UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE

ASSESSMENT OF TEACHING AND LEARNING OF AGRICULTURAL SCIENCE PRACTICAL LESSONS IN SENIOR HIGH SCHOOLS IN THE SAGNARIGU DISTRICT, GHANA

MBA-ONNI SIMON SAMON

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BY

MBA-ONNI SIMON SAMON (BSc. AGRIC. TECHNOLOGY)

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DISSERTATION SUBMITTED TO DEPARTMENT OF AGRICULTURE EDUCATION, FACULTY OF EDUCATION IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PHILOSOPHY DEGREE IN AGRICULTURE EDUCATION

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DECLARATION

I MBA-ONNI SIMON SAMON, hereby declare that this dissertation is the result of my own work and that no part of it has ever been submitted to this university or any other university/institution of Higher Learning for another degree elsewhere.

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Signature:…….. Date:.....

Supervisor's Declaration

I hereby declare that the preparation and presentation of the dissertation was supervised in accordance with the guidelines on supervision of dissertation laid down University for Development Studies.

Supervisor's Name: MR. HUDU ZAKARIA

Signature:..... Date:.....

DEDICATION

This work is dedicated to my late parents Samon Doabil and Samon Konaabpoar, my wife Taranbon Theresa and my children namely: Victor Samon Mba-onni, Gloria Samon Mba-onni, and Rhoda Samon Mba-onni**.** Last but not the least, I also dedicate this work to my research assistant, late Kojo Anan may God grant you and my late parents peaceful rest.

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ABSTRACT

The main research objective was to assess the teaching and learning of practical agriculture in Senior High Schools (SHSs) in Sagnarigu District and how it impacts on students' perceptions about their practical competency. The specific research objectives were to: analyse Senior High Schools Agricultural Science students' hands–on experience perceptions in practical agriculture in the Sagnarigu District. Analyse the teaching and learning methods and techniques mostly employed in the teaching and learning of SHSs agricultural science practical lessons among SHSs in the Sagnarigu District. Analyze the constraints and challenges facing teaching and learning of practical agriculture among SHSs in the Sagnarigu District. Investigate the level of support schools, Society, politicians, civil society (NGOs), MOFA in the Sagnarigu District offer in facilitating the teaching and learning of SHSs practical agriculture. A cross sectional survey design was used to guide in data collection. Tamale Senior High School, Kalpohini Senior High School, Islamic Senior High School and Business College International, Tamale in the Sagnarigu District were purposively selected for data collection. Questionnaire, observation checklists, and interview guide and Focus group discussion were used to gather the data. Descriptive and inferential statistics were used to summarise and interpret quantitative data. The statistical package for social science (SPSS) and Kendall's co-efficient were used to analyze the data. The results showed that, agricultural science students rarely had hands–on experience. The results also indicated that, inadequate instructional aide were the major constraints that affect teaching and learning of SHSs agricultural science practical lessons.The study recommended that, Teachers should emphasize hands-on experience. Educational authorities including Ghana education service and school authorities must provide the needed instructional aide.

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LIST OF ACRONYMS AND ABBREVIATIONS

SHSs	-	SENIOR HIGH SCHOOLS
MOE	-	MINISTRY OF EDUCATION
DOA	-	DEPARTMENT OF AGRICULTURE

CHAPTER ONE

INTRODUCTION

This chapter presents general introduction and background of the study, problem statement, research objectives (main research objective and specific research objectives), research questions as well as the significance and scope of the study.

1.1 Background of the study

The contribution of agriculture in Ghana is well recognized in terms of food production, income generation and job creation (Ministry of Education [MOE], 2010 & Ministry of Food and Agriculture [MOFA], 2011). The Agricultural sector in Ghana remains the major employer of the workforce in the country (MOFA, 2010). According to the Institute of Statistical Social and Economic Research [ISSER], (2012) the sector still remains the main source of employment to majority of Ghanaians, employing directly about 50.6% of the Ghanaian workforce while supporting about 80% of the populates through indirect employment such as agro processing, input distribution and output marketing .

Unfortunately, the agricultural sector in Ghana is bedeviled with low productivity, low uptake of agricultural technology and lack of agricultural modernization. It has been established that the underlying causes of low productivity and lack of agricultural modernization are poor public investment in the agricultural sector (ISSER, 2012) and aging and illiterate farming population (MOFA, 2011). It is also widely acclaimed that with the right investment and active involvement of the youth and literate population in agricultural production it will provide more avenues for employment creation and industrialization.

As a result, the Government of Ghana has, over the years, formulated policies and programmes as an intervention strategy. One of such intervention strategies is Senior High School Agriculture education programme. The aims of agriculture education at secondary school levels are to equip agricultural science students with the necessary skills so that they can undertake agricultural activities more meaningfully, profitably, environmental friendly manners among others (Suleiman & Barry, 1997). Under the agriculture educational policies in Senior High Schools in Ghana, students are expected to be given adequate practical training in the following skills: Equipment handing skills, observation skills, manipulation skills, measuring skills, recording skills, reporting skills, creativity skills, and communication skills (MOE, 2010). This will enable school leavers in agriculture science programme to become self-reliant in that they can solve certain basic problems in agriculture by themselves. Providing practical lessons to agricultural students and creating the enabling environment for them to practice, is imperative in ensuring practical skills acquisition which is critical in producing agricultural graduates capable of undertaking farming as a career (Darko, Offei-Ansah, Shouqi & Jun-ping, 2015).

According to Awuku, Baiden, Brese, and Ofosu (1991) vocational agriculture education is taught in SHSs to educate agricultural science students so that they can provide technical assistance in the form of advice to farmers in their communities. Senior High School agriculture education does not only enable school leavers in agriculture education programme to play supplementary roles in extension services to farmers in their communities but also exposes agricultural science students to diverse job prospects in the agriculture sector (Mwira, 2002 &Kenya Institute of Education, 2006). In addition, graduates of vocational agriculture institutions and Senior High School students who

pursued agriculture can further their education in agriculture and its related disciplines in tertiary institutions (Vandenbosch, 2006; Dlamini & Miller, 1997). Broadly speaking, agricultural science programmes in second cycle institutions is expected to boost agricultural production by equipping the youth with the requisite practical knowledge and skills to go into farming and other agricultural related activities.

To achieve these aims, Ministry of Education (2010) recommended that both theory and practical lesson should be given equal time allocation (i.e. 50% each). Earlier Nnedi (2004) suggested that, more time should be allocated to practical lessons to enable teachers to be able to explain agricultural science concepts and principles adequately to students in that, practical lessons require much time than theoretical tuition. The ministry also recommended that Schools offering General Agriculture must keep a school farm (Ministry of Education, 2010). Where this is not possible, a well-planned garden with small plots should be maintained for regular observation by the students. The same document recommended that, at least one species of farm animals from each of the following three groups must be kept on a small scale basis: Pigs and Poultry, Goat, Sheep and Cattle, Rabbits, Grasscutters, Guinea Pigs and Fish. The Ministry also recommended that students be given the opportunity to visit well established government and private experimental and commercial farms, agricultural research institutes and other institutions related to agriculture.

Besides that, agriculture science Teachers are supposed to invite staff of MOFA and other related institutions to serve as resource persons where necessary. Per the recommendation by the ministry, students are supposed to carry out their practical work in the following: Laboratory experiments, Farm work, observation carried out on the farm or garden, field trips, collection of specimens and record keeping and each student is supposed to keep three

(3) practical note books, one each for: Farm diary, Specimen album, Laboratory experiments and project reports (MOE, 2010).

Apart from Senior High School agriculture education which provide the youth with the requisite practical knowledge and skills in agriculture, the government of Ghana have formulated other policies and programmes including the Youth in Agricultural Programme, Agricultural Mechanization Programme, the Block Farming among others (MOFA, 2007 & 2012), the reviewed of the implementation of Food and Agriculture Sector Development Policy (FASDEP I & II) however observed that, the issue of aging farmer population in the agricultural sector in Ghana still persist, yet the sector is unable to attract the youth needed to replace the aged farmers. The review also identified high illiteracy among farmers which hindered the need for facilitating their access to information on modern technologies and best farming practices. As such the success of Ghana drive to modernize agriculture and encourage commercial farming and large scale production of agricultural commodities cannot be realized if the quality of human resource of the youth, especially graduates who pursued agriculture, is not harnessed.

