both looked at teaching methods as it affect students' performance in Agricultural Science. But their study differed from the present study in terms of the content area, while their study is on an aspect of Agricultural Science, the present study is on Agricultural Science. The geographical location also differed too, while their study was conducted in Ogun State, this present study is in Kaduna State.

Ayang (2011), conducted a research study on the Evaluation of Instruction Methods and their Effects on the Psychomotor Performance in Agricultural Science among Secondary School Students in Cross River State, Nigeria. The main objective of the study was to compare the performance of the secondary school students if demonstration teaching method and project methods of instructions are administered by the Agricultural Science teachers. The population for the study was 550 JSS3 students, while the sampled respondents were 80. Two null hypotheses were set which were tested using t-test statistic at 0.05 level of significance. The design used for the study was quasi experimental where pre-test and post-test were conducted. The results of the findings revealed that there was no significant difference in the joint effects of demonstration and discussion methods on students' performance in psychomotor skills in Agricultural Science.

The study is similar to this present study in that, both are comparing effects of teaching methods and academic performance, both studies used t-test as the statistical tools to test for null hypotheses. However the study differed from the present study in terms of the titles of the research studies, population and target area. This is because, while the previous study was on Evaluation of Instruction Methods and their Effects on the Psychomotor Performance in Agricultural Science among Secondary School Students, the present study is on the Effect of Demonstration and Discussion Methods on the Academic Performance of Senior Secondary Schools Students in Agricultural Science. Also the study differed in the geographical location, while the previous study was in Cross River State the present study is in Kaduna State.

Another research was conducted by Rahman, Khalil, Jumani, Ajmal, Malik, Sharif, (2011). This study was undertaken to investigate the effectiveness of teaching methods in the subject of social studies. The study was experimental in nature and a pre-test/post-test control group design was used. The sample of the study consisted of 62 students of grade 10th. The instrument used for the study was the Social Studies Achievement Test (SSAT) designed by the researchers. The reliability of the instrument was determined through test-re-test and estimation of internal consistency. The scores of the two sets were correlated using Pearson Product Moment Correlation Coefficient Analysis and the reliability index of 0.73 was obtained. The students were grouped into control and experimental groups equally. Both groups were pre-tested. Two teaching methods (discussion and lecture methods) were used in the study. The experimental group was taught with discussion method along with lecture while the control group was taught with lecture method only. Four lessons were selected in the subject of social studies. Duration of each period was 45 minutes. The experiment was conducted for one month. Pre-tests and Post-tests were developed for each topic. The results of pre-tests revealed that there was no significant difference in the performance of both groups. While the results of post-tests revealed that there was significant difference in the mean score of both experimental and control group. The results of the study indicated that mean score of the experimental group was higher than the control

group. The study is similar to this present study as it looked at two teaching methods and both studies employed quasi-experimental design in which pre-test and post-test were adopted. However the study differed from this present study in the sense that the previous study was in social studies while the present study was in Agricultural Science. The previous study was on discussion and lecture method, while the present study was on demonstration and discussion method.

Ameh and Dantani (2012), investigated the effects of lecture and demonstration methods on the academic achievement of students in chemistry in Nassarawa L.G.A. of Kano state. The objective was to find out whether differences existed in the academic achievement of students exposed to lecture method and those exposed to demonstration method; and also to, find out whether there is a difference in the academic achievement of male and female students taught using lecture method and those taught using demonstration method. The study adopted one experimental and control group design. The population of the study comprised of all the senior secondary school SS1 chemistry students in Gwagwaruwa zone, Nasarawa L.G.A. of Kano. The sample size was made up of 58 SS1 chemistry students both boys and girls. The instrument used for the study was Chemistry Achievement Test (CAT). The data collected through the pilot study were analyzed using Kuder Richardson Formula (KR-21) for the purpose of obtaining reliability of the instruments. A reliability co-efficient of 0.89 was obtained. The data were analysed using t-test statistic at significant level of 0.05. The results obtained revealed that students perform better in Chemistry when taught using demonstration method as compared to lecture method; and the boys are better in academic achievement when taught using demonstration method than when lecture method is used. The above empirical research is similar to this study in objectives which is finding out the effect of two instructional methods on students performance. However there is a difference in the educational level, subject and geographical scope.

Edinyang (2012), investigated the relative effectiveness of inquiry and expository methods of teaching social studies on academic performance of secondary school students in Akwa Ibom State, Nigeria. The design adopted for the study was a pre-test, post-test control group experimental design. The population of the study consisted of all junior secondary two (2) students in the state owned post primary schools. Fifty students were randomly selected from each school under study. The instrument used for the study was the social studies achievement test (SSAT). The result obtained from the pilot study was subjected to statistical analysis using Pearson Product Moment Correlation Coefficient and the reliability index of 0.73 was obtained. The results of the data collected were subjected to t-test analysis. The findings of the study showed that the students in the inquiry group performed significantly better than their counterparts in the expository group of the study because of their physical involvement in the lesson and the teacher's teaching technique. The study is similar to the present study as it looked at two teaching methods as it affects students' academic performance. But it differs from the present study in terms of subject, geographical location and the class of the students.

Idoko and Oladimeji (2012), conducted a research on the effect of inquiry and conventional teaching methods on students' achievement in Agricultural Science. The study involved 207 JSS III students in four classes of staff secondary school, Federal College of Education, Okene. All the four classes were exposed to one week teaching period. Two classes were each designated to the inquiry and conventional group. At the end of the week teaching period, both groups were

administered a 25-item Agricultural Science Achievement Test (ASAT). Using Kuder Richardson 20 (K-R20) formula, a reliability index of 0.71 was obtained. The results showed that the students in inquiry group who were allowed to interact and allowed to carry out activities in the group performed better than those in conventional group who were passive listeners in their Agricultural classes. The study is similar to this study in that it looked at two teaching methods as they affect students' achievement in Agricultural Science. However it differed from this present study in the aspect of the category of students used, the geographical location and control group. This is because, the previous study used the Junior Secondary School students while the present study made use of the Senior Secondary School Students.

In the same vein, Ekeyi (2013), conducted a study on the effect of demonstration and greeno-problem solving methods of teaching on students' achievement in Agricultural Science in Kogi State. In his study, he employed a quasi-experimental research design. The population for the study was 18,225 Senior Secondary Two (SSII) students in 195 secondary schools. Six (6) secondary schools were used for the study using purposive random sampling technique. In each of the school selected, two intact classes of the SSII were used. Four hundred and eighty (480) students in the twelve intact classes constituted the sample for the study. The instrument for data collection was a 30-item 'Agricultural Science Achievement Test' (ASAT). Using Kuder Richardson 20 (K-R20) formula, a reliability index of 0.78 was obtained. The result of the study revealed that students taught with the greeno problem solving method, demonstration method and conventional lecture method had significant effects on students' achievement. The greeno problem solving method had the most significant effect followed by the demonstration method with conventional lecture method having little impact. It was concluded from Ekeyi's findings that, efforts should be made by the Agricultural Science teachers to integrate thoroughly both the demonstration and greeno problem solving approaches in the teaching of Agricultural Science in secondary schools; review of Agricultural Science curriculum should be done periodically and efforts should be intensified by teachers to aggressively adopt both the demonstration and greeno problem solving methods in teaching Agricultural Science in all classes at the secondary school level with the intention of promoting students' performance. The study is similar to this research in the sense that both looked at the effect of demonstration method as they affect the achievement of students in Agricultural Science and also both made use of quasi experimental design. However it differed from this study in the sense that while Ekeyi focused on demonstration and greeno-problem solving, the present research focused on demonstration and discussion methods.

Obunadike and Omeje (2014), conducted a research on a comparative study of the influence of lecture and demonstration methods on the teaching of Agricultural Science in Senior Secondary Schools in Bende Local Government Area. The study compared the influence of lecture method and demonstration method on the teaching of Agricultural Science. One research question and one null hypothesis guided the study. The design of the study was descriptive survey design. 266 Senior Secondary School students from 6 schools in Bende Local Government Area formed the sample. A questionnaire structured by the researchers on 4 point response scale was used for data collection. The reliability of the instrument was calculated to be 0.60 using Cronchbach Alpha. Mean ratings were used in answering the research question while correlation was used to analyse the null hypothesis at $P < 0.05$ level of significance. The findings revealed that demonstration is one of the best methods used in the teaching of Agricultural Science in Senior Secondary

Schools. The findings equally revealed that demonstration method exposes students more to all the practicals in Agriculture and equally enhances understanding. Based on the findings, recommendations were made among which is that government should ensure that all the practical facilities, machineries and tools needed for the teaching of Agricultural Science are provided in schools. The research is similar to the present study in that both studies are on two methods focus on Senior Secondary Schools.

Omwirhiren and Ibrahim (2016), conducted another study on the effects of two Instructional Methods (demonstration and lecture methods) on students learning outcomes in chemistry in selected Senior Secondary schools in Kaduna State, Nigeria. The target population was one thousand nine hundred and eleven (1,911) Senior Secondary School (SS II) science students. The sample consisted of 100 Students randomly drawn from two co-educational Senior Secondary Schools within Kaduna North LGA. The students were divided into two groups: The experimental group and the control group of 50 students each based on a categorization test to ascertain the equivalence of the group. The pretest-posttest quasi-experimental control group design was adapted. The students in the experimental group were exposed to demonstration method, while those in the Control group were exposed to the lecture instructional strategy for a period of three weeks. The instrument developed and validated for data collection was Chemical Bonding Performance Test (CBPT). The major findings from the study showed that there was significant difference in learning outcome on students exposed to demonstration and lecture strategies used to teach chemistry. Findings from the study suggested that Chemistry teachers should incorporate demonstration method for teaching at Senior Secondary School level so as to enhance academic performance and also Curriculum planners should recommend and ensure that demonstration method is used for teaching chemistry at Senior Secondary School among others. The study is similar to this present study in that two teaching methods were used to ascertain the performance of students in Chemistry in Kaduna State, Nigeria. However the study differs from the present study in relation to the subjects involved.

Peter, Ayorinde and Okeh (2016), conducted a similar research on the effect of demonstration and discussion teaching methods on students' academic performance in Agricultural Science. The population of the study was 4, 602 Senior Secondary School students in the three senatorial zones in Kaduna state. Eighty (80) students were randomly selected from two secondary schools to serve as sample for the study. Quasi experimental design was adopted for the study in which pre-test and post-test was employed to get the data. The instrument used to get the data from the study was a 25-item Agricultural Science Achievement Test (ASAT). The instrument was pilot tested and the results gotten from the pilot study were analysed using Kuder Richardson Coefficient formula. A reliability coefficient value of 0.78 was obtained. The study revealed the superiority of demonstration teaching method over the discussion teaching method in terms of acquisition of skills and academic performance among the students. It was recommended in the study that teachers should be encouraged to use demonstration teaching method regularly so as to enhance rapid development in education. The study is similar to this particular topic in that both topics are exactly the same, the methodologies are the same and similarly the geographical locations are same too. However there is a slight difference with the present study in terms of population and sample used.

A study carried out by Yusuf, Guga and Ibrahim (2016), investigated the effect of discussion method on the performance of students in reading comprehension in secondary schools in Plateau State. The study adopted a quasi-experimental pre-test and post-test control group design. Two randomly selected Government Secondary Schools from Jos North and Jos South Local Government Areas were used for the study. One hundred (100) Senior Secondary class II students from two intact classes were used for the study (i.e. 50 students per class, per school). Government Secondary School, Jos, was used as the experimental group while Government Secondary School, Bukuru, was used as the control group. Students from both groups were pre-tested to establish the homogeneity of the two groups before the commencement of the treatment to the experimental group. Both groups were taught for eight weeks. Students were tested using an instrument called a Cloze reading comprehension test. The hypothesis postulated for the research was tested using t-test as a statistical tool at 0.05 level of significance. The findings indicated that there is a significant difference in the pre-test and post-test mean scores of students in the experimental and control groups. The result further revealed a higher mean score of students taught reading comprehension using the discussion method as compared with those taught using the conventional method.

Yusuf and Shaibu (2018), conducted a similar research on the Academic Performance of Students taught Biology using Demonstration and Conventional methods in senior Secondary Schools in the Federal Capital Territory, Abuja. The study specifically assessed who among the students taught Biology using each of the methods performed better. The design used for the study was quasi-experimental design. The population of the study was the entire 23,422 SS11 students drawn from the 56 Senior Secondary Schools in the Federal Capital Territory comprising of 12,350 boys and 11,072 girls studying the subject in 2015/2016 academic session. Samples of 131 SS11 students from two (2) intact classes were purposively drawn for this study. The instrument titled “Biology Inquiry and Demonstration Performance Test” (BIDPT) was used for data collection. The instrument consisted of fifty (50) multiple-choice objective questions with four (4) options or answers to pick from. The reliability of the instrument was determined using test/re-test. The scores of the pilot study were computed by using Pearson Product Moment Correlation Coefficient (PPMCC) and a reliability index of 0.849 was obtained. The data collected in the study were analysed using mean and standard deviation while hypothesis was tested using independent t-test at 0.05 level of significance. The research findings revealed that students taught Biology using demonstration method performed far better academically than those taught using conventional method in the Senior Secondary Schools in Abuja. Based on the research findings of this study, it was recommended that Biology teachers should adopt the demonstration method especially when teaching practical aspects of the subject as it enhances retention. The research is similar to this present research in terms of methods of teaching used and the research design. The previous research discussed on demonstration and conventional methods while this present research is on demonstration and discussion method. Also both researches used quasi-experimental design and the same class levels SS11. However, the differences among the two researches are in the location and the instrument used.

2.5 Summary

The review of related literature in this study covered a wide range of studies and it was done under conceptual framework, theoretical framework, empirical studies and summary. The

chapter discussed conceptual overview of Agricultural Science, demonstration method of teaching, discussion method of teaching, teaching methods in Agricultural Science and students' academic performance. The theoretical review began by linking the development of demonstration and discussion methods to the experimental theory of learning or learning by doing theory. The researcher was able to discuss exhaustively on John Dewey's theory of learning and Jean Piaget's cognitive learning theory. This chapter concludes with the discussions on empirical studies. Hence, this study is unique as compared to other studies reviewed because, most of the previous studies were mostly on two methods of teaching on different subjects. Even those who conducted researches using two teaching methods in agricultural science chose an aspect of the subject, however the present study focused on three methods (demonstration, discussion and conventional lecture methods). Also despite the many researches reviewed on the use of demonstration and discussion methods, none was conducted on the use of demonstration and discussion in teaching Agricultural Science in senior Secondary Schools in Kaduna state, hence the conduct of this study becomes imperative in order to identify the effects of demonstration and discussion methods on students' academic performance in Agricultural Science in Senior Secondary Schools in Kaduna State. The gap this present study seeks to fill is in the area of determining the extent to which the selected methods if employed by agricultural science teachers affect students' academic performance in agricultural science.

CHAPTER THREE

METHODOLOGY

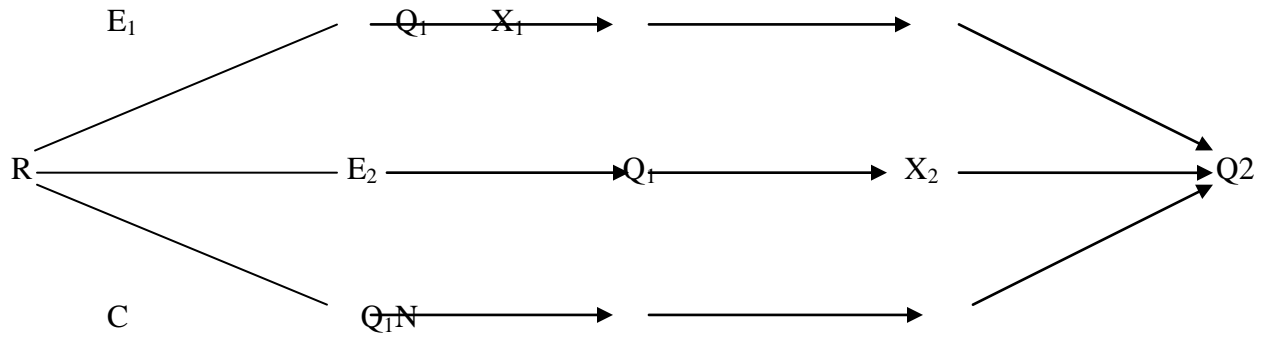
3.1 INTRODUCTION

This chapter presents the research design, population, sample and sampling technique, research instrument, validity and reliability of research instrument, pilot study, table of specification, procedure for collection of data, treatment procedure, treatment plan and method of analysis of data.

3.2 Research Design:

This research work was carried out using quasi-experimental design in which pre-test and post-test were used. The design made it easy for the researcher to randomly select the respondents into the experimental and control groups. This is in line with what Olayiwola in Ekeyi (2013), stated that Quasi-experimental design does not use random assignment of subjects, rather, intact classes are usually used. This research design represents three groups: Demonstration Method (experimental group 1), Discussion Method (experimental group 2) and the conventional (lecture) method (control group). The two treatment groups and the control group were given a pre-test before treatment and a post-test after treatment. The design can be used in a school without any disruption to a school class structure and timetable of academic event. The pre-test is used to establish equality or no difference between the treatment groups at the beginning of the experiment only. The research design is illustrated in figure 1 below.