The problem of lack of interest among Ghanaian's youth in agriculture, especially graduates from agricultural schools and colleges can be traced to the approaches and methodologies used in the teaching and learning of agriculture and students' perception towards farming as a career. The underlying causes of the youth deserting agriculture sector and searching for none existing white color jobs can be traced to their inherent lack of competency in practical agriculture and the misconceptions and negative attitudes they might hold towards farming and other related agricultural activities.

1.2 Statement of the Problem

Teaching and learning of agricultural science programmes in Senior High Schools (SHSs) was introduced to address some of these issues. According to Awuku *et al.,* (1991) vocational agriculture education is taught in SHSs to educate agricultural science students so that they can provide technical assistance in the form of advice to farmers in their communities. Senior High School agriculture education does not only enable school leavers in agriculture education programme to play supplementary roles in extension services to farmers in their communities but also exposes agriculture science students to diverse job prospects in the agriculture sector (Mwira, 2002; Kenya Institute of Education, 2006 & Akinsanmi, 1988).

In addition, graduates of vocational agriculture institutions and Senior High School students who pursued agriculture can pursue further education in agriculture and its related disciplines in tertiary institutions (Vandenbosch *et al.,* 2006; Dlamini & Miller 1997). Broadly, agricultural scienceprogrammes in second cycle institutions is expected to boost agricultural production by equipping the youth with the requisite practical knowledge and skills to take farming and other agricultural related activities.

Unfortunately, agriculture education is struggling image development and enhancement issues (Shelley-Tolbert, Conroy and Dailey, 2000). In other words, current state of teaching and learning of agricultural science practical lessons in our Senior High Schools in Ghana and elsewhere in the African Continent is not the best (Darko *et al.,* 2015; Modebelu & Nwakpadolu, 2013; Dlamini & Keregero 2002). Simply put, all is not well when it comes to the implementation of SHSs agricultural science education programme in Ghana and elsewhere in the African Continent due to a number of issues. For instance, acording to the

findings of Modebelu and Nwakpadolu (2013) lack of in-service training for agricultural science teachers in the Umidike Abia State in Nigeria is affecting teaching and learning of agricultural science education programme in Senior High Schools of that country.

Earlier Dlamini and Keregero (2002) reported that, high student population, insufficient funds, lack of capacity building of agricultural science teachers, insufficient time for practical lessons, lack of field trips, limited exposure of agricultural science students to practical lessons are some of the major constraints confronting agricultural science education in Swaziland. Darko *et al*., (2015) also identified inadequate instructional aids as one of the factors that affect the teaching and learning of the aagricultural science education programmes in public Senior High Schools in the Cape Coast Mmetropolis of Ghana.

This undoubtedly force, teachers to resort to theoretical teaching of the subject as well as compile students to learn agricultural science concepts and principles the rote way. In fact many studies have shown that, many students tend to learn agricultural science programmes in our Schools the rote way and therefore lack understanding of basic scientific concepts and principles (Anamuah-Mensah & Benneh, 2010; Jones, 2008; O'Connor, 2002). Indeed, existing literature have shown that, the quality of science teaching and learning from basic, through senior high schools even up to tertiary institutions including universities and polytechnics in Ghana leaves much to be desired (Anamuah-Mensah, Mereku, & Ampiah, 2010; Ndago, 2012). According to Entsuah-Mensah, (2004), Anamuah-Mensah and Asabere-Ameyaw, (2011), Bello and Oke, (2011), the poor performance of Ghanaian SHSs science students including agricultural science students in West African Senior School Certificate Examination (WASSCE) that disqualify them from gaining admission into

tertiary institutions for further studies can be traced back to poor quality of teaching and learning interactions that take place at Senior High School level.

It is also on record that, Ghanaian students who are graduates of science and technology related programmes are found wanting when it comes to the practical application of scientific knowledge to solve basic societal problems (Anamuah-Mensah & Asabere Ameyaw, 2011). Of course Agriculture as a science related programme is not an exception.It is against this backdrop that, this study sought to assess the teaching and learning of practical agriculture in Senior High Schools in the Sagnarigu District. It also shed light on the practical realities teachers and students go through in the teaching and learning of practical agriculture.

1.3. Research Objectives

The study was guided by one main research objective and three specific research objectives.

1.3.1 Main research objectives

The main research objective was to assess the teaching and learning of practical agriculture in Senior High Schools in the Sagnarigu District and how it impact on students' perceptions about their practical competency.

1.3.2 Specific objectives

Specifically, the study sought to;

1. Analyse SHSs agricultural science students' hands – on experience in practical agriculture in the Sagnarigu District.

2. Examine agricultural science students' perceptions about their agricultural practical competency among agricultural science students in the Sagnarigu District.
3. Assess the teaching and learning methods and techniques mostly employed in the teaching and learning of SHSs agricultural science practical lessons among SHSs in the Sagnarigu District.
4. Analyse the constraints and challenges facing teaching and learning of practical agriculture among SHSs in the Sagnarigu District.
5. Investigate the level of support schools, politicians, MOFA, communities and the civil societies in the Sagnarigu District offer in facilitating the teaching and learning of SHSs practical agriculture.

1.4 Research Questions

The following research questions guided the research study:

1. What are SHSs agricultural science students' hands – on experience in practical agriculture in the Sagnarigu District?

2. How do agricultural science students of SHSs in the Sagnarigu District, perceived their practical competency?

3. What teaching methods and techniques mostly employed in the teaching of agricultural science practical?

4. What are the constraints facing teaching and learning of practical agriculture among SHSs in the Sagnarigu District?

5. How do schools, communities and civil societies support teaching and learning of practical agriculture among SHSs in the Sagnarigu District?

1.5 Significance of the Study

The outcome of the study will be useful in the following ways: it is the hope of the researcher that when policy makers and school administrators use the findings the teaching of practical agriculture in Senior High Schools will be improved. This will improve upon students understanding of concepts, principles and theories in agricultural science. More so the findings of this study provides useful information for school administrators in planning to improve practical lessons in agriculture and equipping students with the requisite practical skills, It will inform the school administrators about the aspect of agricultural science programme in the school that require more attention in terms of resource allocation, time, in-service training of teachers and students alike. Besides, the findings of this study presents some useful empirical information in assisting Ghana education service to formulate appropriate policies that will facilitate the teaching and learning of practical agricultural lessons in Senior High Schools in Tamale and elsewhere in the country. It will also encourage policy makers to give priority to agricultural education.

In addition, the findings will stimulate researchers to conduct more research on the teaching and learning of practical skills in agricultural science programme in Senior High Schools in the Sagnarigu District in particular and Ghana as a whole.

It is the hope of the researcher that when policy makers and school administrators adopt and use the findings, teaching and of practical skills in agricultural science will be improved. This will result in better skilled labor in agriculture sector which will translate into the

production of employable Senior High Schools Leavers in agriculture thus solve the problem of mass unemployment problem in Ghana.

Last but not the least, identification of in-service educational/training needs of agricultural science teachers will enable training institutions to provide appropriate education to agricultural science teachers. In other words identification of in-service educational/training needs of agricultural science teachers will enable training institutions to change/modify their curriculum accordingly, to meet changing needs of modern agricultural science teachers.

1.6 Scope of the Study

The main focus of the study was how teaching and learning of practical agriculture in SHSs are handle and how its impacts on agriculture students' skill acquisition and perception towards farming and other agricultural related activities. As such only second cycle institutions in the Sagnarigu District offering agricultural science were subject of this study. Also only issues relating to the teaching and learning of agriculture were considered.

1.7 Limitation of the Study

Even though this study had it strengths methodologically in certain aspects, it also had its own methodological limitations as well. In the first place, because the study used cross-sectional survey design it involved the use of questionnaires which were self administered to agricultural science students and teachers in the Sagnarigu District to respond to items in the questionnaire. Therefore, the likelihood of the research respondents (i.e. agricultural science students and teachers) not completely understanding some of the items in the questionnaire was high. In other words, due to the inability of the research respondents (agricultural

science students and teachers) not to completely comprehend some of the items in the questionnaire usually, such self-report responses have the tendency of being either exaggerated or the researcher is at risk of gathering inaccurate data which may not be representative of what actually pertains in the sampled population. As a result, the researcher together with the research assistant took the students through the questions and stayed around to address any difficulty the students raised in the process of responding to the items in the questionnaires.

Furthermore, the use of closed ended questions with pre-defined answers without allowing room for students to freely express their perceptions about the nature of the teaching and learning of senior high school agricultural science practical lessons may have been a limitation which could have affected their answers. The researcher, however, provided an exhaustive list of responses that were relevant to the study.

Last but not the least, given the fact that the study was undertaken in four schools within the Sagnarigu District, the researcher was limited in his capacity to generalize the results to all SHSs within the northern in particular and the nation as a whole. However, the findings were generalized to schools within the Sagnarigu District chosen for the study.

1.8 Organisation of the report

The study is organized into five (5) chapters. Chapter one (1) gives general introduction and background of the study, problem statement, research objectives (main research objective and specific research objectives), research questions as well as the significance of the study and scope of the study. Chapter two (2) is mainly on reviewed of relevant literature of the study. Literature is reviewed on school factors that affect teaching and learning of practical

skills in agriculture, agricultural science teachers educational/training needs, teaching methodology used in the teaching of agricultural science in senior high schools in the Tamale Metropolis as well as agricultural science teachers characteristics, funding of agricultural science programmes in senior high schools. Chapter three (3) explains in detail the methodology employed in the study. It systematically presents and describes the research design and tools used in the sampling process and in data collection and analysis. It also enumerates the features of the research areas. Chapter four (4) contains the presentation and discussing of results of data analysis. Finally, chapter five (5) presents on summaries, conclusions and recommendations of the research findings.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of relevant literature on the study's concepts, variables and issues. It positioned the current study within the context of available literature.

2.2 Theoretical Frame Work

Students perceived practical competency is measured based on both self-efficacy and self-concept which contain common elements for assessing practical skills. This study was therefore guided by Pajares and Schunk's (2002) framework of self-concept and self-efficacy. The framework distinguishes between the competency's elements of self-concept and self-efficacy.

2.3 Self-efficacy and self-concept

Self-efficacy and Self-concept differ in the extent to which competence contributes to their composition. Self-efficacy on one hand has its root in the social cognitive theory proposed by Bandura (1986). The term Self-efficacy is basically concerned with a person's beliefs in his or her capabilities to learn or perform behaviour at designated levels (Bandura, 1986 & 1997). Self-efficacy is "I can do it" belief that reflects one's accurate self-assessment in his or her ability to effectively adapt and perform necessary task in the face of challenging environments (Bandura, 1997). More so, Bandura (1997) stated a person's belief in his/her ability to achieve a task would lead to competent performance of that task. In brief Self-efficacy is seen as dealing primarily with cognitive perceptions of competence. Self-concept

on the other hand is defined as the set of knowledge and attributes, that a person has about himself or herself; the perception an individual assigns to herself/himself, the characteristics or attributes that a person uses to describe himself or herself (Sanhez & Roda 2006). Self-concept is a strong predictor of student academic achievement (Olatoye, 2008 and Lang 2006). Olatoye (2008) asserted that any student characteristics that can change because of training and exposure to counselling can be very important in enhancing students' academic achievement. Self-Concept is typically seen as being comprised of affective perceptions as well as competency perceptions (e.g., Marsh, 1992). In brief Self-efficacy perceptions is measured by asking "can" questions (e.g., Can I do mathematics? Can I make friends? Can I keep out of trouble?), whereas self-concept competency perceptions ask "being" questions (e.g., Am I good at mathematics? Do I make friends? Do I keep out of trouble?).

2.3 Aims and Objectives of Agriculture Education

The objectives of agricultural education in the senior secondary school level as indicated by the Federal Ministry of Education (FME) (2007) in Nigeria are: to stimulate and sustain students' interest in agriculture, to enable students acquire useful knowledge and practical skills in agriculture, to prepare students for studies in agriculture, and to prepare students for occupations in agriculture. In it attempts to attain these laudable goals, the Federal Republic of Nigeria (FRN) in 2009 outlined the basic objectives of teaching agricultural science at the secondary school level as follows: to stimulate and sustain students interest in agriculture; to inculcate in students farming skills; to enable students acquire basic knowledge and practical skills in agriculture; to prepare students for future studies in agriculture and to produce prospective future farmers. According to Dlamini and Miller (1997) in Swaziland the goal of junior level agricultural education is make students appreciate and have a positive attitude

towards Agriculture while at senior level agricultural education programme is to prepare interested youth to gain entry to the college of agriculture at the University of Swaziland.

According to Ministry of Education (2010) in Ghana the new agriculture curriculum for General Agriculture at the senior high school level is aimed at:

- Helping agricultural science students in the country to appreciate the contribution of agriculture in the socio-economic development of Ghana;
- Helping agricultural science students to acquire the needed decision making skills through field observation, data collection, data analysis and data interpretation;
- Helping agricultural science students to develop skills and attitudes required for productive and profitable agriculture through practice and experiential learning;
- Helping agricultural science students to see agriculture as a business and a viable livelihood option rather than being merely a livelihood source of the people;
- Helping agricultural science students to develop positive attitudes, interests, habits and good husbandry practices;
- Helping agricultural science students to become aware of the rules of agricultural extension service in agriculture value chain issues;
- Helping agricultural science students to recognize the job prospects that exist in the agricultural sector;
- Helping agricultural science students to acquire techniques for efficient management of agribusinesses; and

- Helping agricultural science students to acquire requisite knowledge and skills needed for further academic and professional advancement in agriculture in the tertiary institutions.

Previous study by Awuku *et al.*, (1991) indicated that, one of the key objectives of agricultural education at the senior secondary school level in Ghana is to train agricultural science teachers and students alike to enable them to play a supplementary role of agriculture extension agents in their respective communities. Baffour-Awuah (1996) also indicated that, the introduction of vocational agricultural education at the senior secondary school level in Ghana is aimed at training agricultural science students to become good workers in both on-farm jobs and off-farm jobs as well as to acquire relevant knowledge and skills needed for further academic and professional advancement at the tertiary institutions including agricultural colleges and universities. Dotse (1994) also said introduction of agriculture into the educational institution are essential components of the curriculum and indicates strongly that policy makers have realized that the problem confronting Ghana Agriculture can partially or if not completely, solved through agriculture education.

2.4 Teaching and learning of Practical Lessons-hands-on experience

The term practical lesson appears to be a difficult terminology to define. However, Lunetta, Hofstein, and Clough, (2007) defined practical lesson as a learning experiences in which students interact with materials or with secondary sources of data to observe and understand the natural world (for example: aerial photographs to examine lunar and earth geographic features; spectra to examine the nature of stars and atmospheres; sonar images to examine living systems). According to Science Community Representing Education [SCORE], (2008), practical lesson is defined as any science teaching and learning activity which

involves students, working individually or in small groups, manipulating and/or observing real objects and materials, as opposed to the virtual world. The term practical lesson can also be defined as an activity whereby students use their own hands to manipulate real objects during teaching and learning process or observe their teacher to manipulate a real object for them to see and practice later. During practical lessons, students observe or manipulate real objects or materials for themselves either individually or in small groups or witness demonstrations by their teachers.

2.4.1 Impact of Teaching and Learning of Agriculture Science Practical Lessons

Practical work can sometimes be called Hands-on experience or experiential or practical lessons.

According to existing literature, practical work (practical lesson), is the best way of learning science, it has also been reported that practical lessons make learning more enjoyable (Osborne & Collins, 2001; Jenkins & Nelson, 2005; Toplis, 2012). Literature reviewed so far have shown that practical lesson helps 'to arouse and maintain' positive attitudes in students' towards science (Hodson, 1990; Swain, Monk and Johnson, 1999). Existing literature has shown that practical lessons help to enhance students' conceptual understanding of science, scientific ideas, and allowing them to see and experience scientific phenomena (Wellington, 1998).

Furthermore empirical studies have shown that, practical lesson is used to generate motivation in science (SCORE, 2008). Apart from that, practical lesson helps promote 'hands-on' (physical activities) and 'brains-on' activities (mental activities) in school science inside and outside the laboratory. For example a well planned and effectively

implemented practical lesson has the potential of engaging students both mentally and physically due to their direct involvement of practical activities where they use both their hands and brains to perform a particular task especially during science laboratory experiments and simulation experiences (Lunetta *et al.*, 2007).