Figure 1: Research design Illustration



The symbols are denoted as follows:

E_1 = Experimental Group 1 (Demonstration Method)

E_2 = Experimental Group 2 (Discussion Method)

C = Control Group (Conventional Method)

Q_1 = Pre-test

X_1 = Treatment using Demonstration Method

X_2 = Treatment using Discussion Method

N = No treatment

Q_2 = Post-test

From the design lay out above, it signified that the students in both the experimental groups (demonstration and discussion methods) and the control group (lecture method) were given the pre-test using the Agricultural Science Performance Test (ASPT). Thereafter, treatments were given to those students in the experimental groups. Then the post-test was administered using the ASPT in both the experimental and control groups.

3.3 Population for the Study

The target population for the study was made up of forty-nine thousand five hundred and sixty-one (49,561) public Senior Secondary Schools II (SSII) students who were offering Agricultural Science in the twelve (12) Educational Zones in Kaduna State. There are three hundred and forty-eight (348) Senior Secondary Schools in the twelve Educational Zones in Kaduna State. The Educational zones are; Kafanchan, Zonkwa, Godogodo, Kachia, Lere, Anchau, Rigachikun, Zaria, Kaduna, Sabon-Tasha, Birnin Gwari and Giwa. The population distribution for the study is presented in Table 1 below;

TABLE 1: Population Distribution of Respondents

S/N	EDUCATIONAL ZONES	NO. OF SCHOOLS	MALE STUDENTS	FEMALE STUDENTS	TOTAL
1.	Kafanchan	36	2,206	2,198	4,404
2.	Zonkwa	42	1,622	1,243	2,865
3.	Godogodo	22	1,670	870	2,540
4.	Kachia	41	1,647	1,150	2,797
5.	Lere	23	2,017	1,123	3,140
6.	Anchau	42	2,824	1,353	4,177
7.	Rigachikun	19	2,310	1,756	4,066
8.	Zaria	29	3,713	2,731	6,444
9.	Kaduna Zone	23	3,559	4,025	7,584
10.	Sabon-Tasha	42	3,912	4,005	7,917
11.	Birnin Gwari	12	785	302	1,087
12.	Giwa	17	1,670	870	2,540
TOTAL		348	27,935	21,626	49,561

Source: Department of Planning and Statistics, Kaduna State Ministry of Education (2017)

3.4 Sample and Sampling Techniques

The sample size of this study was drawn from three (3) selected Senior Secondary Schools 11 (SS2) who were offering Agricultural Science in Kafanchan Educational Zone of Kaduna State for 2017/2018 academic session. A sample size of one hundred and thirty three (133) Senior Secondary Schools Two (SS II) Students offering Agricultural Science from three (3) intact classes was purposefully selected in the study. This sample size is in accordance with the central limit theorem and in tune with Tuckman in Dike (2008), which proposed that 50 sample size and above is viable for experimental research. The three schools that were purposively selected were based on the criteria of type of school and location of school.

In view of this, Government Secondary School (G.S.S) Kukum Daji was used as the experimental group 1, Government Secondary School (G.S.S) Kafanchan as experimental group 2 and Government Secondary School (G.S.S) Kagoro as the control group (Conventional lecture method). Hence the experimental groups 1 and 2 were made up of 90 students while the control group was 43 students. The table 2 below indicates the classification of the experimental and control groups as samples for the study.

Table 2: Sample Distribution of Respondents

S/N	Schools	Group	No. of Students
1.	G.S.S Kukum Daji	Experimental 1 (Demonstration)	35
2.	G.S.S. Kafanchan	Experimental 2 (Discussion)	55
3.	G.S.S. Kagoro	Control Group (Conventional)	43
Total			133

3.5 Instrumentation

The instrument that was used for data collection in this study was a 40-item “Agricultural Science Performance Test” (ASPT) designed by the researcher. The test questions were drawn from the West African Examination Council (WAEC) and National Examination Council (NECO) past question papers for the duration period of (2012-2017) examinations, because the content of the questions consist of the major areas covered in this research. The areas are; Vegetative propagation in plants (budding, grafting process and layering), Digestive and reproductive systems in birds, knapsack sprayer (uses, operation, maintenance), some soil related experiments (porosity, capillarity and PH) and Genetics. The ASPT was developed from the above content areas by first constructing a table of specification or a test blue print for the different contents specified above. The need to maintain continuity and sequence in the normal scheme of work for the sampled schools was recognized. Hence the researcher prepared lesson plan, demonstration activity, items for discussion, and constructed forty (40) multiple choice questions. The ASPT is a forty (40)-item multiple choice questions followed by four options lettered A-D out of which the students were expected to select the best option that answers the question. The ASPT was divided into five sections and they are: Section A (Vegetative propagation: twelve items), Section B (Digestive and reproductive system in birds: five items), Section C (Knapsack sprayer: three items), section D (soil porosity: twelve items) and section E (Genetics: eight items) with high scores of 30 marks, 12.5marks, .75marks, 30marks and 20marks respectively, summing up to 100 marks. The instrument was used to conduct the pre-test and post test in the three selected secondary schools.

3.6 Table of Specification

Table of specification is also known as a test blue print. It is a two-way chart designed based on the list of course objectives, the topic to be covered in the class, the amount of time to be spent on each topic and the emphasis and space provided in the text. Therefore the topics that were treated during the experiment in this research are specified in table 3 below.

Table 3: Table of Specification for Agricultural Science Performance Test (ASPT)

Topics	No of Periods	Know- ledge 25%	Compre- hension 30%	Applica- tion 15%	Analysis 15%	Synthesis 10%	Evalua tion 5%	Total 100%
Vegetative		6	3	3	-	-	-	12
Propagation In plants (30%)	6	(3,4,6, & 7,8,10)	(1,2,&3)	(9,11,& 12)				
Digestive and Reproductive Systems in Birds (15%)	4	2 (18 &20)	1 (19)	2 (16 & 17)	-	-	-	5

Knapsack	2	1 (13)	1 (14)	-	-	1 (15)	-	3
Sprayer (5%)								
Soil related		3 (26,27&	4 (23, 25	2	-	-	3	12
Experiment	4	30)	28 & 31)	(21 & 24)			(22,29& 32)	
(30%)								
Genetics	4	4 (33,35,36	2	2	-	-	-	8
(20%)								
		40)	(34 & 38)	(37&39)				
Total (100%)	20	16	11	9	-	1	3	40

3.7 Validity of the research instrument

The researcher after constructing the Agricultural Science Performance Test (ASPT) subjected it to approval and validation by the project supervisors in the Department of Curriculum and Instruction, Ahmadu Bello University Zaria, experts in the field of Agricultural Science and Science Education. The various experts and supervisors were employed so as to make positive suggestions for face, content and criterion-related validity of the questions. The essence of employing experts in the draft of the ASPT is because it is an effective method of content validation of research instrument.

3.8 Pilot study

To ensure that the Agricultural Science Performance Test (ASPT) is devoid of ambiguities, a pilot study was carried out. The ASPT was administered to forty-two (42) Senior Secondary two (SSII) students offering Agricultural Science at Government Secondary School (G.S.S.) Kadarko who were randomly selected. The ASPT was administered to the subjects and split half on

Statistical Package for Social Science (SPSS) using Spearman Brown Formula for reliability index.

3.9 Reliability of the instrument

The result of the pilot test on Agricultural Science Performance Test (ASPT) was recorded in terms of their overall performance. The scores obtained were subjected to Spearman-Brown formula for split half reliability index (see Appendix V). It showed a reliability index of 0.78. The instrument was therefore, considered highly reliable for use because the reliability index falls between 0.5 to positive one (+1). This is in-line with the assertion of Cohen, Marion and Morrison (2007) that, an instrument can only be reliable when a high correlation coefficient exists between the scores on the test and the scores on other accepted tests of the same performance. This is achieved by comparing the scores on the test with one or more variables (criteria) from other measures or tests that are considered to measure the same factor.

3.10 Procedures for Data Collection

The data for the study was collected through the administration of the pre-test and post-test. The researcher personally visited the sampled schools with an introductory letter. The letter was collected from the office of the Head of Department, Educational Foundations and Curriculum, Faculty of Education, Ahmadu Bello University, Zaria. The pre-test was administered on the students before the treatment. Ten (10) weeks was used for the Demonstration activities (experimental group 1), Discussion activities (experimental group 2) and Conventional lecture activities (control group), and all the three groups were taught by the researcher. After the treatment, the researcher administered the post-test and recorded their test scores before the data analysis was taken.

3.11 Treatment Procedure

Three instructional methods were used for this study. The first two approaches involved the use of demonstration and discussion methods, while the third approach made use of conventional lecture method. The three methods are identical in terms of content, basic instructional objectives and mode of evaluation. The only difference is in the instructional activities. Demonstration and discussion methods were used for the treatment groups 1 and 2 respectively while the conventional lecture method was used for the control group. Subjects in both experimental and control groups will be given the pre-test in ASPT before the experiment by their respective regular Agricultural Science teachers. After the pre-test, the researcher commenced the experiment in the respective schools adhering strictly to the lesson procedure as developed by the researcher. The subjects in the experimental and control groups were taught under the same conditions. The experiment was conducted during the normal school periods following the school timetable, for ten weeks. Each week contains two periods of 45 minutes per period. This implies a total of 20 periods. At the end of the experiment which lasted for ten weeks, the post-test was administered to the subjects in the three groups. The post-test on performance contained the same content and format as the pre-test respectively. Data that was collected from the pre-test and post-test on the instrument (ASPT) was used to provide answers to the research questions and also test the hypotheses that guided the study.

The treatment procedure for demonstration and discussion methods is presented as follows:

3.11.1 Treatment Procedure for Demonstration

The treatment procedure for the demonstration method entails the following steps:

Step 1: The teacher plans the lesson in such a way that all the materials needed for the lesson demonstration are made available. In the course of the preparation, the teacher should keep in mind the subject matter and the objectives of the lesson. The teacher should have a thorough knowledge of the matter or the subject for which he is to teach. He should therefore not hesitate from going through the text book of the class. It is very important to make available everything needed for the demonstration in order to avoid interruption or any kind of problem in the course of the lesson demonstration.

Step 2: Produce an outline based on the most suitable procedure to be identified.

Step 3: Arrange and motivate the learners before starting the demonstration. Ensure that every learner can see and hear you clearly.

Step 4: The teacher introduces the lesson to the students. This step is important because it motivates students to learn the information as without it, they cannot be prepared to understand it. The teacher should introduce the lesson to the learners in a problematic manner by asking students questions relating to the topic in order to stimulate their interest in the class.

Step 5: The next step is the full presentation of the lesson that is, conducting the demonstration devoid of distraction, taking each step at a time.

Step 6: Monitor understanding by asking questions or calling on individuals to attempt the demonstration where possible.

3.11.2 Treatment Procedures for discussion method:- The treatment procedures for discussion method entails the following steps:

Step1: The teacher introduces the topic for discussion and gives relevant examples to arouse the interests of the students for discussion.

Step 2: Students are to be assigned into groups. The entire 35 students are shared into groups of 5 making a total of 7 groups. Each group is assigned a leader, secretary and time keeper.

Step 3: The students are given rules that will guide the discussion. The rules are;

- i. The students should understand the need to discuss and share ideas
- ii. They should respect opposing opinion for a peaceful coexistence
- iii. Students should appreciate the importance of punctuality and constant attendance in school.

Step 4: The teacher gives the students in each group a task to carry out. Each of the groups is given the same task, the same time and the same objectives of the day's lesson.

Step 5: The teacher in this case moves from one group to another listening to the trend discussion. Teacher gives suggestions and advice base on the trend of discussion.

Step 6: The teacher asks each group to compile, organize, write and present a report to the entire class based on the different areas assigned to them. The chairman or each group secretary presents the report to the whole class.

Step 7: The teacher calls for the meeting of the entire class to deliberate on the various reports. Each group presents the summary of their discussion through the group's secretary or chairman to the entire class. As each student airs their views, the teacher can see the extent to which the objectives of the discussion are attained.

Step 8: Students are then given assignment. The teacher instructs the students to consult relevant textbooks on the next topic of discussion.

3.12 Treatment Plan

The treatment plan for the groups will cover ten weeks of teaching activities using the different instructional methods (demonstration, discussion and conventional methods). Table 4 below represents the treatment plan.

Table 4: Treatment Plan for the groups

Week	Periods	Topics	Comments
BT	2 nd	Introduction and Familiarization	This was carried out in both Experimental and Control groups
BT	4 th	Pre-test	It was administered on both Experimental and Control groups.
Week 1 Groups were	2 nd , 4 th	Vegetative propagation in plants (Definition, Forms of Propagation Processes of Layering)	Students in the Exp. taught using demonstration and discussion methods, while Conventional method was used in Control group.

Week 2	2 nd , 4 th	Budding and grafting in plants	„
Week 3	2 nd , 4 th	Marcotting, merits and demerits of vegetative propagation	„
Week 4	2 nd , 4 th	Digestive system in birds	„
Week 5	2 nd , 4 th	Reproductive system in birds	„
Week 6	2 nd , 4 th	Knapsack Sprayer (operation uses and maintenance)	„
Week 7	2 nd , 4 th	Experiment on Soil porosity and PH	„
Week 8	2 nd , 4 th	Experiment on soil capillarity	„
Week 9	2 nd , 4 th	Genetics (terms used in genetics)	„
Week 10	2 nd , 4 th	Mendel’s laws of inheritance	„
AT	2 nd	Post-test	The researcher administered the

Post test, marked and recorded the results

NOTE: BT =Before Treatment while AT=After Treatment

3.13 Control of Extraneous Variables

The following measures were taken to control some of the extraneous variables in the study:

- i. **Initial group differences:** Randomisation is one of the measures for controlling initial group differences in experimental studies. However, this was not done in the present study since the process disrupted the normal school administration. Instead, intact classes were used. Thus to control the initial differences of subjects in the intact classes, analysis of covariance (ANCOVA) was employed in analyzing the data as a post-hoc control.
- ii. **Experimenters’ bias:** When researchers involve external subjects (students) in their experiment, they become sensitized that they are being used for a study. Consequently,

they tend to behave mechanically and fake most of their actions. This introduces experimenter's bias. In order to avoid the bias in the study, the regular Agricultural Science teachers in each of the selected schools were trained to serve as the research assistants. The researcher monitored these teachers so as to ensure that they effectively adhere to the instructions.

- iii. **Teacher variable:** When different teachers are involved in an experiment, the problem of teacher variable is likely to arise since different teachers possess different standards in terms of knowledge of the content, methodology and evaluation. In order to control this variable in the study, the researcher prepared lesson plans for demonstration method, discussion method and conventional method on Agricultural Science topics that were used in the study. The researcher personally taught the students to avoid any ambiguity
- iv. **Pre-Test scripts/Question papers:** The subjects were instructed to provide their pre-test answers in the pre-test question papers provided during the pre- test, in order not to allow the subjects anticipate or prepare for the same questions when post-test would be administered. At the end of the pre-test, the question papers containing their answers were collected by the invigilators.
- v. **Variability of Instructional Situation:** Homogeneity of instruction across groups is ensured as follows:
 - a. The researcher trained all the teachers on the instructional procedure involved.
 - b. The teachers were directed to strictly follow the detailed lesson plans provided.
 - c. Using the demonstration, discussion and conventional lecture methods, the same topics were taught to the students and with the regular periods allotted to Agricultural Science in the school timetable.
- vi. **Instructional Situation Variable:** Instructional situation was the same for all the groups, since intact classes from SS II students were used and lesson notes bearing the same contents were used.
- vii. **Instrumental Variables:** The variables that may have been introduced as a result of misinterpretation of the instrument for data collection by the subjects were removed by trial testing the instrument before actual experiment. Any ambiguity discovered was removed. The instrument that was used was also subjected to validity tests by experts in the field.

3.14 Procedures for Data Analysis

Descriptive statistics (mean and standard deviation) was used to answer the research questions. The justification for the use of descriptive statistics of mean and standard deviation was based on the fact that the statistics is easily obtainable and can easily be interpreted by the readers without complications. Percentages on frequency count for biographical data was used and inferential statistics (T-test and ANOVA) were used to analyse the data. Paired sample T-test was used to test Null hypotheses 1 & 2 at ($P < 0.05$), independent sample t-test was used to test Null hypotheses 3 & 4. Hypothesis 5 was tested using Analysis of Variance (ANOVA). The reason for the use of the t-test is because t-test is an appropriate statistical tool that compares the actual difference between two means in relation to the variation in the data (expressed as the standard deviation of the difference between the means) (Iliya, 2018). ANOVA is used to determine

whether there are differences between two or more independent (unrelated) groups on a dependent variable (Keselman, Huberty, Lix and Olejnik, 2016).

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter deals with the presentation and analyses of data, interpretation of the data, summary of major findings and discussion of findings. This section begins with demographic data.

Table 5: Description of Respondents Taught Agricultural Science by Teaching Method

S/N	Method of Teaching	No. of Students	Percentage (%)
1	Demonstration Method	35	26
2	Discussion Method	55	41
3	Conventional Method	43	33

Table 5 shows that thirty five (35) Students (26%) were taught Agricultural Science subject with the use of demonstration method, fifty five (55) students (41%) were taught Agricultural Science subject with the use of discussion method and forty three (43) students (33%) were taught Agricultural Science subject with the use of conventional method. The results showed that there were more students taught Agricultural Science subject with the use of discussion method than others, followed by those who were taught the subject with the use of conventional method. The students who were taught Agricultural Science subject with the use of demonstration method were the least in number.

4.2 Analyses of Research Questions

Research Question One: What is the pre-test and post-test academic performance of students taught Agricultural Science with the use of demonstration method in Senior Secondary Schools in Kaduna State, Nigeria?

Table 6: Description of pre-test and post-test academic performance of students in Agricultural Science with the use of Demonstration method

Variables	N	Mean score	Standard Dev.
Pre-test	35	17.8571	7.04875
Post-test	35	71.7286	7.8606

Table 6 shows the pre-test and post-test mean scores of 17.8571 and 71.7286 and standard deviations of 7.04875 and 7.8606 respectively. The pre-test result of performance in Agricultural Science with the use of demonstration method is therefore, below the post-test score.

Research Question two: What is the pre-test and post-test academic performance of students taught Agricultural Science with the use of discussion method in Senior Secondary Schools in Kaduna State, Nigeria?

Table 7: Description of pre-test and post-test performance in Agricultural science with the use of Discussion method

Variable	N	Mean score	Standard Dev
Pre-test	55	16.8868	6.04270
Post-test	55	58.3962	7.04270

The result in table 7 reveals pre-test and post-test mean scores of 16.8868 and 58.3962 and standard deviations of 6.04270 and 7.04270 respectively. It is thus, clear that the pre-test result of performance in Agricultural Science with the use of discussion method is therefore, below the post-test score.

Research Question three: Is there any difference in the academic performance of students taught Agricultural Science with the use of demonstration and discussion methods in Senior Secondary Schools in Kaduna state, Nigeria?

Table 8: Description of Post-test Difference in Performance between Demonstration and Discussion methods.

Methods	N	Mean score	Standard Dev	Mean Difference
Demonstration	35	71.7286	7.8606	13.3324
Discussion	55	58.3962	7.04270	

Table 8 shows the post-test mean scores of 71.9256 and 58.3962 for performance in Agricultural Science taught with the use of demonstration and discussion methods and standard deviations of 7.8606 and 7.04270 respectively. This result shows that the post-test performances of students taught with the use of demonstration method is higher than the mean scores of students taught with the use of discussion method by 13.5294.

Research Question Four: What is the academic performance of students taught vegetative propagation in plants with the use of demonstration and discussion methods in Senior Secondary Schools in Kaduna state, Nigeria?

Table 9: Description of Post-test Performance in Vegetative Propagation in Plants with the use of Demonstration and Discussion Methods

Methods	N	Mean score	Standard Dev.	Mean difference
Demonstration	35	21.557	3.39933	3.2025
Discussion	55	18.3545	3.23847	

The mean score here covers 12 items under vegetative propagation in plants with a total score of 30 marks. Table 9 reveals post-test mean scores of 21.557 and 18.3545 for performance in vegetative propagation in plants with the use of demonstration and discussion methods and standard deviations of 3.39933 and 3.23847 respectively. This shows that the performances of students taught vegetative propagation in plants with the use of demonstration method is higher than the discussion method by 3.2025.

Research Question Five: What is the academic performance of students taught digestive and reproductive systems in birds with the use of demonstration, discussion and conventional methods in Senior Secondary Schools in Kaduna State, Nigeria.

Table 10: Description of Post-test Performance in Digestive and reproductive systems in birds with the use of Demonstration, Discussion and Convention methods of Teaching

Method	N	Mean score	Standard Dev.	Mean difference
Demonstration	35	9.7059	1.71499	(Btw Demon & Discuss) = 0.6194
Discussion	55	9.0865	1.644713	(Btw Demon & Conven) = 2.3434
Conventional	43	7.3625	2.23316	(Btw Discuss & Conven)= 1.724

The mean score here covers only 5 items on digestive and reproductive systems in birds with a total score of 12.5 marks. Table 10 shows post-test mean scores of 9.7059, 9.0865 and 7.3625 for performances in digestive and reproductive systems in birds taught to students with the use of demonstration, discussion and conventional methods and standard deviations of 1.71499, 1.64413 and 2.23316 respectively. This means that performance of students taught digestive and reproductive systems in birds with the use of demonstration method is higher than the discussion method by 0.6194, while the performance of students taught digestive and reproductive systems

in birds with the use of demonstration method is higher than the conventional lecture method by 2.3434 and the performance of students taught digestive and reproductive systems in birds with the use of discussion method is higher than the conventional method by 1.724.

4.3 Hypotheses Testing

This section captures the testing of all the null hypotheses raised to guide the study. Inferential statistics (T-test and Anova) were used to test the hypotheses at .05 level of significance.

H₀₁: There is no significant difference in the pre-test and post test academic performance of students taught Agricultural Science with the use of demonstration method in Senior Secondary schools in Kaduna state, Nigeria.

Table 11: T-test Paired Sample Result of Difference between Pre-test and Post-test of Academic Performance in Agricultural Science with the use of Demonstration Method among Senior Secondary School Students in Kaduna State.

Variable	N	Mean	Stand Dev	Df	t-Cal	p-Val	Decision
Pre-test	35	17.8571	7.04875	68	44.034	.000	Rejected
Post-test	35	71.7286	7.86106				

P-val < .05 at 68df (2tailed)

Table 11 reveals t-calculated value of 44.034 and p-value of .000 at .05 level of significance. The analysis also shows the pre-test and post-test mean scores of 17.8571 and 71.7286 respectively. Since the p-value is lower than the t-calculated value, it means that there is significant difference between the pre-test and the post-test result of the students' performance in Agricultural Science. More so, with the mean score of post-test higher than the pre-test mean score, it showed that demonstration method had effect on the performance of students in Agricultural Science subject. The difference in the mean score was 53.8715. This difference shows much variation between the mean scores of pre-test and post-test. This difference reveals a high efficiency of the demonstration method package on teaching Agricultural Science subject. Therefore, since the treatment by the use of demonstration method improved the academic performance of the participants, it is evident that the use of demonstration package is effective in increasing academic performance of students. On this premise, the null hypothesis which states that there is no significant difference in the pre-test and post-test academic performance of students taught Agricultural Science with the use of demonstration method in Senior Secondary Schools in Kaduna state, Nigeria is rejected.

H0₂: There is no significant difference in the pre-test and post test academic performance of students taught Agricultural Science with the use of discussion method in senior secondary schools in Kaduna state, Nigeria.

Table 12: T-test Paired Sample Result of Difference between Pre-test and Post-test of Academic Performance in Agricultural Science with the use of Discussion Method among Senior Secondary School Students in Kaduna State

Variable	N	Mean	Stand. Dev.	Df	t-Cal	p-Val	Decision
Pre-test	55	16.8868	6.02291	108	30.308	.000	Rejected
Post-test	55	58.3962	7.04270				

P-val < .05 at 108 df (2tailed)

Table 12 reveals t-calculated value of 30.308 and p-value of .000 at .05 level of significance. The analysis also shows the pre-test and post-test mean scores of 16.8868 and 58.3962 respectively. Since the p-value is lower than the t-calculated value, it means that there is significant difference between the pre-test and the post-test results of the students' performance in Agricultural Science. More so, with the post-test mean score higher than the pre-test mean score, it showed that discussion method had effect on the performance of students in Agricultural Science subject. The difference in the mean score was 41.5094. This difference shows much variation between the mean scores of pre-test and post-test. This difference reveals a high efficiency of the discussion method package on teaching Agricultural Science subject. Therefore, since the treatment by the use of discussion method improved the academic performance of the participants, it is evident that the use of discussion package is effective in increasing academic performance of students. On this premise, the null hypothesis which states that, there is no significant difference in the pre-test and post-test academic performance of students taught Agricultural Science with the use of discussion method in Senior Secondary Schools in Kaduna state, Nigeria is rejected.

H0₃: There is no significant difference between the academic performance of students taught Agricultural Science with the use of demonstration and discussion methods in Senior Secondary Schools in Kaduna State, Nigeria.

Table 13: Difference in Independent Sample T-test Post-test Results in Agricultural Science Academic Performance with the use of Demonstration and Discussion Methods among Senior Secondary School Students in Kaduna State

Method	N	Mean	Stand. Dev	Df	t-Cal	p-Val	Decision
Demonstration	35	71.9282	7.86106	98	1.736	.323	Retained
Discussion	55	58.3962	7.04270				

P-val >.05 at 98df (2tailed)

The data in table 13, reveals t-calculated value of 1.736 and p-value of .323 at .05 level of significance. The data also shows the post-test mean score of 71.9282 and 58.3962 for demonstration and discussion methods respectively. Thus, the p-value is greater than the t-calculated value at .05 level of significance, suggesting that there is no difference existing in the result of academic performance in Agricultural Science taught with the use of demonstration method and discussion methods. The difference between the mean scores of students' performance in Agricultural Science between demonstration and discussion methods is 13.532. Since the mean score of performance in Agricultural Science subject taught with the use of demonstration method is higher than the mean score of performance in Agricultural Science subject taught with the use of discussion method, it shows that the variation in academic performance in Agricultural Science subject favours demonstration method than discussion method. It is therefore evident that demonstration method has more effect on performance but the difference is not statistically significant. Since the p-value of .323 is higher than .05 level of significance. Therefore, the null hypothesis which states that there is no significant difference between the academic performance of students taught Agricultural Science using demonstration and discussion methods in senior secondary schools in Kaduna state, Nigeria is hereby retained.

H0₄: There is no significant difference between the academic performance of students taught vegetative propagation in plants with the use of demonstration and discussion methods in senior secondary schools in Kaduna state, Nigeria.

Table 14: Difference in Independent Sample T-test Result of Performance in Vegetative Propagation with the use of Demonstration and Discussion Method among Secondary School Students in Kaduna State

Method	N	Mean	Stand. Dev.	Df	t-Cal	p-Val	Decision
Demonstration	35	21.5571	3.39933	98	2.725	.0453	Rejected
Discussion	55	18.3545	3.23847				

P-val<.05 at 98df (2tailed)

Data in table 14, reveals t-calculated value of 2.725 and p-value of .0453 at .05 level of significance. The data also shows the post-test mean score of 21.5571 and 18.3545 for demonstration and discussion methods respectively. Thus the p-value is lower than the t-calculated value, and also lower than the .05 level of significance, suggesting that there is a significant difference existing in the result of academic performance in Vegetative Propagation taught with the use of demonstration method and discussion method. The difference between the mean scores of students' performance in Vegetative Propagation between demonstration and discussion method is 3.2026. Since the mean score of performance in Agricultural science subject taught with the use of demonstration method is higher than the mean score of performance in Agricultural science subject taught with the use of discussion method, it shows that the variation in academic performance in Agricultural science subject favours demonstration

method than discussion method. It can therefore be seen from the means that demonstration method has more effect on performance. On this premise, the null hypothesis which states that there is no significant difference between the academic performance of students taught agricultural science with the use of demonstration and discussion methods in senior secondary schools in Kaduna state, Nigeria is hereby rejected.

H₀₅: There is no significant difference between the academic performance of students taught digestive and reproductive systems in birds with the use of demonstration, discussion and conventional methods in senior secondary schools in Kaduna state, Nigeria.

Table 15: Analysis of Variance Test for Difference in Digestive and Reproductive Systems in birds in Academic Performance with the use of Demonstration, Discussion and Conventional Methods

Source	Df	Sum of square	Mean square	F-Cal	P-value	Decision
Between groups	2	29.721	9.907	2.165	.039	Rejected
Within groups	130	164.773	4.577			
Total	132	194.4941				

P-val < .05 at 132df (2tailed)

The data in table 15 reveals F-calculated value of 2.165 and p-value of .039 at .05 level of significance. Since the p-value is lower than the t-calculated value, it depicts a significant difference in digestive and reproductive systems in academic performance among Senior Secondary School students taught with the use of demonstration method, discussion method and conventional method. This result shows that different methods of teaching Secondary School Students in Kaduna State has differential effects on their academic performance in digestive and reproductive systems in birds. Tables 11 and 12 showed how effective the demonstration and discussion methods are in improving performance. Therefore, the difference here is attributed to non suitability of conventional lecture method in teaching digestive system in birds. It means that demonstration and discussion methods have more effect on the academic performance of the students in digestive and reproductive systems in birds. Therefore, the null hypothesis which states there is no significant difference between the academic performance of students taught digestive and reproductive systems in birds with the use of demonstration, discussion and conventional methods in Senior Secondary Schools in Kaduna state, Nigeria is rejected.

4.4 Summary of Major Findings

The following are the summary of the major findings.

1. The post-test performance of Agricultural Science Students taught with the use of demonstration method in Senior Secondary Schools in Kaduna State, was significantly higher than the pre-test performance with (p-value .000 < 0.05)

2. The post-test performance of Agricultural Science Students taught with the use of discussion method in Senior Secondary Schools in Kaduna State, was significantly higher than the pre-test performance, with (p-value $.000 < 0.05$)
3. There is no significant difference between the academic performance of students taught Agricultural Science with the use of demonstration and discussion methods in Senior Secondary Schools in Kaduna State, Nigeria with (p-value $.323 > 0.05$)
4. Senior Secondary School Students in Kaduna State, taught vegetative propagation in plants with the use of demonstration method, performed significantly better than those taught with the use of discussion method with (p-value $.0453 < 0.05$).
5. Senior Secondary School Students in Kaduna State, taught digestive and reproductive systems in birds with the use of demonstration and discussion methods performed significantly better than those taught with the use of conventional methods with (p-value $.039 < 0.05$)

4.5 Discussion of Findings

The Concepts learned in Agricultural Science by students in schools is greatly influenced by how they are being taught. Teachers teaching Agricultural Science Curricular have implemented a wide variety of teaching methods. Thus, this study was concerned with determining the effect of demonstration and discussion methods on senior secondary school students' academic performance in Agricultural Science in Kaduna state, Nigeria. The discussion of the findings was based on the hypotheses formulated by the researcher.

The result in hypothesis one (1) revealed that, the post-test academic performance of Agricultural Science Students taught with the use of demonstration method in Senior Secondary Schools in Kaduna State, was significantly higher than the pre-test academic performance. The hypothesis was rejected because the calculated value of 0.000 was found to be lower than the 0.05 alpha level of significance. This suggests the effect of treatment on participants taught with the use of demonstration method. This study is in line with Dyer (2009), who affirmed that demonstration teaching method is important in teaching science, vocational and technical subjects, because science and vocational subjects are not only theoretical but have considerable portion of practical work also. This implies that the researcher after carrying out successful demonstration activities in teaching-learning of the selected contents for this study provided concrete experience to students and opportunity to play active role in the learning process. The activity nature of the demonstration method made the students to provide relevant answers to the Agricultural Science Performance Test (ASPT) questions. In the course of this study, the researcher observed that, when students are given the opportunity to interact with the learning materials, there is higher retention and better academic performance. This finding confirmed the findings of Abdulhamid, (2010), Ekeyi, (2013), Obunadike and Omeje (2014), whose researches found higher academic performances in the post-test scores than the pre-test scores due to the effect of the treatment on the Package. Since the treatment by the use of demonstration method improved the academic performance of the participants, it is evident that the use of demonstration package is effective in increasing academic performance of students in Agricultural Science in Senior Secondary Schools.

The result in hypothesis two (2) revealed that, the post-test academic performance of Agricultural Science Students taught with the use of discussion method in Senior Secondary Schools in Kaduna State, was significantly higher than the pre-test academic performance. The hypothesis was rejected because the calculated value of 0.000 was found to be lower than the 0.05 alpha level of significance. This result shows that discussion method has effect on teaching of Agricultural Science in Senior Secondary Schools. Discussion approach is a predominantly interactive process involving a multiple-flow of communication between the teacher and the pupils and from one pupil to another. Students are allowed to bring out their ideas in the process of teaching and learning. The teacher under discussion method of teaching serves as a guide to the students, while the students are active participants in the course of teaching and learning. The discussion method is based on the principles that knowledge and ideas of many people have greater merit than that of a single person. Elvis (2013), pointed out that, one of the most desirable aspects of the discussion method is that it helps the pupils to develop logic through comparison with their peers. The researcher observed during the experiment that, when students are involved in expressing concepts, asking for clarification and engaging in argumentation, their understanding becomes sharper and more accurate, this is the real value of discussion method. It also promotes inquiry and provides good practice for problem - solving. This is evident in the post-test results of the students who obtained higher scores because of the opportunity they had to interact amongst themselves and with the learning materials. This study is in agreement with the findings of Yusuf, Guga and Ibrahim (2016), who earlier found effects of the use of discussion method in teaching students reading comprehension in Secondary Schools. Most of the Agricultural Science teachers solely rely on lecture method which makes students to be passive in the classroom teaching-learning process.

The finding on hypothesis three (3) showed that, there is no significant difference between the academic performance of students taught agricultural science with the use of demonstration and discussion methods in senior secondary schools in Kaduna state. The hypothesis was retained because the calculated value of 0.323 was found to be greater than the 0.05 alpha level of significance. In contrast to the present study, Abdulhamid (2010), and Peter, Ayorinde and Okeh (2016), revealed in their studies that though both teaching methods had significant effect on students' performance in agricultural science, the demonstration method was found to be more effective than the discussion method. The differences in the results could be due to the instruments used. Both demonstration and discussion methods are activity centered method of teaching, which gave students practical opportunities to be directly involved in the teaching-learning process. This gave the reason for high academic performances of students' scores in the post-test conducted using the demonstration and discussion methods. Since there is a slight difference in the post-test scores which favoured demonstration method than discussion method, this is due to the fact that more learning materials were made available, teacher demonstrated the concepts taught and students were given ample opportunities to carry out tasks on their own.