There is even some evidence that practical lessons does not only make lesson interesting but also makes learning enjoyable (Cerini, Murray, & Reiss, (2003). From a Social learning theory perspective group work in the laboratory is believed to bring about conceptual focused dialogue between students as well as between the teacher and the students. (Lunetta et*al.*, 2007).

Specifically on teaching and learning of agriculture practical lessons Okorie, (2001), indicates that, practical agricultural education encompasses farming and agro-allied business organizations including others involved services and sales in agriculture. The purpose of agricultural science practical lesson is to educate present and prospective farmers for proficiency in farming Phipps and Clarke (1993), The authors opined that such education provides systematic instruction in agriculture of less than college grade in the public schools for those persons who have entered upon, or who are preparing to enter upon, the work of the farm or the farm home.

Martin and Odubiya (1991) reported that the primary role of practical agriculture teachers has always been to help students to learn knowledge and skills in agriculture. Onuekwusi and Okorie (2008) also observed that, practical skills training of agricultural science students, enables students to acquire entrepreneurial skills. Notwithstanding this and several other importance of practical agriculture, Modebelu and Nwakpadolu (2013) reported that, the practical component of secondary school agriculture science education programme in

Umudike, Abia State Nigeria is being neglected. Recently Darko, Yuan, Okyere, Ansah, and Liu (2016) also reported that practical teaching of Agricultural Science in the Senior High Schools in Ghana is greatly impeded by the non-existence of the following: lack of school garden, animal farm, educational trips, demonstration plots, and well-equipped laboratory, lack of funds was found to be the major challenge to practical work in Agricultural Science in the Senior High School.

2.5 Agricultural Science Teaching Methods

Agriculture is a practically oriented subject and for that its teaching should be aimed at making agricultural science students to adequately understand the practical component of the programme. To achieve this, the curriculum prescribed the following teaching methods for agricultural science teachers to use during teaching and learning process: demonstration teaching method, lecture teaching method, problem teaching method, field trip, project based learning teaching method, discussion teaching method, role playing teaching methods, project teaching method etc.

2.5.1 The Demonstration teaching method

Demonstration teaching method refers to the type of teaching method in which the type is the principal actor while the learners watch with the intention to act later. In this method 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.

A science demonstration teaching method can also be defined as a science experiment or activity carried out by a science teacher (sometimes students) in full view of his/ her science

students who do not participate but only watch what is going on. Mundi (2006) described it as a display or an exhibition usually done by the teacher while the students watch with keen interest.

In this method the agricultural science teacher simply displays or an exhibit what is to be taught while the students watch with keen interest. In other words in this method the teacher shows how something works or he/she shows the procedure involved in the process. It is done by explanations by the teacher while the student watches. It involves the use of materials and provides a visual experience, which is usually increased in value by verbal explanations (Nwachukwu, 2001). It involves showing how something works or the steps involved in the process. The step involves identifying a task, planning the process, analyzing the problem and checking and interpreting of solution. It is done by the teacher, while the student watches. Demonstration can either be done to individual or groups depending on the available facilities on the ground to the teacher. Agricultural science is a practical oriented course and therefore requires practical instructions and application via effective demonstration strategies.

In-depth review of the study by Mundi,(2006) have highlighted the following as the characteristics and significance of demonstration teaching method : It demands certain level of skills and practical; It is a good method for introducing new skills; It is a good method for developing understanding; It is good in showing the appropriate ways of doing things; Though it allows for very low interaction between students and materials in class, activities are retained for a long time in the learner; It helps to enlist the various senses in a human being; It helps to motivate students especially when skilled teachers carry it out; It saves time and energy especially for the teacher; The method helps to enhance the prestige of the

teacher, as students get convinced of the teacher's command of the subject; There is a measure of positive reinforcement in which case students repeat what the teacher has demonstrated; It gives a real-life situation of course of study as students acquire skills in real-life situations using tools and materials; It allows process and produce evaluation ; Students receive feedback immediately through their own products; The method is an attention inducer and a powerful motivator in lesson delivery by the agricultural science teacher; It allows the teacher to use activities that ordinarily will be too dangerous for the students to handle or carryout themselves e.g. chemical spraying and tractor operation; It is useful in giving explicit explanations of lessons especially practical lessons in agriculture and It saves time and also facilitate materials economy when large group of students are to be taught by the teacher.

Taking notes from Mundi (2006) it can be observed that, demonstration teaching method in science is a useful alternative 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 due to student direct engagement of all the senses of learning. It is an ideal method for introducing new skills, developing understanding and showing the appropriate ways of doing things. In fact demonstration teaching method is one of the very effective methods applied by teachers in achieving objective learning in real life situations.

A study by, Waiganjo, Ngesa, Cheplogoi, and Wambugu (2014) entitle: Effects of Co-operative Learning Approach on Secondary School Students Academic Achievement in

Agriculture in Nakuru Sub-county Kenya showed that, the use of demonstration teaching method is good in teaching a practically oriented subject like Agricultural Science. Earlier Olaitan (1984) entitled: Agricultural Education in the Tropics-Methodology for Teaching Agriculture also indicated that demonstration teaching method is ideal in teaching practically oriented subject like Agriculture. In a related study, Auwal (2013) reported that, demonstration teaching method enhances practical skills acquisition among students. He further explained that, demonstration teaching method enhance students understanding as well as promote students retention of concepts, principles in agriculture due to its ability to arrest students attention.

2.5.2 Lecture Teaching Method

In this method the Teacher has a greater control over what is being taught in the classroom because he/she is the sole source of information. According to Tamakloe, Amedahe and Atta (2005) lectures are a straightforward way to impart knowledge to students quickly. Aroh (2006) described it as a teaching method, whereby the teacher communicates ideas to learners by direct verbal discourse. Considering the above descriptions one can describe it as a one-way communication because it allows for little or none audience participation. Anecdotal data suggest that, lecture teaching has negative influence on student academic performance and practical skills acquisition in agricultural science. In other words, lecture teaching method does not foster critical thinking, creative thinking, as well as collaborative problem-solving abilities amongst SHSs agriculture science students.

According to Olasehinde and Olatoye (2014) students inability to record high academic achievement in the sciences is not because they do not have positive attitude towards Science, but rather has to do with the teaching method used by the teacher during

instructional period. Resmick, (2000) also asserted that, the use of lecture teaching method does not promote students understanding of certain concepts, principles and theories in the sciences especially agricultural science practical skills acquisition. In other words the lecture method does not promote learner analytical thinking skills hence learners are not able to apply the knowledge they obtain in the classroom.

Auwal (2013), in his submission in a research topic: Effects of teaching methods on retentions of Agricultural Science knowledge in senior secondary schools of Bauchi Local Government Area, Nigeria said that, the use of lecture method is not good in teaching a practically oriented subject like agricultural science. The author however indicated that, lecture teaching is only helpful in situations where teaching and learning materials are not enough.

Empirical study on the lecture teaching method elsewhere has shown that students' attention and concentration tend to drop off dramatically over a short period of time (Stuart and Rutherford, 1978).This attention "drift" occurs even among highly motivated postgraduate students (Stuart & Rutherford, 1978). In brief, this method is not student- centred hence students are most likely not going to gain mastery of concepts, principles, theories taught in the classroom. Even the bright ones among them tend to forget whatever they have learnt after a few time intervals. Despite several drawbacks of lecture teaching method empirical evidence have revealed that teachers, and for that matter agricultural science teachers, still resort to using this teaching method (Tamakloe *et al.,* 2005).

Commenting on the pedagogy used by teachers during teaching and learning process Tamakloe *et al.*,(2005) reports that, the reason why teachers continue to use lecture teaching method is that it enables them to cover many topics within a period of time. Darko *et al.*,

(2015) also remarked that, the reason why most senior high school agricultural science teachers in the Cape Coast Metropolis used lecture teaching method is to enable them to complete their syllabus on time. This means that the lecture method enables the secondary school teachers of agricultural science to cover a wide scope of the curriculum within a short period of time. Pullan (1993) on the other hand attributed the frequent use of lecture teaching method by teachers to teachers their familiarity with the method.

2.5.3 The Problem Teaching Method

Problem solving method has been defined by many educationists in various ways with regard to its philosophical and psychological backgrounds. The Gestalt theorists according to Alio (1997) defined it as an insightful or initiative process involving the perceptual processes of the solver. To them (the Gestalt theorists) problem solving is a type of discovery learning whose emergence depends on the structure of the task and is independent of the learners' previous knowledge.