The finding on hypothesis four (4) revealed that there is significant difference between the academic performance of students taught vegetative propagation in plants with the use of demonstration and discussion methods in Senior Secondary Schools in Kaduna State. The hypothesis was rejected because the calculated value of 0.0453 was found to be lower than the 0.05 alpha level of significance. The finding is in agreement with the research of Rahman, Khalil, Jumani, Ajmal, Malik, Sharif, (2011) which revealed differential effect of discussion

teaching method on academic performance of the students taught social studies. This difference may be due to differences in instrumentation and also they did not use agricultural science for their study and that could be the cause of the variation that was found.

The finding on hypothesis five (5) revealed that, there is significant difference between the academic performance of students taught digestive and reproductive systems in birds with the use of demonstration, discussion and conventional methods respectively, favouring Demonstration and Discussion methods in Senior Secondary Schools in Kaduna State. The hypothesis was rejected because the calculated value of 0.039 was found to be lower than the 0.05 alpha level of significance. The study agrees with Olatoye and Adekoye (2010), who found differences in the effects of demonstration, discussion and conventional method on performance among students. The findings also confirmed other researches of Idoko and Oladimeji (2012), and Yusuf and Shuaibu (2018), who found similar results. These researchers observed that the students in the experimental group who were allowed to interact and allowed to carry out activities in group performed better than those in the control group who were passive listeners in their agricultural science classes. The demonstration and the discussion methods used in this study were activity oriented and encouraged students-teachers, students-students and students-material interactions. Students in the demonstration group, who recorded higher academic performances, were taught with the use of more activity oriented teaching method. The activity nature of the teaching method made the students to provide relevant answers to the ASPT questions than their counterparts in the control group, which were not exposed to the activity-based method. This agrees with Musa (2007), who stated that adoption of good and thought provoking teaching methods, under a conducive learning environment, facilitate better learning and mastery of the learnt materials by students.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter captures the summary of the research, conclusions from the findings, recommendations in line with the conclusions and suggestions made for further studies.

5.2 Summary of the Study

This research was carried out to find out the effects of Demonstration and Discussion Methods on Senior Secondary School Students Performance in Agricultural science in Kaduna State. The objectives of the study were to: determine the pre-test and post-test academic performance of students taught Agricultural Science with the use of demonstration method in Senior Secondary Schools in Kaduna State, Nigeria; assess the pre-test and post-test academic performance of students taught Agricultural Science with the use of discussion method in Senior Secondary Schools in Kaduna State, Nigeria; find out if there is any difference in the academic performance of students taught Agricultural Science with the use of demonstration and discussion methods in Senior Secondary Schools in Kaduna State, Nigeria; determine the academic performance of students taught vegetative propagation in plants with the use of demonstration and discussion methods in Senior Secondary Schools in Kaduna State, Nigeria and examine the academic performance of students taught digestive and reproductive systems in birds with the use of demonstration, discussion and conventional methods in Senior Secondary Schools in Kaduna State, Nigeria. Five research questions and five null hypotheses were raised to guide the study.

Reviews were made on related literatures to offer explanations to concepts of demonstration and discussion methods of teaching. Literature reviews section also included theoretical frameworks and various related empirical studies on each of the five objectives of the study. The study design was quasi experimental research involving the use of demonstration and discussion methods as invention packages so that conventional method became the control group. Agricultural Science Performance Test (ASPT) was Validated by experts and pilot tested, yielding the reliability of .78 on split-half. It was administered to 133 Senior Secondary School Students from a population of forty-nine thousand five hundred and sixty-one (49,561) public Senior Secondary Schools II (SSII) students who were offering Agricultural Science in the twelve (12) Educational Zones in Kaduna State.

Data were analysed using percentages, mean and standard deviations, t-test and analysis of variance (ANOVA) and there was significant difference between the pre-test and post-test results of Agricultural Science performance by using both demonstration and discussion method of teaching. There was also differential effect of demonstration and discussion methods in performance in Agricultural Science. Conclusions and recommendations were made in line with the findings. Suggestions were also made for further studies.

5.3 Conclusions

In view of the findings from the study, the researcher concludes that, demonstration method enhanced performance of Agricultural Science students than their counter parts that were taught with the use of conventional lecture methods in Senior Secondary Schools in Kaduna State. It was also concluded that Agricultural Science students in Kaduna State that were taught with the use of discussion methods performed better than their counter parts that were taught with conventional lecture method. The researcher therefore concludes that demonstration and discussion methods enhance academic performance of Agricultural Science Students in Senior Secondary Schools in Kaduna State. The two methods of teaching (demonstration and discussion) are activity centred methods where students are actively involved in the teaching and learning, it is evident in their post test results. Similarly the researcher concludes that demonstration and discussion methods of teaching enhance better performance of students in Vegetative propagation in plants. Finally, the researcher concludes that demonstration and discussion methods of teaching enhance better performance of students in digestive and reproductive systems in birds. The result of the study also proved that different methods suit different purposes, abilities and interests of learners. Therefore, teachers of Agricultural Science should explore these methods so as to improve the academic performance of their students.

5.4 Recommendations

The researcher made the following recommendations in consonance with the findings and conclusions of the study:

1. Teachers should make use of demonstration method of teaching in Senior Secondary Schools to enhance academic performance of students in Agricultural Science.
2. Educators in secondary schools should embrace the application of discussion method of teaching to improve academic performance of the students in Agricultural Science.

3. Preference should not be made to demonstration method of teaching than discussion method in teaching Agricultural Science in Secondary Schools.
4. There should be preference given to demonstration method of teaching than discussion method in teaching vegetative propagation in secondary schools so as to improve their performances.
5. Differential preferences should be given to demonstration and discussion methods in teaching digestive and reproductive systems in birds rather than conventional method so as to improve students' academic performance.

5.5 Contribution to Knowledge

This study made some contributions to the body knowledge in the premise that demonstration and discussion methods were able to turn students from passive listeners in the classroom to active and free-self learners. The study also revealed the need for Agricultural Science teachers to plan and organize learning contents of Agricultural Science in order to enhance and encourage students to avail themselves to the learning opportunities that are available in Demonstration and Discussion Methods. The study also contributed to knowledge in such that due to the practical experience gained by students during the study, they were able to develop participatory, decision making and analytical skills for carrying out practical and group work.

5.6 Suggestions for Further Studies

The following suggestions were made for future researches:

1. Effects of project based and demonstration methods on academic performance in Basic science among secondary school students.
2. Effects of problem solving and enquiry methods on academic performance of students in Agricultural Science in Kaduna State.

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APPENDIX 1

LESSON PLAN FOR CONVENTIONAL (LECTURE) METHOD

The teacher's guide to conventional teaching method

The conventional teaching method is a method of teaching where the teacher dominates the teaching with very little or no participation from the students. The teacher concentrates on the use of examples in textbooks in directing students to learn. The students are seen as passive recipients of knowledge transmitted by the teacher in the process of learning.

Guidelines for the use of conventional (lecture) method are;

1. Use adequate examples to assist in explanation.
2. There should be minimal students' interaction (chalk and talk only).
3. Control the class, don't be careless about discipline.
4. Use good communication skills, speak clearly, use appropriate facial expressions.
5. There should be little opportunity to ask questions.

LESSON PLAN ON VEGETATIVE PROPAGATION IN PLANTS USING CONVENTIONAL LECTURE METHOD

Week one lesson 1

School: Government Secondary School Kagoro

Date: 6th May, 2019

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 43

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Vegetative propagation in plants

Sub-topic: Definition of propagation and forms of vegetative propagation in plants, processes of layering and budding in vegetative propagation.

Teaching Method: Conventional lecture method

Instructional Materials: Cardboard paper showing the drawing of vegetative propagation-layering and budding, chalkboard etc.

Specific objectives: By the end of the lesson, the students should be able to:

- i. define the concepts propagation and vegetative propagation in plants

- ii. list the forms of vegetative propagation in plants.
- iii. describe the process of layering as a form of vegetative
- iv. describe the process of budding as a form of vegetative propagation
- v. list examples of crops used for layering and budding.

Previous knowledge: Students were taught the meaning of crops, classes of crops and planting processes.

Introduction: The teacher introduces the lesson by asking students questions based on their previous knowledge as follows:

- i. Define crops
- ii. List any four classes of crops and three examples in each case.

The answers provided by the students will be corrected where necessary.

Presentation: The teacher presents the lesson using the steps below;

Step 1: The teacher defines propagation in plants as the multiplication of plant's part. It is in two major forms: These are sexual and asexual. Sexual propagation is that done with the use of seeds while asexual refers to vegetative propagation. Similarly the teacher defines vegetative propagation to the students as: Vegetative propagation is the planting of other parts of the plant other than the seeds.

Step 2: The teacher lists the forms of vegetative propagation as; layering, budding, marcotting and grafting.

Step 3: The teacher describes the process of layering to the students as follows: - layering involves using the stem portion of the plant. Here the stem is laid horizontally on the ground and covered with fertile soil which later sprout to form shoots. The cut stem used for this must contain nodes. This is demonstrated to the students on the chalkboard.

Step 4: The teacher describes the process of budding to the students as follows: Budding involves using the bud from plant(s) with desirable characteristics on another stock with the use of a budding knife and tied with a budding tape (wax). The process is allowed to stay for 4-6 weeks and if the bud still appears greenish, the process would be said to be successful. Note that the removal of the bud and attachment to the stock and other processes is via demonstration before the students.

Step 5: The teacher lists the crops that could be planted using layering and budding as follows: Layering- Cassava, Opuntia, Crotolaria, Bitter leaf etc. Budding: - Citrus plant, cocoa etc.

Evaluation: The teacher gives students the opportunity to ask questions and responses are given. Similarly the teacher evaluates the lesson using the following questions;

- a. Differentiate between propagation and vegetative propagation in plants.
- b. List any three methods of vegetative propagation in plants you have studied.
- c. Describe briefly budding process in plants.
- d. Describe the layering process in plants
- d. What are the major tools used for budding in plants?
- e. List any three crops used for layering as a type of vegetative propagation in plants.

Summary and conclusion: The teacher summarizes the lesson taught by highlighting the salient points on the chalkboard, and then concludes by giving the students assignment.

Assignment: Students were assigned to read more about budding and its practicing process. They were also instructed to read about grafting from any Agricultural Science text book.

LESSON PLAN ON VEGETATIVE PROPAGATION IN PLANTS USING CONVENTIONAL LECTURE METHOD

Week one lesson II

School: Government Secondary School Kagoro

Date: 9th May, 2019

Class: SS II

Time/period: 11:20 am-12:05 pm/ 4th period

Number of students: 43

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Vegetative propagation in plants

Sup-topic: Vegetative propagation (Grafting and Marcotting) including merits and demerits of vegetative propagation generally

Specific objectives: By the end of the lesson, students should be able to:

1. describe vividly the process of marcotting in plants
2. describe vividly the process of grafting in plants
3. list the merits and demerits of vegetative propagation

Instructional Materials: - Charts on cardboard paper showing the diagrams of marcotting and grafting.

Previous knowledge: Students were taught propagation, vegetative propagation, layering and budding in plants.

Introduction: The teacher introduces the lesson by asking students questions based on their previous knowledge as;

i. What is vegetative propagation?

ii. List two major forms of propagation

iii. What is the difference between layering and budding processes in plants? Corrections are provided in the answers given by the students where need be.

Presentation: The teacher presents the lesson using the steps below;

Step 1: Teacher discusses with the students the process of marcotting as follows: Marcotting involves bringing portion of the plant's part (branch) close to the ground and covering it with soil which after sometimes it develops roots and continue the growth process. After a long time, the survived branch is cut off at the ground level with the roots and taken to another area for planting.

Step 2. The teacher discusses the process of grafting with the students as follows: Grafting involves getting the stock of the most resistant plant like the bitter orange and the scion of the most desirable specie like the sweet orange. The cut are either in slant, T-Shaped or Vshaped form. The surfaces of scion will be married to the stock and with the use of a glue or grafting wax before the two surfaces are brought together. After some times like 3-6 weeks, the surfaces got healed up and growth continues.

Step 3. Discusses with the students, the merits and demerits of vegetative propagation in plants as follows:

Merits of vegetative propagation in plants

1. Promote growth rate.
2. Yield increases
3. Attack of diseases becomes ineffective.
4. Quality of the product is improved.
5. Market value of the product is improved.
6. Other parts of the plant can be grown without necessary relying on the use of seeds

Demerits of vegetative propagation in plants

1. It needs pre-requisite skills

2. Materials to be used are scarce.
3. Time is really needed.
4. Expert knowledge is needed
5. The rate of survival is very slim.
6. Viable materials to be used are rarely gotten

Evaluation: The teacher gives room to students to ask questions and put them through where necessary. Similarly the teacher uses the following questions to evaluate the lesson taught;

1. describe the process of marcotting in plants
2. describe the process of grafting in plants
- c. Enumerate any four Merits and four demerits of vegetative propagation in plants.

Summary and conclusion: The teacher summarizes the lesson taught by highlighting the salient points on the chalkboard, and then concludes by giving the students assignment.

Assignment: Students are instructed to go home and practice the process of grafting with plant like citrus or mangoes common within their locality.

LESSON PLAN ON DIGESTIVE AND REPRODUCTIVE SYSTEMS IN BIRDS USING THE CONVENTIONAL METHOD

Week two lesson 1

School: Government Secondary School Kagoro

Date: 13th may, 2019

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 43

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Digestive and reproductive systems in birds

Sub-topic: Digestive system in birds

Specific objectives: By the end of the lesson, students should be able to:

1. describe the process of digestion in birds
2. identify the component parts of the digestive system of a bird
3. state the functions of the digestive system of a bird

Instructional Materials:- Drawing of the digestive system of a bird on a cardboard paper or chalkboard, etc.

Previous Knowledge: Students are supposed to be familiar with the birds.

Introduction: Students are posed with the following questions based on their previous knowledge

- i. Have you ever seen a bird?
- ii. Have you seen a roasted chicken?
- iii. Have you ever seen when a chicken is slaughtered and component parts dissected?

Presentation: The teacher presents the lesson using the steps below:

Step1: The teacher discusses with the students the process of digestion in birds as follows;

- i. The mouth is made up of a beak with tongue that forces food to the gullet or oesophagus.
- ii. The food moves from the gullet to the proventriculus and dilate to form the crop which stores the food.
- iii. Food mixes with the enzymes in the proventriculus before moving to the gizzard where grinding and crushing of food takes place.

- iv. Grinded and crushed food moves to the small intestine where absorption takes place.
- v. The caecum which is located at the junction between the small and large intestine helps in bacteria action.
- vi. The large intestine helps to store the faeces before it is pushed out.

Step 2: The teacher shows a chart to the students that contains the diagram of a digestive system of a bird. He tells them to identify the component parts

Step 3: The teacher explains to the students the functions of the various parts of the digestive system of the bird.

Step 4: The teacher asks the students to draw the digestive system in their exercise books.

Evaluation: Students are evaluated with the following questions: -

- i. Describe the process of digestion in birds
- ii. draw and identify the component parts of a digestive system of a bird
- ii. What are the functions of the following parts of the digestive system of a bird, crop, gizzard and small intestine.
- iii. Draw and label the digestive system of a bird

Chalkboard Summary: Students are made to copy down the chalkboard summary in their note books.

Assignment: Students are instructed to read more about the bird and practice how to draw the digestive system of a bird.

**LESSON PLAN ON DIGESTIVE SYSTEM AND REPRODUCTIVE SYSTEMS IN
BIRDS USING THE CONVENTIONAL METHOD**

Week two lesson 2

School: Government Secondary School Kagoro

Date: 16th May, 2019

Class: SS II

Time/period: 11:20am-12:05pm/ 4th period

Number of students: 43

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Digestive and Reproductive Systems in Birds

Sub-topic: Reproductive system in birds

Specific objectives: By the end of the lesson, students should be able to:

1. describe the reproductive system of a bird.
2. identify the component parts of the reproductive system of a bird.
3. state the functions of the reproductive system of a bird.
4. draw the reproductive system of a bird.

Instructional Materials:- Drawing of the reproductive system of a bird on a cardboard paper or chalkboard, etc.

Previous Knowledge: Students were taught the digestive system in birds

Introduction: Students are posed with the following questions based on their previous knowledge

- i. mention five component parts of the digestive system in birds
- ii. Mention the functions of the parts mentioned above.

Presentation: The teacher presents the lesson using the following steps;

Step 1: The teacher describes briefly the reproductive system to the students as follows:

The reproductive system of a bird is modified to form the egg after the ovum has been fertilized.

Step 2: The teacher shows a chart to the students that contains the diagram of a reproductive system of a bird. He tells them to identify the component parts which are; infundibulum, the magnum, isthmus, the uterus and the vagina. It is through these structures that the processes of formation of egg are determined.

Step 3: The teacher discusses the functions of each of the structural components identified.

Step 4: The teacher asks the students to draw the digestive system in their exercise books.

Evaluation: Students are evaluated with the following questions: -

- i. Describe the process of reproduction in birds
- ii. draw and identify the component parts of a reproductive system of a bird
- ii. state the functions of the component parts of the reproductive system in birds
- iii. Draw and label the reproductive system of a bird

Chalkboard Summary: Students are made to copy down the chalkboard summary in their note books.

Assignment: Students are instructed to read more about the bird and practice how to draw the reproductive system of bird.

LESSON PLAN ON KNAPSACK SPRAYER USING CONVENTIONAL LECTURE METHOD

Week three lesson 1

School: Government Secondary School Kagoro

Date: 20th May, 2019

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 43

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: knapsack sprayer (operation, uses and maintenance)

Specific objectives: By the end of the lesson, the students should be able to:

a. define the terms (a sprayer and knapsack sprayer)

- b. describe the physical structure of a knapsack sprayer.
- c. identify the components parts of a knapsack sprayer
- d. explain the operation of a knapsack sprayer.
- e. state the uses of a knapsack sprayer.
- f. enumerate the maintenance practices of a knapsack sprayer.

Instructional Materials: Cardboard paper and charts showing the pictures of a knapsack sprayer and a man spraying a cowpea farm.

Previous knowledge: Students have been seeing people carrying a container on their backs spraying on crops like, maize farm, cowpea farm etc.

Introduction: Students are asked the following questions based on their previous knowledge.

- a. Do your parents grow crops?
- b. Are your crops sprayed.
- c. What do you use in spraying your crops?

The answers provided by the students are corrected where necessary.

Presentation: The teacher presents the lesson using the steps below

Step 1: The teacher defines a sprayer to the students as a machine used to apply liquid chemicals on plants to control pest and diseases. It can also be used to apply herbicides to control weeds and to spray micronutrients to enhance plant growth. While a knapsack sprayer is spraying equipment, it is suitable for applying chemicals to several field crops.

Step 2: Teacher describes a knapsack sprayer as a hand operated machine which is made up of the following parts—container, pump handle, flexible pipe, on-off lever, extension pipe and nozzle. It can accommodate about 10-15 litres of chemical.

Step 3: The teacher shows a chart to the students having a diagram of a knapsack sprayer, he identifies the various parts of the sprayer to the students.

Step 4: The teacher tells the students the steps to be followed in the usage of a knapsack sprayer as follows:

- a. Pour a measured quantity of water into the tank.
- b. Add correct amount of chemical to the water in the tank and mix well. - Cover the tank with a lid.
- c. Pump to raise pressure within tank.
- d. Mount the sprayer on the back.
- e. Spray while walking away from the sprayed area.
- f. Direct nozzle to the area to be sprayed etc.

Step 5: The teacher mentions the uses of the knapsack sprayer to the students.

1. It is used for spraying to insects, disease causing pathogens and weeds etc.

Step 6: The teacher discusses with he students the maintenance operations of a knapsack sprayer as follows:

- a. Ensure the equipment is in good condition before starting.
- b. Read and follow instructions before using the equipment.
- c. Ensure to clean the container before refilling with chemicals.
- d. Handle the equipment during usage with care.
- e. Avoid smoking, eating or drinking while spraying with the equipment.
- f. Blow the nozzle regularly to avoid blockage.

Evaluation: The teacher gives room to the students to ask questions and correct them where necessary. The lesson is evaluated using the following questions:

1. Define a sprayer and a knapsack sprayer.
2. Briefly describe the structure of a knapsack sprayer.
3. Identify farm parts of the knapsack sprayer.
- . Describe the steps involved in the usage of a knapsack sprayer.
4. Mention the use of a knapsack sprayer
5. List two maintenance operations of a knapsack sprayer.

Summary and conclusion: The teacher summarizes the lesson taught by highlighting the salient points on the chalkboard, and then concludes by giving the students assignment.

Assignment: Students are asked to list any four crops on which knapsack sprayer can be employed. They (students) are also instructed to read about digestive and reproductive system of a bird against the next lesson.

LESSON PLAN ON SOIL EXPERIMENTS (POROSITY AND SOIL PH) USING CONVENTIONAL LECTURE METHOD

Week Four lesson 1

School: Government Secondary School Kagoro

Date: 27th May, 2019

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 43

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Soil Experiments (porosity and Soil PH).

Specific objectives: By the end of the lesson, students should be able to:

- i. define the term soil porosity.
- ii. describe vividly the experiment on soil porosity.
- iii. explain the concept soil PH
- iv. describe the procedure of using PH scale
- v. explain how soil PH can be corrected.

Previous knowledge: Students have dealt with meaning of soil, types, characteristics and importance of soil.

Instructional Materials:- Use of charts, chalkboard etc.

Introduction: The teacher introduces the lesson by asking the students based on their previous knowledge as follows:

- i. What is soil?
- ii. List any three (3) types of soil.
- iii. List the characteristics of sand and clay soil.

Teacher makes corrections based on the responses provided where need be

Presentation: The teacher presents the lesson using the steps below;

Step 1: The teacher defines the term porosity as: Porosity is the process of water draining through a given semi permeable membrane like cotton.

Step 2: The teacher describes the process of soil porosity as: different soil types have different porosity rates. The quantity/volume of water drained is high in sand, followed by loam and lowest in clay. This then shows that sand has high porosity rate. This experiment will be briefly performed before the students using diagrammatic representation.

Step 3: The teacher defines the concept soil PH as; Soil Ph is a measure of the acidity, neutrality and alkalinity of a given medium like the soil. It defines the amount of hydrogen ions (H^+) and hydroxyl ion (OH^-) concentration.

Step 4: The teacher describes the procedure of using the soil PH as; If the H^+ ion is high, the soil medium will be termed acidic. If the H^+ is equal to the OH^- ion the soil is regarded as being neutral and if it has high hydroxyl (OH^-) ions, the soil will be termed alkaline. A Ph metre rule that is graduated into 14 units will be used to measure this. Universal indicator and litmus paper will be used to measure soil Ph.

Step 5: The teacher explains to the students how soil PH can be corrected. Soil Ph can be corrected with the use of calcium and magnesium containing compound e.g. CaO , $CaCO_3$, $Ca(OH)_2$, $CaMgCO_3$, lime etc.

Evaluation : The teacher evaluates the lesson using the following questions;

1. Define soil porosity
2. Which of the soil types has the highest porosity rate?
3. Define soil PH
4. What tools are used to determine the Ph of the soil?
5. How can soil PH be corrected?

Summary and conclusion: The teacher summarizes the lesson taught by highlighting the salient points on the chalkboard, and then concludes by giving the students assignment.

Assignment: Students are instructed to read about capillarity rates among soil samples.

LESSON PLAN ON SOIL EXPERIMENT (CAPILLARITY) USING CONVENTIONAL LECTURE METHOD

Week Four lesson 2

School: Government Secondary School Kagoro

Date: 30th May, 2019

Class: SS II

Time/period: 11:20 -12:05 pm/ 4th period

Number of students: 43

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Soil Experiments

Sub-topic: Soil capillarity

Specific objectives: By the end of the lesson, students should be able to:

1. define the concept capillarity
2. describe vividly the experiment on capillarity.
3. determine which of the soil types has the highest capillarity rate.
4. list the roles of capillarity rate of soil on crop production.

Instructional Materials:- Cardboard paper showing the items used for the experiment.

Previous knowledge: Students have dealt with soil porosity and soil Ph.

Introduction: The teacher introduces the lesson by asking students questions based on their previous knowledge as follows:

1. Define soil porosity.
2. How can soil PH be corrected?

Correct the answers provided where need be.

Presentation: The teacher presents the lesson using the steps below

Step 1: The teacher defines the concept capillarity to the students as follows: Capillarity is the process that involves the rate at which water rises in the soil..

Step 2: The teacher lists and identifies the materials used in the experiment of capillarity as follows: Three test tubes, water trough, cotton wool, water basin, water and the three different soil samples – dry sand, dry clay and dry loam.

Step3.The teacher shows the diagrammatic representation of the set up to the students on the chalkboard and explains to them the process of carrying out the experiment.

Step 4. The teacher discusses with the students the importance of capillarity in agricultural production as follows:

1. Retaining of water by the different soil samples can be determined.
2. The type of crop to be planted on the various soil types can be determined.
3. The rate of loss of water by the various soil types can be determined.

Evaluation:- The teacher evaluates the lesson by asking the students the following questions.

1. Define the concept capillarity?
2. Which of the soil types has the highest capillarity rate?
3. In the conduct of capillarity experiment, which materials are needed?
4. Mention four roles of capillarity in agricultural production.

Chalkboard Summary: Students were made to write down the chalkboard summary which is derived from the answers provided based on the evaluation of the lesson.

Assignment: Students were instructed to conduct the experiment on capillarity on their own when they go home.

LESSON PLAN ON GENETICS USING CONVENTIONAL LECTURE METHOD

Week Five lesson 1

School: Government Secondary School Kagoro

Date: 3rd June, 2019

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 43

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Genetics

Specific objectives: By the end of the lesson, students should be able to:

1. Define genetics.
2. List and explain the various terms used in genetics.
3. State Mendel's law of inheritance
4. Describe vividly Mendelian laws of inheritance
4. Handle crossing on monohybrid inheritance.

Instructional Materials: Charts, chalkboard, illustrations etc.

Previous knowledge: Students have seen within their locality that resemblance exist between different plant species as well as between different animal species.

Introduction: The teacher introduces the lesson by asking the students questions based on their previous knowledge as follows:

- i. Have you ever seen man resembling another man in your area?
- ii. Which features are usually used to identify sense of resemblance among animals?
- iii. Are there traits of resemblance found in plants?

Correct them in the answers provided where necessary.

Presentation:

Step 1: The teacher defines Genetics as science of heredity and environment. It involves different terms like

Step 2: The teacher explains the terms related to genetics

- a. Gene-particulate unit of heredity of inheritance.
- b. Chromosomes – Thread like structure on which genes are carried.
- c. Alleles – Are genes that perform similar functions that occur in corresponding locus or position.
- d. Dominance – Is a state or condition in which a gene or its associated characteristics manifest itself in a heterozygous state.
- e. Homozygous – Refers to a state when an individual carries identical genes at one or more loci.
- f. Recessive – A condition in which a gene does not produce a phenotype or observable characteristics in the presence of a dominant allele.
- g. Heterozygous – When an individual carries unlike genes or different alleles at one or more loci in a homologous chromosome.
- i. Phenotype – Outward appearance or condition of an organism.
- j. Genotype – Refers to hereditary make up of an individual.

Step 2. Teacher teaches the students the crossing process involving dominant homozygous tall pea and recessive homozygous short pea plants.

Step 3: The teacher states the Mendelian laws of inheritance as; ‘ ‘ genes are responsible for the development of the individual and that they are independently transmitted from one generation to another without undergoing any alteration.

Evaluation: Students are evaluated with the following questions.

a. Demonstrate a cross between red pea plants and white pea plant giving that red is dominant over white.

b. What will be ratio of red to white in the F₂ generation?

Chalk board Summary: Students are made to copy down the chalkboard summary in their note books.

Assignment: Students are instructed to read and get more information on dihybrid inheritance.

LESSON PLAN FOR DEMONSTRATION METHOD

The teacher's guide to demonstration teaching method

Demonstration method of teaching is a method of teaching in which the teacher is the principal actor, while the learners watch with the intention to act later. Here the teacher does whatever the learners are expected to do at the end of the lesson by showing them how to do it and explaining the step by step process to them. In any demonstration, the teacher should take note of the following;

1. The teacher plans the lesson in such a way that all the materials needed for the lesson demonstration are made available. It is very important to make available everything needed for the demonstration in order to avoid interruption or any kind of problem in the course of the lesson demonstration.
2. Produce an outline based on the most suitable procedure identified.
3. Arrange and motivate the learners before starting the demonstration. Ensure that every learner can see and hear you clearly.

LESSON PLAN ON VEGETATIVE PROPAGATION IN PLANTS USING DEMONSTRATION METHOD FOR THE EXPERIENTIAL GROUP I

Week One lesson 1

School: Government Secondary School Kukum Daji

Date: 8th May, 2019

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 35

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Vegetative propagation in plants

Sub-topic: Definition of propagation and forms of vegetative propagation in plants, processes of layering and budding in vegetative propagation.

Teaching method: Demonstration method

Instructional Materials: Budding knife, budding wax, layering plant e.g Cassava stem plant, Biter leaf. Budding plant; Citrus plant; Cardboard paper showing the diagram of vegetative propagation-layering and budding,

Specific objectives: By the end of the lesson, the students should be able to:

- i. define the concepts propagation and vegetative propagation in plants
- ii. list the forms of vegetative propagation in plants.

- iii. describe the process of layering as a form of vegetative
- iv. describe the process of budding as a form of vegetative propagation
- v. list examples of crops used for layering and budding.

Previous knowledge: Students were taught the meaning of crops, classes of crops and planting processes.

Introduction: The teacher introduces the lesson by asking students questions based on their previous knowledge as follows:

- i. Define crops?
- ii. List any four classes of crops and three examples in each case.

The answers provided by the students will be corrected where necessary.

Presentation: The teacher presents the lesson using the steps below;

Step 1: The teacher aids the students to define the concept propagation in plants as the multiplication of plant's part. It is in two major forms these are sexual and asexual. Sexual propagation is that done with the use of seeds while asexual refers to vegetative propagation which is the planting of other parts of the plant other than the seeds.

Step 2: Students are guided by the teacher to list the forms of vegetative propagation as; layering, budding, marcotting and grafting.

Step 3: Using the materials available for carrying out layering process, the teacher describes the process of layering to the students as follows: - layering involves using the stem portion of the plant. Here the stem is laid horizontally on the ground and covered with fertile soil which later sprout to form shoots. The cut stem used for this must contain nodes. This is demonstrated to the students on the chalkboard and also students are taken to the school farm to demonstrate it for them to see. Thereafter teacher gives the students opportunity to carry out the demonstration themselves on the farm, this is to allow students understand the concept being taught.

Step 4: Using the available materials for budding process, the teacher describes the process of budding to the students as follows: Budding involves using the bud from plant(s) with desirable characteristics on another stock with the use of a budding knife and tied with a budding tape (wax). The process is allowed to stay for 4-6 weeks and if the bud still appears greenish, the process would be said to be successful. Note that the removal of the bud and attachment to the stock and other processes is done through demonstration before the students. Thereafter teacher gives the students opportunity to carry out the demonstration themselves on the farm, this is to allow students understand the concept being taught.

Step 5: Students are asked to list the crops used for layering and budding as follows: Layering- Cassava, Opuntia, Crotolaria, Biter leaf etc. Budding: - Citrus plant, cocoa etc.

Evaluation: The teacher gives students the opportunity to ask questions and responses are given. Similarly the teacher evaluates the lesson using the following questions;

- a. Differentiate between propagation and vegetative propagation in plants.
- b. List any three methods of vegetative propagation in plants you have studied.
- c. Describe briefly budding process in plants.
- d. Describe the layering process in plants
- d. What are the major tools used for budding in plants?
- e. List any three crops used for layering as a type of vegetative propagation in plants.

Summary and conclusion: The teacher summarizes the lesson taught by highlighting the salient points on the chalkboard, and then concludes by giving the students assignment.

Assignment: Students are asked to go home and practice the budding and layering process taught in the class.

LESSON PLAN ON VEGETATIVE PROPAGATION IN PLANTS USING DEMONSTRATION METHOD FOR EXPERIMENTAL GROUP 1

Week one lesson 2

School: Government Secondary School Kukum Daji

Date: 10th May, 2019

Class: SS II

Time/period: 11:20 am-12:05 pm/ 4th period

Number of students: 35

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Vegetative propagation in plants

Sup-topic: Vegetative propagation (Grafting and Marcotting) including merits and demerits of vegetative propagation generally

Specific objective(s): By the end of the lesson, students should be able to:

1. describe vividly the process of marcotting in plants
2. describe vividly the process of grafting in plants
3. list the merits and demerits of vegetative propagation

Instructional Materials: - grafting plant e.g. mango, orange, grafting wax; Cardboard paper showing the drawing of vegetative propagation- marcotting and grafting,

Previous knowledge: Students were taught propagation, vegetative propagation, layering and budding in plants.

Introduction: The teacher introduces the lesson by asking students questions based on their previous knowledge as;

- i. What is vegetative propagation?
- ii. List two major forms of propagation
- iii. What is the difference between layering and budding processes in plants? Corrections are provided in the answers given by the students where need be.

Presentation: The teacher presents the lesson using the steps below

Step 1: Teacher discusses and demonstrates to the students the process of marcotting as follows: Marcotting involves bringing portion of the plant's part (branch) close to the ground and covering it with soil which after sometimes develop roots and continue the growth process. After a long time, the survived branch is cut off at the ground level with the roots and taken to another area for planting. Note; the teacher demonstrates on the chalkboard this process for students to understand. Similarly students are taken to the school farm for practical demonstration.

Step 2. The teacher explains and demonstrates the process of grafting with the students as follows: Grafting involves getting the stock of the most resistant plant like the bitter orange and

the scion of the most desirable specie like the sweet orange. The cut are either in slant, T-Shaped or V-shaped form. The surfaces of scion will be married to the stock and with the use of a glue or grafting wax before the two surfaces are brought together. After some times like 3-6 weeks, the surfaces got healed up and growth continues.

Step 3.The students are asked to state, the merits and demerits of vegetative propagation in plants as follows:

Merits of vegetative propagation in plants

1. Promote growth rate.
2. Yield increases
3. Attack of diseases becomes ineffective.
4. Quality of the product is improved.
5. Market value of the product is improved.
6. Other parts of the plant can be grown without necessary relying on the use of seeds

Demerits of vegetative propagation in plants

1. It needs pre-requisite skills
2. Materials to be used are scarce.
3. Time is really needed.
4. Expert knowledge is needed
5. The rate of survival is very slim.
6. Viable materials to be used are rarely gotten

Evaluation: The teacher gives room to students to ask questions and put them through where necessary. Similarly the teacher uses the following questions to evaluate the lesson taught;

1. describe the process of marcotting in plants
2. describe the process of grafting in plants
- c. Enumerate any four Merits and four demerits of vegetative propagation in plants.