In support, Idoko and Ibitoye (1998) described problem solving as a manipulation of the problem statement geared towards achieving the desired solution which is cognitive in nature or domain dependent. This method involves identification and selection of problems arising from individual experiences to the students. These problems are then placed before the learners and they are guided to the solutions. As a teaching procedure, the method involves steps of scientific method and also steps of reflective thinking. The teachers also play an important part in clarifying the problems and providing the necessary materials which will help the students solve the problems.

The success in the use of a problem-solving method depends on sufficient interest and creative minds on the part of the students in activity undertaken which should be within the

researchable reach of the students. Students must be willing to succeed on the problem given or selected. From the above, problem solving is a pathway of getting to a solution of problem which involves identification of the type of problem to be solved, the necessary pre-requisites, the strategies, the heuristics or hints and the elements used in applying the strategies. Problem solving method is highly very useful as it helps students to gain knowledge through active participation and autonomously find out information for themselves, thus promoting their level of intellectual productivity. It also creates the ability to appraise problematic situations constructively and objectively among students (Olaitan, 1984 & Mundi, 2006).

2.5.4 Field Trip

Field trip, according to Limbu (2012), is a visit to a place outside the regular classroom which is designed to achieve certain objectives, which cannot be achieved by using other means. Field trips enrich the school curriculum and when they are properly organized can help students to develop keen interest in a subject. According to Sweeter (1984), successful and safe field trips are determined by explicit planning. Hazards do occur or exist on field trips, but with good planning and purposeful directions, pupils could have a safe and worthwhile experience.

Limbu (2012) enumerated the following as the importance of educational field trip: It enriches the curriculum by exposing students to actual hands-on experiences instead of teachers teaching concepts, principles, theories in abstract, hence makes learning more meaningful and memorable; Give students experiential learning experiences. Involvement in a real world experience makes learning more meaningful and memorable. As a result, the

students will have more concept of the topic as they have learnt through their hand-on experiences; Concrete skills such as note taking.

Students have to develop questions to be asked, write reports or thank you letters after the trip, or evaluate their experiences. By doing such activities, students will develop various skills such as note taking skills, speaking skills, writing skills would be enhanced; Involvement in a real world experience makes learning more meaningful and memorable; Field trips can add variety to the regular instructional programme; they also tend to be special and enjoyable learning experiences; Field trips are rich in educational possibilities because students learn from actual first hand experiences, rather than by simply reading or hearing about something; Field trips help the students appreciate the relevance and importance of what they learn in the classroom etc.

2.5.5 Project Based Learning (PBL)

Detailed review of literature shows Project Based Learning (PBL) as one of the teaching methods that are becoming more popular within the engineering education community (Zabit, 2010; Mundi, 2006 & Olaitan, 1984). From the review, PBL can be described as a teaching method that challenges students to learn how to learn, working cooperatively in groups to seek solutions to real world problems. This approach is extensively used in applied sciences including medicine and engineering and sometimes in the law court. Literature review have shown that, PBL improves upon students retention, fosters students understanding of concepts, principles and their ability to extrapolate scientific knowledge to subsequent learning experiences and new situations (Barron *et al.*, 1998; Blumenfeld *et al*., 1991; Bransford & Schwartz, 1999) .

The use of projects based learning enables students to learn because of their active involvement in the tasks this force them to think hence enhance their learning. The use of real data generated by themselves serve as source of motivation for them because they want to know how the outcome would look like. The implication is that without the projects their understanding of the process of problem-solving using the statistical thinking strategy outlined in the syllabus would have been more theoretical than practical.

Project based learning is also believed to have the components to motivate teachers and students to develop a cooperative work mainly aimed at the students to perceive and understand all the necessary stages required to arrive at logical conclusion (Biajone, 2006). The indication is that, continuous use of this teaching method would enable teachers to select appropriate content and activities to amplify and extend the skills and capabilities of their students.

2.5.6 Project work method

In this teaching method, the student designs and conducts units of activities depending on the student background and experience, to attain the goals the student set for himself or herself while the teacher (s) supervise(s) the project work. This means that, the student has full autonomy over his/her project work. In other words, the students decide on what and how he/she wants his/her project work to be like.

2.5.7 Role Playing teaching method

This teaching method is like a drama whereby each participant is assigned a character to portray. Each participant imitates actions of teachers, parents, community members, elders,

farmers etc with the intention of making people to believe in whatever message they want them to believe in. For this method to enhance learning it is usually recommended that, the teacher brings to class a problem situation which the participants are familiar with but not necessarily related to the classroom situation.

2.6 Teaching Methods Frequently Used

Different scholars have assigned different reasons for using lecture teaching method. For example according to the findings of Darko *et al., (*2015) many Agricultural Science teachers in the Senior High Schools in the Cape Coast Metropolis adopt the lecture method of teaching because this teaching method allows them to cover many topics in the teaching syllabus . Pullan (1993) attributed the use of the lecture method by most teachers to their familiarity with the lecture teaching method because it was the teaching method they were taught during their educational career training programme. The author however emphasized that students can find lectures boring causing them to lose interest.

According to Tamakloe, Amedahe, and Atta (2005), lectures are a straightforward way to impart knowledge to students quickly. Teachers also have a greater control over what is being taught in the classroom because they are the sole source of information Tamakloe *et al.,* (2005). The lecture teaching method have often been criticized due to teacher domineering role in the teaching and learning process with very little participation on the part of the learners (Daluba 2013). The author therefore recommends a more interactive teaching method such as the demonstration method as it (the demonstration method) is found to have a significant effect on students' achievement compared to the conventional lecture method. Aneke (2015) reported that, Agricultural science teachers in Enugu State,

Nigeria. Adopt demonstration, farm field experience, individual teaching method, etc as instructional methods for enhancing skills acquisition in secondary schools.

Earlier, Ogwo and Oranu (2006) stated that, skill acquisition is enhanced when concepts are demonstrated and that, it is better used for subjects which are practical oriented like agriculture. The authors stated that skill acquisition proceeds habit formation which in turn leads to perfection. Okoli (2011) also affirms that involving the students in practical exercise meant for their training and supervising them effectively by the teacher will enhance their creative ability.

Olaitan and Mama (2001) had already agreed that the use of demonstration teaching method aid in mastery of agricultural skills and that this is usually carried out in the farm which the authors described as a laboratory, but, under direct supervision of teachers. If teachers do not take the students to the school farm to demonstrate skills and practice it, they cannot acquire skills that will make them competent to be self-employed or compete with other in the labour market. Esomonu (2012) on the other found that field trip which was a relevant tool for enhancing skill acquisition of agricultural science students helps students to experience various areas performing replica functions.

2.7 Constraints

Available literature have shown that teaching and learning of practical agriculture is hindered due to a number of constraints namely: inadequate instructional aids, poor funding, lack of support, lack motivation, low wages and salaries of teachers, absence of school farm (Awuku *et al.,* 1991, Wootoyitidde, 2010). According to Amuah, (2009) inadequate facilities, low professional and efficiency levels of teachers, poor attitudes of teachers, poor

funding, school administrators and parents towards agricultural education, and political instability are Common problems of teaching agricultural practical in developing country like Nigeria.

In fact the list of problems faced by teachers continue to grow taller and taller notable amongst them include; salaries (Self, 2001), low ability students (Farrington, 1980), student motivation (Farrington,1980 &Self 2001), demands of young and adult farmer programmes (Farrington 1980), community support (Mundt & Connors 1999), student discipline (Self 2001) administration support (Fox & Certo, 1999; Sultana, 2002), facilities and equipment (Farrington ; Heath-Camp *et al.;* Veenman), time management (Heath-Camp *et al.*; Mundt and Connors; Talbert *et al.;* Veenman), lesson planning (Heath-Camp *et al.;* Talbert *et al.),* recruiting students (Mundt & Connors), parental relationships (Fox & Certo; Heath-Camp *et al.;* U.S. Department of Education, 1999, Veenman), stress (U.S. Department of Education, 1999), and preparation (U.S. Department of Education, 2002).