Summary and conclusion: The teacher summarizes the lesson taught by highlighting the salient points on the chalkboard, and then concludes by giving the students assignment.

Assignment: Students are instructed to go home and practice the process of grafting with plant like citrus or mangoes common within their locality.

LESSON PLAN ON DIGESTIVE AND REPRODUCTIVE SYSTEMS IN BIRDS USING THE DEMONSTRATION METHOD

Week two lesson 1

School: Government Secondary School Kukum Daji

Date: 15th May, 2019

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 35

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Digestive and reproductive systems in birds

Sub-topic: Digestive system in birds

Specific objective(s): By the end of the lesson, students should be able to:

1. describe the process of digestion in birds
2. identify the component parts of the digestive system of a bird
3. state the functions of the digestive system of a bird

Instructional Materials: A real life chicken, Knife, Tray; A chart showing the diagram of the digestive system of a bird

Previous Knowledge: Students are supposed to be familiar with the birds.

Introduction: Students are posed with the following questions based on their previous knowledge

- i. Have you ever seen a bird?
- ii. Have you seen a roasted chicken?
- iii. Have you ever seen when a chicken is slaughtered and component parts dissected?

Presentation: The teacher presents the lesson using the steps below:

Step 1: The teacher explains to the students the process of digestion in birds as follows;

- i. The mouth is made up of a beak with tongue that forces food to the gullet or oesophagus.
- ii. The food moves from the gullet to the proventriculus and dilate to form the crop which stores the food.
- iii. Food mixes with the enzymes in the proventriculus before moving to the gizzard where grinding and crushing of food takes place.
- iv. Grinded and crushed food moves to the small intestine where absorption takes place.
- v. The caecum which is located at the junction between the small and large intestine helps in bacteria action.
- vi. The large intestine helps to store the faeces before it is pushed out.

Step 2: The teacher slaughters the chicken, dissects it and shows to the students the component parts of a bird. Similarly the teacher shows a chart to the students that contains the diagram of a digestive system of a bird. He tells the students to identify the component parts. The students identify each part on individually.

Step 3: The teacher explains to the students the functions of the various parts of the digestive system of the bird as follows:

Step 4: The teacher asks the students to draw the digestive system in their exercise books.

Evaluation: Students are evaluated with the following questions: -

- i. Describe the process of digestion in birds

ii. draw and identify the component parts of a digestive system of a bird

ii. What are the functions of the following parts of the digestive system of a bird, crop, gizzard and small intestine.

iii. Draw and label the digestive system of a bird

Chalkboard Summary: Students are made to copy down the chalkboard summary in their note books.

Assignment: Students are instructed to read more about the bird and practice how to draw the digestive system of bird.

BIRDS USING THE DEMONSTRATION METHOD

Week two lesson 2

School: Government Secondary School Kukum Daji

Date: 17th May, 2019.

Class: SS II

Time/period: 11:20am-12:05pm/ 4th period

Number of students: 35

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Digestive and Reproductive Systems in Birds

Sub-topic: Reproductive system in birds

Specific objectives: By the end of the lesson, students should be able to:

1. describe the reproductive system of a bird.
2. identify the component parts of the reproductive system of a bird.
3. state the functions of the reproductive system of a bird.
4. draw the reproductive system of a bird.

Instructional Materials: A real life chicken, Knife, Tray; A chart showing the diagram of the reproductive system of a bird

Previous Knowledge: Students were taught the digestive system in birds

Introduction: Students are posed with the following questions based on their previous knowledge

- i. mention five component parts of the digestive system in birds

ii. Mention the functions of the parts mentioned above.

Presentation: The teacher presents the lesson using the following steps;

Step 1: The teacher describes briefly the reproductive system to the students as follows:

The reproductive system of a bird is modified to form the egg after the ovum has been fertilized.

Step 2: The teacher presents to the students the live chicken and dissects it for the students to see real parts of the reproductive system of a bird. He tells them to identify the component parts which are; infundibulum, the magnum, isthmus, the uterus and the vagina. It is through these structures that the processes of formation of egg are determined.

Step 3: The teacher discusses the functions of each of the structural components identified.

Step 4: The teacher asks the students to draw the reproductive system of a bird in their exercise books.

Evaluation: Students are evaluated with the following questions: -

- i. Describe the process of reproduction in birds
- ii. draw and identify the component parts of a reproductive system of a bird
- ii. state the functions of the component parts of the reproductive system in birds
- iii. Draw and label the reproductive system of a bird

Chalkboard Summary: Students are made to copy down the chalkboard summary in their note books.

Assignment: Students are instructed to read more about the bird and practice how to draw the reproductive system of bird.

LESSON PLAN ON KNAPSACK SPRAYER USING DEMONSTRATION METHOD

Week three lesson 1

School: Government Secondary School Kukum Daji

Date: 22nd May, 2019

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 35

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: knapsack sprayer (operation, uses and maintenance)

Specific objectives: By the end of the lesson, the students should be able to:

- a. define the terms (a sprayer and knapsack sprayer)
- b. describe the physical structure of a knapsack sprayer.
- c. identify the components parts of a knapsack sprayer
- d. explain the operation of a knapsack sprayer.
- e. state the uses of a knapsack sprayer.
- f. enumerate the maintenance practices of a knapsack sprayer.

Instructional Materials: A Knapsack Sprayer, Water, chemical.

Previous knowledge: Students have been seeing people carrying a container on their backs spraying on crops like, maize farm, cowpea farm etc.

Introduction: Students are asked the following questions based on their previous knowledge.

- a. Do your parents grow crops?
- b. Do grasses grow on your farms?
- c. What means do you control the weeds or pests on your farms?

The answers provided by the students are corrected where necessary.

Presentation: The teacher presents the lesson using the steps below

Step 1: The teacher defines a sprayer to the students as a machine used to apply liquid chemicals on plants to control pest and diseases. It can also be used to apply herbicides to control weeds and to spray micronutrients to enhance plant growth. While a knapsack sprayer is a spraying equipment, it is suitable for applying chemicals to several field crops.

Step 2: Teacher describes a knapsack sprayer as a hand operated machine which is made up of the following parts—container, pump handle, flexible pipe, on-off lever, extension pipe and nozzle. It can accommodate about 10-15 litres of chemical.

Step 3: The teacher presents to the students a knapsack sprayer; then identifies the various parts of the sprayer to the students.

Step 4: The teacher takes the students to the farm to demonstrate to the students the steps to be followed in the usage of a knapsack sprayer as follows:

- a. Pour a measured quantity of water into the tank.
- b. Add correct amount of chemical to the water in the tank and mix well. - Cover the tank with a lid.
- c. Pump to raise pressure within tank.
- d. Mount the sprayer on the back.
- e. Spray while walking away from the sprayed area.
- f. Direct nozzle to the area to be sprayed etc.

The teacher gives opportunity to the students practice how to use the knapsack sprayer.

Step 5: The teacher mentions the uses of the knapsack sprayer to the students.

1. It is used for spraying to insects, disease causing pathogens and weeds etc.

Step 6: The teacher discusses with the students the maintenance operations of a knapsack sprayer as follows:

- a. Ensure the equipment is in good condition before starting.
- b. Read and follow instructions before using the equipment.
- c. Ensure to clean the container before refilling with chemicals.
- d. Handle the equipment during usage with care.
- e. Avoid smoking, eating or drinking while spraying with the equipment.

f. Blow the nozzle regularly to avoid blockage.

Evaluation: The teacher gives room to the students to ask questions and correct them where necessary. The lesson is evaluated using the following questions:

1. Define a sprayer and a knapsack sprayer.
2. Briefly describe the structure of a knapsack sprayer.
3. Identify farm parts of the knapsack sprayer.
- . Describe the steps involved in the usage of a knapsack sprayer.
4. Mention the use of a knapsack sprayer
5. List two maintenance operations of a knapsack sprayer.

Summary and conclusion: The teacher summarizes the lesson taught by highlighting the salient points on the chalkboard, and then concludes by giving the students assignment.

Assignment: Students are asked to list any four crops on which knapsack sprayer can be employed. The students are equally instructed to go home and carry practice how to use a knapsack sprayer.

**LESSON PLAN ON SOIL EXPERIMENTS (POROSITY AND SOIL PH) USING
DEMONSTRATION METHOD**

Week Four lesson 1

School: Government Secondary School Kukum Daji

Date: 31st May, 2019.

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 35

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Soil Experiments

Sub-topic: Porosity and Soil PH

Specific objective(s): By the end of the lesson, students should be able to:

- i. define the term soil porosity.
- ii. describe vividly the experiment on soil porosity.
- iii. explain the concept soil PH
- iv. describe the procedure of using PH scale
- v. explain how soil PH can be corrected.

Previous knowledge: Students have dealt with meaning of soil, types, characteristics and importance of soil.

Instructional Materials:- Samples of soil, water and test tubes, Ph meter rule, Universal indicator and litmus paper.

Introduction: The teacher introduces the lesson by asking the students questions based on their previous knowledge as follows:

- i. What is soil?
- ii. List any three (3) types of soil.
- iii. List the characteristics of sand and clay soil.

Teacher makes corrections based on the responses provided where need be

Presentation: The teacher presents the lesson using the steps below;

Step 1: The teacher defines the term porosity as: the process of water draining through a given semi permeable membrane like cotton.

Step 2: The teacher describes and demonstrates to the students the process of determining soil porosity as: different soil types have different porosity rates. The quantity/volume of water drained is high in sand, followed by loam and lowest in clay. This then shows that sand has high porosity rate. This experiment will be briefly performed before the students using the materials available.

Step 3: The teacher defines the concept soil PH as; Soil Ph is a measure of the acidity, neutrality and alkalinity of a given medium like the soil. It defines the amount of hydrogen ions (H⁺) and hydroxyl ion (OH⁻) concentration.

Step 4: The teacher describes the procedure of using the soil PH as; If the H^+ ion is high, the soil medium will be termed acidic. If the H^+ is equal to the OH^- ion the soil is regarded as being neutral and if it has high hydroxyl (OH^-) ions, the soil will be termed alkaline. A Ph meter rule that is graduated into 14 units will be used to measure this. Universal indicator and litmus paper will be used to measure soil Ph.

Step 5: The teacher explains to the students how soil PH can be corrected. Soil Ph can be corrected with the use of calcium and magnesium containing compound e.g. CaO , $CaCO_3$, $Ca(OH)_2$, $CaMgCO_3$, lime etc.

Evaluation: The teacher evaluates the lesson using the following questions;

1. Define soil porosity
2. Which of the soil types has the highest porosity rate?
3. Define soil PH
4. What tools are used to determine the Ph of the soil?
5. How can soil PH be corrected?

Summary and conclusion: The teacher summarizes the lesson taught by highlighting the salient points on the chalkboard, and then concludes by giving the students assignment.

Assignment: Students are instructed to read about capillarity rates among soil samples.

LESSON PLAN ON SOIL EXPERIMENT (CAPILLARITY) USING DEMONSTRATION METHOD

Week Five lesson 1

School: Government Secondary School Kukum Daji

Date: 5th June, 2019.

Class: SS II

Time/period: 11:20 -12:05 pm/ 4th period

Number of students: 35

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Soil Experiments

Sub-topic: Soil capillarity

Specific objectives: By the end of the lesson, students should be able to:

1. define the concept capillarity
2. describe vividly the experiment on capillarity.
3. determine which of the soil types has the highest capillarity rate.
4. list the roles of capillarity rate of soil on crop production.

Instructional Materials:- Samples of soil, water and test tubes, water trough, cotton wool, water basin.

Previous knowledge: Students have dealt with soil porosity and soil Ph.

Introduction: The teacher introduces the lesson by asking students questions based on their previous knowledge as follows:

1. Define soil porosity.
2. How can soil PH be corrected?

Correct the answers provided where need be.

Presentation: The teacher presents the lesson using the steps below

Step 1: The teacher defines the concept capillarity to the students as follows: Capillarity is the process that involves the rate at which water rises in the soil.

Step 2: The teacher lists and identifies the materials used in the experiment of capillarity as follows: Three test tubes, water trough, cotton wool, water basin, water and the three different soil samples – dry sand, dry clay and dry loam.

Step3. The teacher using the materials available describes to the students the experiment to show how water rises in the soil. Students are asked to individually repeat the experiment.

Step 4. The teacher discusses with the students the importance of capillarity in agricultural production as follows:

1. Retaining of water by the different soil samples can be determined.
2. The type of crop to be planted on the various soil types can be determined.
3. The rate of loss of water by the various soil types can be determined.

Evaluation:- The teacher evaluates the lesson by asking the students the following questions.

1. Define the concept capillarity?
2. Which of the soil types has the highest capillarity rate?
3. In the conduct of capillarity experiment, which materials are needed?
4. Mention four roles of capillarity in agricultural production

Chalkboard Summary: Students are made to write down the chalkboard summary which is derived from the answers provided based on the evaluation of the lesson.

Assignment: Students are instructed to conduct the experiment on capillarity on their own when they go home.

LESSON PLAN ON GENETICS USING DEMONSTRATION METHOD

Week six lesson 1

School: Government Secondary School Kukum Daji

Date: 12th June, 2019

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 35

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Genetics

Specific objectives: By the end of the lesson, students should be able to:

1. Define genetics.
2. List and explain the various terms used in genetics.
3. State Mendel's law of inheritance
4. Describe vividly Mendelian laws of inheritance
5. Handle crossing on monohybrid inheritance.

Instructional Materials: Charts, chalkboard illustrations etc.

Previous knowledge: Students have seen within their locality that resemblance exist between different plant species as well as between different animal species.

Introduction: The teacher introduces the lesson by asking the students questions based on their previous knowledge as follows:

- i. Have you ever seen man resembling another man in your area?
- ii. Which features are usually used to identify sense of resemblance among animals?
- iii. Are there traits of resemblance found in plants?

Correct them in the answers provided where necessary.

Presentation:

Step 1: The teacher aids the student to define Genetics as science of heredity and environment.

Step 2: The teacher explains the terms related to genetics as;

- a. Gene-particulate unit of heredity of inheritance.
- b. Chromosomes – Thread like structure on which genes are carried.
- c. Alleles – Are genes that perform similar functions that occur in corresponding locus or position.
- d. Dominance – Is a state or condition in which a gene or its associated characteristics manifest itself in a heterozygous state.
- e. Homozygous – Refers to a state when an individual carries identical genes at one or more loci.
- f. Recessive – A condition in which a gene does not produce a phenotype or observable characteristics in the presence of a dominant allele.
- g. Heterozygous – When an individual carries unlike genes or different alleles at one or more loci in a homologous chromosome.
- i. Phenotype – Outward appearance or condition of an organism.
- j. Genotype – Refers to hereditary make up of an individual.

Step 2: Teacher teaches the students the crossing process involving dominant homozygous tall pea and recessive homozygous short pea plants.

Step 3: The teacher states the Mendelian laws of inheritance as; genes are responsible for the development of the individual and that they are independently transmitted from one generation to another without undergoing any alteration.

Evaluation: Students are evaluated with the following questions.

- a. Demonstrate a cross between red pea plants and white pea plant giving that red is dominant over white.
- b. What will be ratio of red to white in the F₂ generation?

Chalk board Summary: Students are made to copy down the chalkboard summary in their note books.

Assignment: Students are instructed to read and get more information on dihybrid inheritance.

APPENDIX I11

LESSON PLAN ON DISCUSSION METHOD EXPERIMENTAL GROUP 11

Teacher's Guide to Discussion Teaching Method

Discussion approach to teaching is a predominantly interactive process involving a multiple-flow of communication between the teacher and the pupils and from one pupil to another. Interaction centers on problems and questions with the teacher directing affairs towards the lesson objectives. The teacher is a facilitator who encourages the pupils to discover things for themselves. The students generate varieties of ideas, which will lead to the solution of the problem while the teacher moderates. To make lesson for discussion method effective, attention must be given to the following aspects:

1. Encourage group discussion
2. Allow students interactions through independent work
3. Encourage asking questions.

**LESSON PLAN ON VEGETATIVE PROPAGATION IN PLANTS USING THE
DISCUSSION METHOD**

Week One Lesson 1

School: Government Secondary School Kafanchan

Date: 7th May, 2019

Class: SS II

Time/period: 11:20 am- 12:05 pm/ 4th period

Number of students: 55

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Vegetative propagation in plants

Sub-topic: Definition of propagation and forms of vegetative propagation in plants, processes of layering and budding in vegetative propagation.

Teaching Method: Discussion method

Specific objectives: By the end of the lesson, the students should be able to:

- i. define the concepts propagation and vegetative propagation in plants
- ii. list the forms of vegetative propagation in plants.
- iii. describe the process of layering as a form of vegetative
- iv. describe the process of budding as a form of vegetative propagation
- v. list examples of crops used for layering and budding.

Introduction: The teacher introduces the lesson by defining the concept propagation as the process of multiplication of plant's part. It is in two major forms these are sexual and asexual. Sexual propagation is that done with the use of seeds while asexual refers to vegetative propagation.

Assigning of students into groups: The teacher shares the entire 55 students into 7 groups. Each group consists of 8 students. Each group is assigned a leader, secretary and time keeper.

Students are given Rules to follow: Students within the groups should;

- i. Understand the need to discuss and share their ideas
- ii. Respect opposing opinion for a peaceful coexistence
- iii. Appreciate the importance of punctuality and constant attendance in school

Assignment of Task: The teacher gives the students in each group the objectives of the day's

lesson and then gives them time to discuss and share ideas on the same topic that was introduced. The students will be mainly engage in discussions and jotting down of salient points towards the objectives of the lesson. At the end of the discussion, the points are reconciled for the final presentation to the whole class.

Teacher's Role: The teacher who is the chief organizer of the class discussion acts as a supervisor. He moves from one group to another listening to the trend of discussion. The teacher gives suggestions and advice in each group ensuring that each group is moving towards the set objectives. As the discussion is still going on, the teacher similarly through the time keeper of each group alerts them on the time limit for the discussion and when to compile the summary report for presentation

Culminating Activities: The teacher asks each group to compile, organize, write and present a report to the entire class based on the different areas assigned to them. The chairman or the secretary of each group presents the report to the whole class. Thereafter the teacher guides students back to their various seats.

Evaluative Activities: This is a time when the teacher calls a meeting of the entire class for the deliberation on the various reports. Each group presents the summary of their discussion through the group's chairman or secretary. The various reports are considered collectively by the entire class and a final report drawn up by the class. The final report serves as a reference point for the members of the class. Finally the teacher encourages students to share all that they have discussed in their various groups by asking them the following questions;

- a. Differentiate between propagation and vegetative propagation in plants.
- b. List any three methods of vegetative propagation in plants you have studied.
- c. Describe briefly budding process in plants.
- d. Describe the layering process in plants
- d. What are the major tools used for budding in plants?
- e. List any three crops used for layering as a type of vegetative propagation in plants.

Assignment: The teacher asks the students to read more about budding and its practicing process. They are also instructed to read about grafting relevant agricultural science textbooks which will be their next topic of discussion.

LESSON PLAN ON VEGETATIVE PROPAGATION IN PLANTS USING THE DISCUSSION METHOD

Week One Lesson 2

School: Government Secondary School Kafanchan

Date: 9th May, 2019.

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 55

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Vegetative propagation in plants

Sup-topic: Vegetative propagation (Grafting and Marcotting) including merits and demerits of vegetative propagation generally

Specific objectives: By the end of the lessons, students should be able to:

- i. describe vividly the process of marcotting in plants
- ii. describe vividly the process of grafting in plants
- iii. list the merits and demerits of vegetative propagation

Teaching method: Discussion method

Introduction: The teacher introduces the lesson by asking students questions based on their previous knowledge as;

i. What is vegetative propagation?

ii. List two major forms of propagation

iii. What is the difference between layering and budding processes in plants? Corrections are provided in the answers given by the students where need be. The teacher then tells the students on the topic for discussion on that lesson.

Students are given Rules to follow: Students within the groups should;

- i. Understand the need to discuss and share their ideas
- ii. Respect opposing opinion for a peaceful coexistence
- iii. Appreciate the importance of punctuality and constant attendance in school.

Assigning of students into groups: The teacher shares the entire 55 students into 7 groups. Each group consists of 8 students. Each group is assigned a leader, secretary and time keeper.

Assignment of Task: The teacher gives the students in each group the objectives of the day's lesson and then gives them time to discuss and share ideas on the same topic that was introduced. The students will be mainly engaged in discussions and jotting down of salient points towards the objectives of the lesson. At the end of the discussion, the points are reconciled for the final presentation to the whole class.

Teacher's Role: The teacher who is the chief organizer of the class discussion acts as a supervisor. He moves from one group to another listening to the trend of discussion. The teacher gives suggestions and advice in each group ensuring that each group is moving towards the set objectives. As the discussion is still going on, the teacher similarly through the time keeper of each group alerts them on the time limit for the discussion and when to compile the summary report for presentation.

Culminating Activities: The teacher asks each group to compile, organize, write and present a report to the entire class based on the different areas assigned to them. The chairman or the secretary of each group presents the report to the whole class. Thereafter the teacher guides students back to their various seats.

Evaluative Activities: This is a time when the teacher calls a meeting of the entire class for the deliberation on the various reports. Each group presents the summary of their discussion through the group's chairman or secretary. The various reports are considered collectively by the entire class and a final report drawn up by the class. The final report serves as a reference point for the members of the class. Finally the teacher encourages students to share all that they have discussed in their various groups by asking them the following questions;

- i. describe the process of marcotting in plants

- ii. describe the process of grafting in plants
- iii. Enumerate any four Merits and four demerits of vegetative propagation in plants.

Assignment: Students are instructed to go home and practice the process of grafting with plant like citrus or mangoes common within their locality. They are also instructed to read about Digestive and reproductive system in birds from relevant agricultural science textbooks which will be their next topic of discussion.

LESSON PLAN ON DIGESTIVE AND REPRODUCTIVE SYSTEMS IN BIRDS USING THE DISCUSSION METHOD

Week two lesson 1

School: Government Secondary School Kafanchan

Date: 14th May, 2019

Class: SS II

Time/period: 11:20am-12:05pm/ 4th period

Number of students: 55

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Digestive and reproductive systems in birds

Sub-topic: Digestive system in birds

Specific objectives: By the end of the lesson, students should be able to:

- i. define the concept digestion
- ii. describe the process of digestion in birds
- iii. identify the component parts of the digestive system of a bird
- iv. state the functions of the digestive system of a bird

Introduction: The teacher introduces the lesson by defining the concept Digestion as the process by which insoluble food substances are broken down into simple soluble and absorbable compounds.

Students are given Rules to follow: Students within the groups should;

- i. Understand the need to discuss and share their ideas
- ii. Respect opposing opinion for a peaceful coexistence
- iii. Appreciate the importance of punctuality and constant attendance in school.

Assigning of students into groups: The teacher shares the entire 55 students into 7 groups. Each group consists of 8 students. Each group is assigned a leader, secretary and time keeper.

Assignment of Task: The teacher gives the students in each group the objectives of the day's lesson and then gives them time to discuss and share ideas on the same topic that was introduced. The students will be mainly engaged in discussions and jotting down of salient points towards the objectives of the lesson. At the end of the discussion, the points are reconciled for the final presentation to the whole class.

Teacher's Role: The teacher who is the chief organizer of the class discussion acts as a supervisor. He moves from one group to another listening to the trend of discussion. The teacher gives suggestions and advice in each group ensuring that each group is moving towards the set objectives. As the discussion is still going on, the teacher similarly through the time keeper of each group alerts them on the time limit for the discussion and when to compile the summary report for presentation

Culminating Activities: The teacher asks each group to compile, organize, write and present a report to the entire class based on the different areas assigned to them. The chairman or the secretary of each group presents the report to the whole class. Thereafter the teacher guides students back to their various seats.

Evaluative Activities: This is a time when the teacher calls a meeting of the entire class for the deliberation on the various reports. Each group presents the summary of their discussion through the group's chairman or secretary. The various reports are considered collectively by the entire class and a final report drawn up by the class. The final report serves as a reference point for the members of the class. Finally the teacher encourages students to share all that they have discussed in their various groups by asking them the following questions;

- i. Define the concept digestion

- ii. Describe the process of digestion in birds
- iii. What are the functions of the following parts of the digestive system of a bird, crop, gizzard and small intestine.
- iv. Draw and label the digestive system of a bird.

Assignment: Students are instructed to read more about the process of digestion in birds and practice how to draw the digestive system of bird and also students are asked to read on the next sub topic reproductive system in birds from relevant agricultural science textbooks.

LESSON PLAN ON DIGESTIVE SYSTEM AND REPRODUCTIVE SYSTEMS IN BIRDS USING THE DISCUSSION METHOD

Week two lesson 2

School: Government Secondary School Kafanchan

Date: 16th May, 2019.

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 55

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Digestive and Reproductive Systems in Birds

Sub-topic: Reproductive system in birds

Specific objectives: By the end of the lesson, students should be able to:

- i. Define the concept reproduction
- ii. describe the reproductive system of a bird.
- iii. identify the component parts of the reproductive system of a bird.
- iv. state the functions of the reproductive system of a bird.
- v. draw the reproductive system of a bird.

Introduction: The teacher introduces the lesson by defining the concept reproduction as the process by which living organisms give rise to a new member of its species. It is an attribute of living things and is the basis for the continued existence of a race or species.

Students are given Rules to follow: Students within the groups should;

- i. Understand the need to discuss and share their ideas
- ii. Respect opposing opinion for a peaceful coexistence
- iii. Appreciate the importance of punctuality and constant attendance in school.

Assigning of students into groups: The teacher shares the entire 55 students into 7 groups. Each group consists of 8 students. Each group is assigned a leader, secretary and time keeper.

Assignment of Task: The teacher gives the students in each group the objectives of the day's lesson and then gives them time to discuss and share ideas on the same topic that was introduced. The students will be mainly engaged in discussions and jotting down of salient points towards the objectives of the lesson. At the end of the discussion, the points are reconciled for the final presentation to the whole class.

Teacher's Role: The teacher who is the chief organizer of the class discussion acts as a supervisor. He moves from one group to another listening to the trend of discussion. The teacher gives suggestions and advice in each group ensuring that each group is moving towards the set objectives. As the discussion is still going on, the teacher similarly through the time keeper of each group alerts them on the time limit for the discussion and when to compile the summary report for presentation

Culminating Activities: The teacher asks each group to compile, organize, write and present a report to the entire class based on the different areas assigned to them. The chairman or the secretary of each group presents the report to the whole class. Thereafter the teacher guides students back to their various seats.

Evaluative Activities: This is a time when the teacher calls a meeting of the entire class for the deliberation on the various reports. Each group presents the summary of their discussion through the group's chairman or secretary. The various reports are considered collectively by the entire class and a final report drawn up by the class. The final report serves as a reference point for the members of the class. Finally the teacher encourages students to share all that they have discussed in their various groups by asking them the following questions;

Evaluation: Students are evaluated with the following questions: -

- i. Define the concept reproduction
- ii. Describe the process of reproduction in birds
- iii. Draw and identify the component parts of a reproductive system of a bird
- iv. State the functions of the component parts of the reproductive system in birds
- v. Draw and label the reproductive system of a bird

Assignment: Students are instructed to read more about reproduction in birds and practice how to draw the reproductive system of bird. Students are asked to read on the next topic which is Knapsack sprayer

LESSON PLAN ON SOIL EXPERIMENTS (POROSITY AND SOIL PH) USING DISCUSSION METHOD

Week four lesson 1

School: Government Secondary Kafanchan

Date: 21st May, 2019

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 56

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Soil Experiments

Sub-topic: Porosity and Soil PH

Specific objectives: By the end of the lesson, students should be able to:

- i. define the term soil porosity.
- ii. describe vividly the experiment on soil porosity.
- iii. explain the concept soil PH
- iv. describe the procedure of using PH scale
- v. explain how soil PH can be corrected.

Introduction: The teacher introduces the lesson by defining the term porosity as: Porosity is the process of water draining through a given semi permeable membrane like cotton.

Students are given Rules to follow: Students within the groups should;

- i. Understand the need to discuss and share their ideas
- ii. Respect opposing opinion for a peaceful coexistence
- iii. Appreciate the importance of punctuality and constant attendance in school.

Assigning of students into groups: The teacher shares the entire 56 students into 7 groups. Each group consists of 8 students. Each group is assigned a leader, secretary and time keeper.

Assignment of Task: The teacher gives the students in each group the objectives of the day's lesson and then gives them time to discuss and share ideas on the same topic that was introduced. The students will be mainly engaged in discussions and jotting down of salient points towards the objectives of the lesson. At the end of the discussion, the points are reconciled for the final presentation to the whole class.

Teacher's Role: The teacher who is the chief organizer of the class discussion acts as a supervisor. He moves from one group to another listening to the trend of discussion. The teacher gives suggestions and advice in each group ensuring that each group is moving towards the set objectives. As the discussion is still going on, the teacher similarly through the time keeper of each group alerts them on the time limit for the discussion and when to compile the summary report for presentation

Culminating Activities: The teacher asks each group to compile, organize, write and present a report to the entire class based on the different areas assigned to them. The chairman or the secretary of each group presents the report to the whole class. Thereafter the teacher guides students back to their various seats.

Evaluative Activities: This is a time when the teacher calls a meeting of the entire class for the deliberation on the various reports. Each group presents the summary of their discussion through the group's chairman or secretary. The various reports are considered collectively by the entire class and a final report drawn up by the class. The final report serves as a reference point for the members of the class. Finally the teacher encourages students to share all that they have discussed in their various groups by asking them the following questions

- i. Define soil porosity
- ii. Which of the soil types has the highest porosity rate?
- iii. Define soil PH
- iv. What tools are used to determine the Ph of the soil?
- v. How can soil PH be corrected

Assignment: Students are instructed to read about capillarity rates among soil samples.

LESSON PLAN ON SOIL EXPERIMENT (CAPILLARITY) USING DISCUSSION METHOD

Week four lesson 2

School: Government Secondary School Kafanchan

Date: 23rd May, 2019

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 56

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Soil Experiments

Sub-topic: Soil capillarity

Specific objectives: By the end of the lesson, students should be able to:

1. define the concept capillarity
2. describe vividly the experiment on capillarity.
3. determine which of the soil types has the highest capillarity rate.
4. list the roles of capillarity rate of soil on crop production.

Introduction: The teacher introduces the lesson by defining the concept capillarity to the students as follows: Capillarity is the process that involves the rate at which water rises in the soil..

Students are given Rules to follow: Students within the groups should;

- i. Understand the need to discuss and share their ideas
- ii. Respect opposing opinion for a peaceful coexistence
- iii. Appreciate the importance of punctuality and constant attendance in school.

Assigning of students into groups: The teacher shares the entire 56 students into 7 groups. Each group consists of 8 students. Each group is assigned a leader, secretary and time keeper.

Assignment of Task: The teacher gives the students in each group the objectives of the day's lesson and then gives them time to discuss and share ideas on the same topic that was introduced. The students will be mainly engaged in discussions and jotting down of salient points towards the objectives of the lesson. At the end of the discussion, the points are reconciled for the final presentation to the whole class.

Teacher's Role: The teacher who is the chief organizer of the class discussion acts as a supervisor. He moves from one group to another listening to the trend of discussion. The teacher gives suggestions and advice in each group ensuring that each group is moving towards the set objectives. As the discussion is still going on, the teacher similarly through the time keeper of each group alerts them on the time limit for the discussion and when to compile the summary report for presentation

Culminating Activities: The teacher asks each group to compile, organize, write and present a report to the entire class based on the different areas assigned to them. The chairman or the secretary of each group presents the report to the whole class. Thereafter the teacher guides students back to their various seats.

Evaluative Activities: This is a time when the teacher calls a meeting of the entire class for the deliberation on the various reports. Each group presents the summary of their discussion through the group's chairman or secretary. The various reports are considered collectively by the entire class and a final report drawn up by the class. The final report serves as a reference point for the members of the class. Finally the teacher encourages students to share all that they have discussed in their various groups by asking them the following questions;

- i. Define the concept capillarity?
- ii. Which of the soil types has the highest capillarity rate?
- iii. In the conduct of capillarity experiment, which materials are needed?
- iv. Mention four roles of capillarity in agricultural production

Assignment: Students are instructed to conduct the experiment on capillarity on their own when they go home. They are also told to read on Genetics which is the next topic.

Week Five lesson 1

School: Government Secondary School Kafanchan

Date: 28th May, 2019

Class: SS II

Time/period: 8:45-9:30 am/ 2nd period

Number of students: 56

Sex: Mixed (male/female)

Average age of students: 15-17 years

Subject: Agricultural Science

Topic: Genetics

Specific objective(s): By the end of the lesson, students should be able to:

1. Define genetics.
2. List and explain the various terms used in genetics.
3. State Mendel's law of inheritance
4. Describe vividly Mendelian laws of inheritance
4. Handle crossing on monohybrid inheritance .

Introduction: The teacher introduces the lesson by defining the concept Genetics; as science of heredity and environment.

Students are given Rules to follow: Students within the groups should;

- i. Understand the need to discuss and share their ideas
- ii. Respect opposing opinion for a peaceful coexistence
- iii. Appreciate the importance of punctuality and constant attendance in school.

Assignment of students into groups: The teacher shares the entire 56 students into 7 groups. Each group consists of 8 students. Each group is assigned a leader, secretary and time keeper.

Assignment of Task: The teacher gives the students in each group the objectives of the day's lesson and then gives them time to discuss and share ideas on the same topic that was introduced. The students will be mainly engaged in discussions and jotting down of salient points towards the objectives of the lesson. At the end of the discussion, the points are reconciled for the final presentation to the whole class.

Teacher's Role: The teacher who is the chief organizer of the class discussion acts as a supervisor. He moves from one group to another listening to the trend of discussion. The teacher gives suggestions and advice in each group ensuring that each group is moving towards the set objectives. As the discussion is still going on, the teacher similarly through the time keeper of each group alerts them on the time limit for the discussion and when to compile the summary report for presentation

Culminating Activities: The teacher asks each group to compile, organize, write and present a report to the entire class based on the different areas assigned to them. The chairman or the secretary of each group presents the report to the whole class. Thereafter the teacher guides students back to their various seats.