Poor administrative support have also been mentioned by researchers to be one of the major contributory factors responsible for many teachers leaving the profession (Fox & Certo, 1999; Ingersoll, 2001, 2003; Self 2001); Ingersoll (2001) on the other hand identified, large class sizes; inadequate time to prepare; and lack of community support to be accountable for many teachers abandoning their profession. It is also on record that, many teachers leave the profession because of problems they face in their teaching assignment (Fox & Certo, 1999; Self, 2001). Problems linked to teacher attrition include: lack of parental support (Fox & Certo, 1999; Self, 2001); lack of involvement in decision making (Fox and Certo, 1999; Gersten *et al.;* Ingersoll, 2001, 2003); student discipline (Ingersoll, 2001, 2003; Self); poor student motivation (Ingersoll, 2001, 2003; Self 2001).

2.7.1 Inadequate Teaching and Learning Materials

Owino, Yungungu, Ahmed, and Ogolla, (2015) posit that the availability of teaching-learning resources enhances the effectiveness of schools as these are the basic things that can bring about good academic performance in students. According to Shiyam and Inyang-Abia (2011), the level of availability of Agricultural Science facilities in the school has significant influence on students' attitudes towards the subject. Mutai (2006) asserts that learning is strengthened when there are enough reference materials such as text books, exercise books, teaching aids and classrooms. In brief it is undeniable fact that used of instructional aids would facilitate learning of abstract concepts by helping to concretize ideas and stimulate learners' imagination. It also has the potential of increasing active students' participation in the learning process and ultimately saving the teacher's energy, and also reducing the verbal instructions by the teacher. For instance the use of charts during teaching and learning process have been found to be useful during teaching because it appeals to all the sensory organs and also enables learners to see the connection of concepts taught in the classroom (Ibe-Bassey, 2000). The use of pictures including charts during teaching –learning interaction enhances students' academic output than those taught without pictures. A study by Etim (2006) have established that, when pictures are used during delivery of lessons it turns to arrest students attention , enables students to learn better and this consequently leads to longer retention of the information, facts and figures. Anecdotal data suggest that, agricultural science practical lessons are better taught by the teachers and better understood by their students when charts, pictures and filmstrips are used during teaching –learning process.

Isiaka (2007) stated that the use of video for instance enhances students' comprehension and retention of concepts. Video- taped instructions in teaching and learning of agricultural science may enhance students' performance especially where the class is over populated (Isiaka, 2007). Unfortunately, studies have shown that, instructional aids are not in adequate supply in SHSs (Wootoyittide, 2010; Dasmani, 2011). This compel educators to resort to theoretical tuition using conventional teaching method, particularly lecture teaching method which is not so appropriate for practical skills acquisition in a like agricultural science (Resmick, 2000). The issue of lack of instructional aids for teaching and learning of science subjects has been highlighted by Makgato (2007) who report that inadequate instructional aids to be an endemic problem in most South African public schools. Research findings have shown that even basic materials such as textbook, chalkboards, computer, projectors, television, and video are not readily available in many schools (Wootoyittide, 2010).

Similarly Darko *et al.*, (2015 and 2016) reported that, agricultural practical lessons in the Cape Coast Metropolis and Sekondi-Takoradi Metropolis in Ghana is faced with inadequate instructional aids. As a result the subject is taught theoretically in the two metropolises (Darko *et al.*, 2015 & 2016). This obviously makes teaching and learning less flexible. As Seawell (1990) confirmed that without adequate pieces of apparatus and thorough preparation on the part of every teacher, Agricultural Science and Science lesson would become rigid, boring, dull and unrealistic. In fact the uniqueness of the subject in itself requires adequate supply of materials and experiment necessary for effective teaching and learning.

Nacino-Brown, Oke, and Brown (1982) also have it that the mere use of these materials however does not guarantee effective teaching and communication. It is their careful

selection and skilful handling by the teacher that renders them useful in facilitating learning (Bremner, 1990).

2.7.2 Inadequate Funds

The supply of resources for practical lessons in Agricultural Science in the Senior High is greatly hindered by lack of funds (Darko *et al.*, 2016). The Agriculture Science subject involves a lot of practical activities. Therefore, lack of funds to acquire the needed teaching and learning resources for practical work will impede the effective teaching and learning of the subject. The work of Awuku *et al.*, (1991), also showed that lack of textbooks, poor management, and poor funding are among the factors that militate against effective teaching and learning of Agricultural Science.

Similarly, Ssekamwa (2009) posits that lack of funds and inadequate funds to run practical education have reduced the effectiveness of undertaking practical education in subjects like agriculture. Also, according to Itodo (2004), most schools faced a lot of challenges when it comes to practical work in Agricultural Science. Most of these challenges are in connection with lack of funds. Wootoyitidde (2010) and Muchiri and Kiriungi (2015) posit that Agriculture as a practical subject requires facilities like land, equipment and a well-equipped laboratory. These facilities demand a lot of funds which many schools are not able to afford, hence making it difficult for such schools to undertake the needed practical work in Agriculture.

According to Wootoyitidde (2010) the issue of funding goes beyond inadequate funding but also include late release of funds meant for practical lessons in agricultural science. As a result, teachers are not able to purchase consumables such as fertilizers, pesticides,

weedicides on time and this affect their ability to teach practical lessons in agricultural science (Wootoyitidde, 2010). This consequently leads to the theoretical instruction of Agricultural Science in many schools. According to Government of Ghana (2003), most schools in the country do not have adequate funds to provide all the necessary materials for practical work. Some also have no school farm. This situation had reduced teaching of practical subjects like agriculture into a theoretical exercise. Inadequate funding to purchase farm inputs such as fertilizers, pesticides, and tools and equipment to carryout successful practical lessons has the potential of demotivating teachers as well as their students. Clearly, demoralised agricultural science teachers can badly influence their students who they impact knowledge and skills on (Mbajiorg *et al.,* 2014).

Commenting on this same issue UNESCO (1999) observed that lack of financial resources hindered the expansion of facilities in schools which led to specific problems in vocational subjects like Agricultural Science. In some cases the courses apparently are largely limited to theoretical classroom presentation because of lack of farmland. Those that have farmland also mostly experience shortage of simple farm tools, irrigation equipment and consumables such as fertilizers. All these require a lot of funds, without which it is not possible to build sound attitudes to farming since the practical aspect cannot be provided.

Wootoyitidde (2010) posits that Agriculture as a practical subject requires facilities like land, equipment and a well-equipped laboratory. These facilities demand a lot of funds which many schools are not able to afford, hence making it difficult for such schools to undertake the needed practical work in Agriculture. It is essential for students to learn and practice skills in a good quality school farm. However, in most cases this is not possible because the schools do not have good quality farms due to inadequate funds (Erongu, 1995).

Similar observation was made by Dlamini and Keregero (2002) who also reported that, aside high student population, lack of capacity building of agricultural science teachers, insufficient time for practical lessons, and lack of field trips, another equally important issue that is affecting the quality of agricultural science education in Swaziland is insufficient funds. This, the researchers said that, limits agricultural science students exposure to practical lessons in that country.

Lack of funds is the major challenge that inhibits the supply of resources for Agricultural Science Education in the Senior High Schools (Darko *et al*., 2016; Modebelu & Nwakpadolu, 2013). The finding lends credence to a submission of Kalyango (1998) that financial constraints or budget cuts inhibit the effective functioning of various educational institutions. Scholars including Omaren (1998) and Muchiri, and Kiriungi (2015) carried out research separately and said that, lack of funds to acquire educational facilities hinder, the practical teaching of Agricultural Science and stimulation of food production as these activities depend on the timely availability of funds.

2.7.3 Large Numbers of Students-Large Class Size

Apart from insufficient funds, lack of in-service training to upgrade knowledge of teacher, inadequate practical time allocation, unattractive terms and condition of service, limited visit to commercial agricultural farms and or enterprises, limited exposure of students to agricultural industries, is one of the constraining factors that inhibit effective teaching of agriculture in Swaziland is the large number of students per class (Dlamini & Keregeri, 2002). According to these authors this makes class management very difficult. A study by Bruhwiler and Blatchford, (2011) entitled: Effects of class size and adaptive teaching

competency on classroom processes and academic outcome showed that large class size affects the quality of teacher –student interaction during and after teaching. The implication of this is that students who do not understand any lesson cannot go to the teacher for further tutorials and if this persists such students' academic output will be affected.

The work of Yodder and Symons (2010) entitled: Observational measurement of behaviour has shown that class size has influence on classroom time management. In a related study Anderson, (2000) said that high student population compromises teacher-student interaction. In other words, high students 'population reduces teacher attention to individual student's needs. In other words, high student population reduces teacher attention to individual students needs. Research has shown that, large class size does not only reduce teacher student interaction but also makes classroom management difficult if not impossible (Finn, Pannozzo, & Achilles, 2003).This consequently affects students' behaviour as the teachers are unable to mould individual student behaviour. A large class size also makes students assessment extremely very difficult, if not impossible. This undoubtedly reduces the frequency of student assessment. The implication therefore is that, teachers are not able to adequately assess the level of knowledge and skills their students have acquired during the period of training.

This makes students complete without being adequately prepared to meet the qualification required in the job market. Also, large class size has the tendency of bringing about truancy among students. This therefore implies that class size is an important variable especially with youngest age students who need more attention and care to be able to perform a given task (Ehrenberg, Brewer, Gamoran, and Williams, (2001). More recently Muchiri and Kiriungi (2015) have also highlighted large class size as one of the constraints affecting

teaching and learning of secondary school agriculture education and for that matter practical agriculture in Tharaka Nithi County Kenya.

2.7.4 Inadequate Number of Teachers

A teacher of agriculture was described by Olaitan, Asogwa and Umeh (2009) as someone who has undergone a teacher preparatory programme in the area of agriculture and is charged with the responsibility of managing the learning behaviour of the students. Aneke (2012) described a teacher as somebody who teaches especially as a professional in the area of agriculture. Teachers are important human capital in any educational institution. Aghenta (2000) described them as "the key factors in formal education". Adesina (1981) called them the "key input of a highly-skilled labour resource" while Adeyemi (2004) regarded them as the hub of the educational system. Teachers therefore constitute an important aspect in students' learning. Teachers are believed to be the major source of knowledge for pupils as well as the main actors in educational curriculum implementation (Anamuah-Mensah, Asabere-Ameyaw & Dennis, 2007). For this to be possible there is the need competent teachers to implement the curriculum in schools.

Notwithstanding the importance given to teachers in the schools' system, evidence available has it that some schools do not have adequate number of teachers in many countries (Dennison, 1984 & Levin, 1985). Dennison (1984) specifically, mentioned shortage of Mathematics and physics teachers in the UK. He argued that "a situation whereby a school is unable to fill a physics vacancy constitutes a critical level in balancing staffing and curriculum and it is a real institutional difficulty." Levin (1985) too examined the problem of teacher shortages in American schools and remarked that one of the most serious

challenges facing American education is the death of science and mathematics teachers at the secondary level. He argued that majority of new science and mathematics teachers in the US lack sufficient training in the subject they taught.

DES (1986) identified the following three types of teachers' shortage. Overt shortage, measured by unfilled vacancies in a subject and their relationship to demand for tuition in that subject: hidden shortage, where tuition in a subject is given by teachers considered to be inadequately qualified in it or to be lacking the personal qualities required for effective teaching; suppressed shortage, where a subject is under-represented in the timetable because of a lack of situated teachers (DES 1986). Considering these shortages, Millar (1988) commented on this problem and remarked that the 'hidden shortage' of physics teachers in the UK has resulted in the "teaching of substantial parts of the physics curriculum in many schools by teachers without qualifications in physics." According to him, secondary teachers may be required to teach outside their specialised areas" perhaps due to the shortages of suitably qualified teachers. Straker (1988) also observed a serious hidden shortage problem in mathematics in the UK and argued that the problem is exacerbated at school level by a high wastage rate among mathematics teachers who often left the teaching profession for other careers. He observed similar critical teacher shortages in mathematics in Australia and New Zealand.

Lowe (1991) found that 20% of those teaching mathematics in British schools did not have recognized qualifications in mathematics. This finding was consistent with the finding made by Wilson and Pearson (1993) who reported that "20% of tuition in secondary schools was undertaken by teachers without specialist qualifications in the subjects they were required to teach." Smithers (1994) argued that the problem of getting teachers for physics, chemistry

and mathematics in British schools is in an increasing difficulty. McNamara (1995) argued that "until comparatively recently, graduates in the UK could enter the teaching profession without any formal training." He reported that it was "only since 1974 that there has been a compulsory requirement that graduates must be trained before being able to teach in maintained schools." As such, effective teaching is likely to be absent if it cannot be situated within an overall philosophy of meaning, purpose and achievement as especially as a result of shortage of teachers (McClelland 1995). In this regard, Jones (1997) remarked that teacher education should be seriously considered.

In Nigeria, the shortage of qualified teachers has been reported. Ivowi (1982) for instance, examined the performance of Nigerian students in Physics, Chemistry and biology in the West African School Certificate Examinations and found that "the high failure rate was due in part to the acute shortage of science teachers." These shortages have been attributed to the low salaries and social prestige given to teachers.

In other countries, almost the same situation was found. In the USA, for instance, Straker (1988) reported that salaries in teaching were low in relation to those offered in alternative professions, in Canada, Freeman (1994) reported that "teachers are feeling the pleasure not only to improve results but to do it with less money. Pay freezes have become common place across Canada with teachers in populous Ontario taking several days per term without pay." Considering the situation of teachers' salaries in Canada, one could be tempted to believe that the situation was similar to that of Nigeria. The difference was, however, glaring considering the fact that Nigeria is a developing country with a low per capital income (Adeyemi, 1998).

Research findings have shown that teachers are almost always in short supply in school and their turnover is high because they tend to leave the teaching profession if and when more attractive jobs become available in government, politics or private enterprises (Nwadiani, 1995; Aghenta, 2001). Supporting these arguments, Adeyemi (2008) reported that the supply of qualified teachers to Ondo State secondary school did not match the demand for them.

Many reasons have been attributed to the high turnover rate among teachers. Some of these reasons include poor condition of service, low social status in the society, poor salary, lack of incentives and delayed promotional aspects. A researcher like Adeyemi (2008) explained that many teachers leave the teaching profession due to discouragement and frustration resulting from low social status accorded the teaching profession in the society. Subject such as social studies, economics and government attract surplus teachers while physics, chemistry and biology persistently lack professional teachers. Fabusuyi (2006) reiterated that subjects such as social studies, economics and government attract surplus teachers in secondary schools in Ekiti State Nigeria at the expense of physics, chemistry and biology.

2.7.5 Poor teacher attitude and interest on practical lessons

According to Kumpulainen, Hmelo-Silver and Cesar, (2011) on their publication entitled: Investigating Classroom Interaction Methodologies in Action showed that, students attitudes depend on the attitude of their teachers. For instance the teachers view or thoughts about science and their comments could either encourage or discourage the pupils. Comments like, science is for brilliant pupils, science is difficult, and science is not meant for poor pupils.

All these comments can either discourage or encourage students to develop; positive or negative attitude, like or dislike towards the subject.

Amedeker (1998) on the other hand stated that the continuous use of English Language throughout science lessons by teachers prevents some of the pupils from participating actively during teaching and learning process. The author explained that, due to students' inability to understand the English language and for that matter they do not adequately understand scientific concepts and principles. In short when science teachers' in this context agricultural science use English, throughout their teaching and learning interaction, it has the potential of making the pupils to lose interest in the subject. Therefore, it is only the few enthusiastic ones who can understand the English language will take part.

Aside that, teachers approach or methods of teaching and the teaching / learning materials they use will also influence the pupils attitudes either positively or negatively. For instance the use of lecture, brainstorming etc will undoubtedly make the subject boring and difficult to understand therefore students will be compelled to memorize solution to pass examinations which will not bring about learning. But the use of discussion and pupil centred approach will make the subject interesting and will make them like the course and learn to understand without memorizing for only examination purposes. In other words detailed review of literature revealed that teachers more often than not concentrate on the theoretical tuition to the detriment of practical lessons of the subject which consequently affect their practical skills acquisition (Resmick, 2000). In fact, the issue of poor teacher attitude towards science practical skills training appear to be a global issue. For example, Dlamini and Keregero (2000) reported that, poor attitude of agricultural science teachers towards practical skills training is affecting practical skills acquisition among secondary

school students in Swaziland. The problem of poor teacher attitude has also been in the work of Darko, Yuan, Okyere, Ansah and Liu, (2016). According to these authors, poor teachers' attitude towards agriculture is responsible for poor student attitude and interest towards the subject. Similarly the study by Darko, Offei-Ansah, Shouqi and Jun-ping, (2015) have also highlighted poor teachers attitude towards agriculture practical skills training to be the reason behind poor agricultural science students attitudes and lack of interest among agricultural science students in the Cape Coast Metropolis of Ghana.