Evaluative Activities: This is a time when the teacher calls a meeting of the entire class for the deliberation on the various reports. Each group presents the summary of their discussion through the group's chairman or secretary. The various reports are considered collectively by the entire class and a final report drawn up by the class. The final report serves as a reference point for the members of the class. Finally the teacher encourages students to share all that they have discussed in their various groups by asking them the following questions;

- a. Demonstrate a cross between red pea plants and white pea plant giving that red is dominant over white.
- b. What will be ratio of red to white in the F₂ generation?

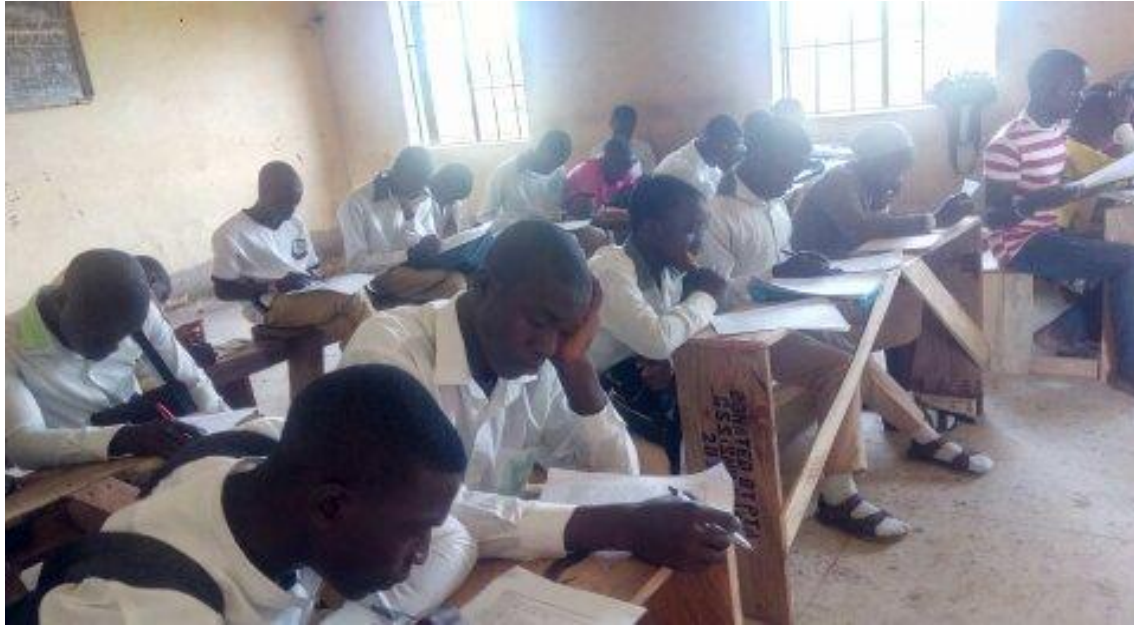
Assignment: Students are instructed to read and get more information on dihybrid inheritance.

APPENDIX IV

PICTURES OF EXPERIMENTAL ACTIVITIES

GOVERNMENT SECONDARY SCHOOL KUKUM DAJI

(EXPERIMENTAL GROUP 1 DEMONSTRATION METHOD)



STUDENTS DURING PRE-TEST



RESEARCHER DEMONSTRATING ON THE CHALKBOARD

GOVERNMENT SECONDARY SCHOOL KUKUM DAJI KAGORO



STUDENTS DURING POST-TEST

GOVERNMENT SECONDARY SCHOOL KAFANCHAN

(EXPERIMENTAL GROUP 2 DISCUSSION METHOD)



STUDENTS DURING PRE-TEST



STUDENTS IN A DISCUSSION CLASS



RESEARCHER SUPERVISING STUDENTS DURING A DISCUSSION CLASS



STUDENTS SUMMARIZING POINTS AFTER DISCUSSION

GOVERNMENT SECONDARY SCHOOL KAGORO

(CONTROL GROUP CONVENTIONAL LECTURE METHOD)



STUDENTS DURING PRE-TEST



STUDENTS DURING POST-TEST

APPENDIX V

AGRICULTURAL SCIENCE PERFORMANCE TEST (ASPT) FOR PRE-TEST AND POST-TEST

PERSONAL DATA

You are requested to give the appropriate response. All information will be held confidential.

1. Name of school:
2. Education Zone:
3. Class:
4. Class Arm:
5. Sex: Male () Female ()
6. Age: Below 20 years () 20 – 25 years () Above 25 years ()

INSTRUCTIONS: This paper consists of sections A-E, each section comprises of five (5) multiple choice questions with four options A-D, tick (√) the correct option. Each question carries two and half (2.5) marks, making a total of hundred (100) marks.

Attempt all questions.

Time allowed: 40 minutes

SECTION A

1. Vegetative propagation means.....

- a. Raising any portion of the plant's parts.
 - b. Planting the seeds
 - c. Transferring the plant from one growth region to another.
 - d. Raising any portion of the plant parts other than the seeds.
2. The alternative name of asexual propagation is
- a. Mar-cutting
 - b. Unisexual
 - c. Vegetative
 - d. Scion implantation
3. Which of these crops can be propagated vegetatively?
- a. Millet
 - b. Cassava
 - c. Rice
 - d. Groundnuts
4. The outward appearance of an organism is known as;
- a. Genotype
 - b. Phenotype
 - c. Heterozygous
 - d. Chromosome
5. Which of the following is not a method of vegetative propagation in plants.
- a. Grafting
 - b. Layering
 - c. Seeds
 - d. Budding
6. The advantages of vegetative propagation in plants include the following except.
- a. It serves in the perpetuation of a clone.
 - b. The impossibility of propagating some plants' whose seeds are not viable or that do not produce seeds at all is overcome.
 - c. Many ornamental plants can be easily obtained and multiplied cheaply by vegetative propagation.
 - d. It makes the unionism of plant's parts possible.
7. Oranges are propagated by means of:

- a. Seeds only
 - b. Budding only
 - c. Grafting only
 - d. Seeds, budding and grafting
8. In the process of budding, a T-shaped cut is made on the stem of the stock at about a height of _____ from the ground.
- a. 60cm
 - b. 45cm
 - c. 35CM
 - d. 55cm.
9. If after _____ days, the bud is still green, it is said to have ‘taken’ meaning that the budding has been successful.
- a. 8-10 days
 - b. 10-14 days
 - c. 12 – 14 days
 - d. 15-16 days
10. The act of joining plant parts together in such a way that they unite and grow together after sometimes is referred to as
- a. Budding
 - b. Marcotting
 - c. Grafting
 - d. Layering
11. Slant or v-shaped cutting is possible in
- a. Layering
 - b. Budding
 - c. Grafting
 - d. Scion
12. Scion refers to
- a. a stem with more than one bud that is joined to the stock
 - b. the aerial part of the plant
 - c. the xylem portion of the plant
 - d. the budless portion of a flowering plant.

SECTION B

13. The mouth part of a bird is known as

- a. Gizzard
- b. Oesophagus
- c. Beak
- d. Duodenum

14. The swelling or Projection at the neck of the bird which helps in softening the grains for 1-2 days is known as

- a. Cloaca
- b. Crop
- c. Preventriculus
- d. Gizzard

15. Where does fertilization take place in the reproductive tract of the bird?

- a. Uterus
- b. Magnum
- c. Infundubulum or oviduct
- d. Isthmus

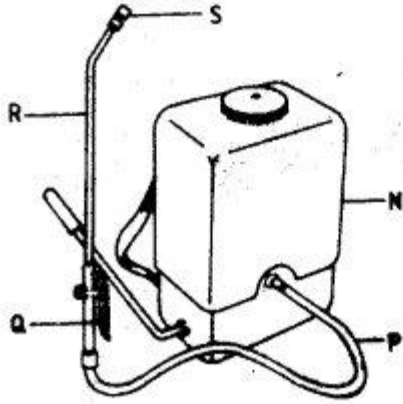
16. Which organ in the reproductive tract of the bird deposits the shell on the egg?

- a. Isthmus
- b. Magnum
- c. Uterus
- d. Cloaca/Oviduct

17. Where does the egg takes its shape?

- a. At the cloaca
- b. At the isthmus
- c. At the infundubulum
- d. At the ovary

SECTION C



Use the above diagram to answer question 18–20

18. What is the name of the above equipment?

- a. Sprayer
- b. Container
- c. Garden sprayer
- d. Knapsack sprayer

19. The above equipment is operated by

- a. Hand
- b. Powered engine
- c. Automobile engine
- d. Backing process.

20. The following are some of the step by step details on how the equipment is used except.

- a. Pour a measured quantity of water into the tank.
- b. Add correct amount of chemical to water in tank and mix well.
- c. Cover the tank properly with the lid and pump to raise pressure within tank
- d. Mount sprayer on the neck before use.

SECTION D

21. N.P.K. fertilizer contains how many plant nutrients

- a. 2
- b. 4
- c. 8
- d. 4

22. Which of the following is a macro nutrient?

- a. Nitrogen
- b. Iron
- c. Zinc
- d. Molybdenum

23. Which of the following is not organic manure?

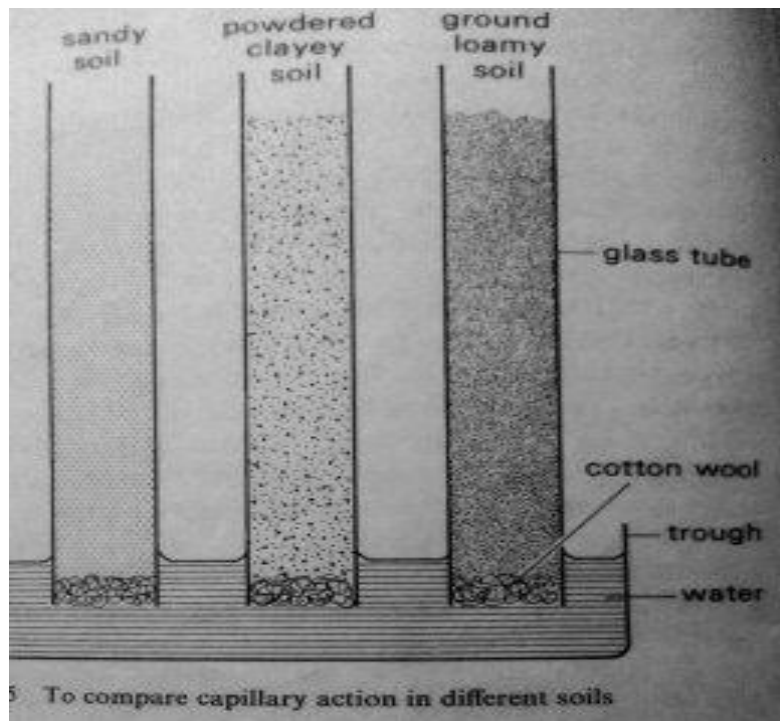
- a. Urea
- b. Farmyard
- c. Compost
- d. Green manure

24. In an experiment on soil porosity the following measurements were taken and recorded

Volume of dry soil	_____	50cm ³
Volume of water	_____	50cm ³
Total volume of soil and water	_____	74cm ³

What is the volume of air space in the soil sample?

- a. 20cm³
- b. 14cm³
- c. 36cm³
- d. 24cm³



Use the diagram above to answer questions 25-32

25. Which of the glass has the highest rise of water and why?

- a. Clay soil because it has coarse particles
- b. Sandy soil because it has fine particles
- c. Clay soil because it has finer particles

d. Loamy soil because it has organic matter

26. What is the work of the water basin in the experiment?

- a. It acts as a semi impermeable material.
- b. It helps to store water
- c. It acts as a permeable membrane.
- d. It will aid water rise through the soil in the tube.

27. What happens to the water level in the water trough after one hour?

- a. It will decrease in level.
- b. It will remain constant
- c. It will be reabsorbed by the cotton wool
- d. It will overflow.

28. The cotton used in the experiment above is acting as

- a. a porous medium
- b. a permeable membrane
- c. a semi-permeable membrane
- d. a blockage to trap dirt

29. To get better reading of the rise in water level in the test tubes, the set up must be kept on.

- a. a high table
- b. a table with flat surface
- c. a table with partially rough surface
- d. a table that must have to be allowed to lean on the laboratory wall.

30. A soil with PH of 6.9 is classified as

- a. Neutral
- b. Acidic
- c. Alkaline
- d. Lime

31. The soil PH is determined by the following except

- a. Use of litmus paper
- b. Use of PH meter
- c. Use of BDH (Universal Indicator)
- d. Use of photometer

32. Which of the following compound is a lime material used in the control of soil acidity?

- a. Nacl
- b. MgCo3
- c. Caco3
- d. H2504

SECTION E

33. A particulate unit of heredity of inheritance is known as

- a. Chromosome
- b. Gene
- c. Alleles
- d. Zygote

34. A condition in which a gene or its associated characteristics manifest itself in a heterozygous state is referred to as

- a. Dominance
- b. Recessive
- c. Allelomorphs
- d. Homozygous

35. The outward appearance of an organism is known as

- a. Genotype
- b. Phenotype
- c. Heterozygous
- d. Chromosome

Below is the crossing between tall pea plants versus short pea plants

Parent Tall TT X Short tt

Gamete	T	X	T
Fertilization	Tt	Zygote	

F1 generation			
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Use the above crossing to answer questions 35-36

36. Which of the parents has dominant gene?

- a. Tall pea plants
- b. Short pea plants
- c. both tall and short pea plants
- d. Gamete

37. When the F1 generation is selfed, what will be the ratio of the F2 generation?

- a. 2:1
- b. 3:1
- c. 2:2
- d. 3:2

38. The Father of Genetics is known as;

- a. Lord Luther
- b. Sir Clifford
- c. Gay Lussac
- d. Gregor Mendel

39. What will be the parental genotype of the Red and white flower colour pea plants?

- a. RR rr
- b. Rr Rr
- c. rr RR
- d. RR RR

40. The science of heredity and environment is referred to as

- a. Deploid
- b. Hereditary traits
- c. Physiology
- d. Genetics

APPENDIX V1

Split Half Reliability Index on Spearman Brown Formula

Reliability

[DataSet0]

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	42	100.0
	Excluded ^a	0	.0
	Total	42	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Part 1 Value	1.000
	N of Items	1 ^a
	Part 2 Value	1.000
	N of Items	1 ^b
Total N of Items		2
Correlation Between Forms		.596
Spearman-Brown Coefficient Equal Length		.785
Unequal Length		.785
Guttman Split-Half Coefficient		.783

a. The items are: HalfA

b. The items are: HalfB

DESCRIPTIVES VARIABLES=Demonstr Discussin Conventin

/STATISTICS=MEAN STDDEV MIN MAX.

APPENDIX V11

Descriptives statistics of means score

Descriptives

[DataSet0]

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Demonstr	35	50.00	85.00	71.9286	8.80525
Discussin	55	20.00	72.50	58.3962	6.94495
Conventin	43	30.00	62.50	44.3721	8.41703
Valid N (listwise)	35				

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
DemDigest	34	5.00	12.50	9.7059	1.71499
ConvDigest	40	5.00	12.00	7.3625	2.23316
DiscDigest	52	5.00	12.50	9.0865	1.64413
Valid N (listwise)	34				

1. Prettest and Posttest Result of Demonstration Method

T-TEST PAIRS=PretestDem WITH PosttestDem (PAIRED)

/CRITERIA=CI(.9500)

/MISSING=ANALYSIS.

T-Test

[DataSet0]

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PretestDem	17.8571	35	7.04875	1.19146
	PosttestDem	71.9286	35	7.86106	1.32876

Paired Samples Test

	Paired Differences					t	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 PretestDem PostDem	54.50000	7.32140	1.23754	57.01499	51.98501	44.039	34	.000

2. Pretest and Posttest Result of Discussion Method

T-TEST PAIRS=PosttestDisc WITH PretestDisc (PAIRED)

/CRITERIA=CI(.9500)

/MISSING=ANALYSIS.

T-Test

[DataSet0]

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PosttestDisc	58.3962	55	7.04270	.96739
	PretestDisc	16.8868	55	6.02291	.82731

Paired Samples Test

	Paired Differences					t	Df	Sig. (2- tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 PosttestDisc PretestDisc	41.50943	9.97087	1.36960	38.76112	44.25775	30.308	52	.000

3. Posttest Result of Demonstration and Discussion Method

T-TEST GROUPS=Discussin(80)

/MISSING=ANALYSIS

/VARIABLES=Demonstrn

/CRITERIA=CI(.95).

T-Test

Report

	Demonstrn	Discussin
Mean	71.9286	68.7963
N	35	55

Std. Deviation	7.86106	7.42730
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[DataSet0]

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	.000	.999	1.736	33	.513	3.1319	7.74950	-2.31059	29.22236
Demonstrn Equal variances not assumed									

4. Posttest Result Independent T-test Difference Vegetative Propagation between Demonstrated and Discussion

T-TEST GROUPS=VegDisc(15)

/MISSING=ANALYSIS

/VARIABLES=VegDemo

/CRITERIA=CI(.95).

T-Test

[DataSet0]

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
VegDemon	4.664	.038		98	.323		2.49618	6.73004	3.42701
								2.725	32.000

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
VegDemon	35	15.00	30.00	21.5571	3.39933
VegDisc	55	12.50	25.00	18.3545	3.23847
Valid (listwise)	N 35				

5. Anova Results of Posttest Digestive and reproductive: Demomtration, Discussion and Conventional Method

ONEWAY DiscDigest ConvDigest BY DemDigest

/MISSING ANALYSIS.

ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	29.721	2	9.907	2.165	.039
Within Groups	164.773	130	4.577		
Total	194.494	132			