2.7.6 Poor students' attitude and interest on practical lessons

It is common knowledge that people act based on their perception. This means that, students' readiness and willingness to pursue agriculture science as a career depends on their perception towards farming /agriculture (Ilenloh, Onemolease, Erie, 2012; Radhakrishna, Leite, & Domer, 2003). In other words the perceptions students hold towards farming /agriculture determine, their decision to pursue agricultural science education programme (Ilenloh, Onemolease, & Erie, 2012). According to MOFA (2011) many youth in Ghana have developed poor attitude towards agriculture even including graduates of agriculture due to negative perceptions they hold about agriculture as being an occupation for the poor people and illiterates, drudgery and tiring, less rewarding etc. Similarly the work of Darko *et al.,* (2015) has revealed that, agricultural science students have wrongful perception about agriculture in general and practical agriculture in particular.

There is no doubt that, students academic output is influenced by their attitudes and perception towards a specific subject. For instance, when students perceive agriculture education curriculum as being capable of equipping them with adequate knowledge and skills in agriculture/farming as enshrined in the agricultural science education curriculum,

they will undoubtedly develop positive attitude towards agriculture/farming activities. In the same vein if students perceive agriculture/farming activities to be lucrative business it will go a long way to influence their decision to study agriculture education to enable them acquire entrepreneurial skills in on-farm and off-farm job as required in the curriculum (MOE, 2010).

Another determinant of students' attitude towards learning is job prospect of the programme they are studying. For example if students realize that the programme they are pursuing now will one day enable them to secure job in the near future they will develop positive attitudes towards agriculture. On the other hand, if students know that the programme they are studying now has limited job prospect it would lead to poor attitude development towards the subject. Students as rationale beings would definitely work hard if they realize that, the programme they are studying in school now will have a direct benefit on their lives in the near future. This explains why students opt for different courses rather than agriculture because they perceive agriculture to have limited job prospects.

According to Rameela (2004) another important variable determines one's attitude towards an object is the person knowledge about the object. Along similar augment Fishbein and Ajzen (1975) opined that People's interest to participate or not in an activity could be based on the person's knowledge, observations, or other relevant information about the issue or occasion.

Apart from that, the teaching method adopted by the teacher also have, influence on students attitude. For example, empirical evidence have shown that, the lecture method has been shown to be ineffective in engaging learners positive attitude, in developing the conceptual understanding of the subject (Resmick, 2000). In their write up Olasehinde and Olatoye

(2014) indicate that, non-performance of students in science was not because they did not have favourable scientific interest in or attitude towards science, but rather has to do with other factors such as the teacher's method of teaching that hindered science achievement of the students. Ampiah (2002) said that, teaching and learning of an applied science like Agricultural Science consists of learning facts and figures, rules, laws formulae, problem solving, understanding of basic scientific principles of concepts and explanation of concepts and observed phenomena. It is therefore of utmost significance for the teacher to use the appropriate pedagogy to bring to good understanding and learning of a particular learning task.

Nneji (1997), viewed the traditional talk and chalk method, to be wasteful and unproductive, particularly with slow and average learners. Along similar lines, Costello (2001), report that the lecture method is ineffective as its turn learners into passive participants in the learning process though it is useful in covering large content. However, the work of Omrod (2008) shows that, some students seem to learn better when information is presented through words (verbal learners), whereas others seem to learn better when it is presented in the form of pictures (visual learners). Therefore, in a class where only one instructional method is employed, there is a strong possibility that a number of students will find the learning environment less optimal and this could affect their academic performance. As Agyei (2010) indicated, teachers of science related subjects mostly adopt the expository method of teaching that induces rote learning ("chew and pour"), where students only learn to pass their exams and forget what they have learned soon afterwards. The author, therefore, recommends discussions, project, and discovery methods of teaching. According to Agyei

(2010), discussions, project, and discovery methods of teaching provide an enabling environment for the learners and ensure that individual differences are taken care of.

2.7.7 Availability of School Library

A School library is a place where print materials such as books, magazines, journals and other reference materials namely filmstrips, video tapes, and audio recordings, computers etc are housed and used by teachers and students for research and edutainment purposes as well as for their private study. Fayose (1983) described a school library as a place where a collection of books, periodicals, Newspapers, magazines, filmstrips, video tapes, audio recording of all types, slides, computers, study kits and students and learning and for personal interest as well as for entertainment purposes.

Due to the wealth of knowledge in the curriculum, Kolade (2001) described it as nerve centre of any academic environment or educational institution. Aina (2004) said that the main reason why libraries are established in schools is to provide support to schools to be able to attain their educational objectives in the areas of learning, teaching, research and services. Unfortunately, many secondary schools do not have functional school library particularly those schools own by the Government, as a result students do not see school library to be beneficial to their education (Odusanya & Amusa, 2002). The implication therefore is that, such schools would register low academic attainment due to students' inability to access relevant information.

2.7.8 Inadequate Access to laboratory and workshops

A school laboratory is a place where scientific experiments are conducted. In fact, school laboratory enables students to be able to carry out scientific experiments. It also enables science students to become familiar with certain chemicals, equipment etc. It is against this back drop that Mama and Olaitan (2002) indicate that, the availability of school laboratory and its facilities determines the ability of the teacher to teach theoretical knowledge or practical skills to his / her students. Ekanem (2005) also reported that, the availability of school laboratory and facilities determines the type of practical tuition in any educational institution.

The work of Nsa *et al.,* (2014) in Oyo state in Nigeria also indicated that school factors like availability of laboratory and farming facilities are essential ingredients for successful agricultural science practical tuitions in schools. According to science Adeyemi, (1998) and Ige, (2000) science laboratories is indispensible so far as teaching and learning of secondary school science related discipline is concern. In other words there cannot be effective teaching and learning of science without the availability of science laboratory. Science laboratory is places where scientific experiments are conducted to further explain scientific concepts, principles and theories. The study by, (Cash, 1993) have revealed that schools that have science laboratories usually record higher academic achievement than their counterparts that do not have science laboratories. Science laboratory enables students to develop critical thinking skills as well improve upon students overall performance due to their daily activities in the laboratory (Ogunleye, 2002).

Despite the relevance of science laboratory to practical lessons in science education, empirical studies have shown that many schools in different parts of the world do not have

science laboratories Jones (1990) and Barrow`s (1991) in Saudi Arabia, Black *et al*. (1998) in Uganda as well as Alebiosu (2000) and Onipede (2003) in Nigeria. These researchers reported that, where science laboratories exist they are usually not well resourced. The resultant effect is that, students perform poorly in their examination due to lack of practical skills training by their instructors in school (Keister, 1992). The implication is that there is a direct link between student academic attainment and the availability of science laboratory. This explains why Hamide and Geban`s (1996), Greenwald *et al*., (1996) indicated that school facilities such as Science laboratories have direct bearing on students academic achievement. Commenting on this same issue Linn (1997) reported that, the availability of science laboratory has the potential of improving upon students learning outcomes.

2.7.9 Availabilities and Accessibilities of School farms and Garden

A school farm enables students to develop the requisite skills and attitudes in the world of work. It enables agricultural science students to have experiential learning (i.e. learning by doing) in that it provides the opportunity to learn about agronomic practices such as land preparation, fertilizer application, weed and pest management, proper record keeping and other husbandry practices such as feed formulation among others using their own hands. In other words, School farm as required in the teaching syllabus is supposed to: give agricultural science students the opportunity to practice what they have learnt in the classroom on the farm; Serve as a source of income through the sale of agricultural products; Expose students to best crop / animal husbandry practices example.; -enables students to develop observation skills; enables students to develop record keeping skills dust to mention but a few.

In that regard Samuel (2012) commented that Students who participated in nurturing school farm are bound to appreciate the subject (agriculture) more and even become stakeholders in agriculture. As indicated by FAO (2012), the familiarization of students in the secondary schools with up-to-date methods for improved sustainable production of food that are applicable to their homesteads or farms is a potentially powerful tool for improving the household food security.

This explained why the West African Examination Council (WAEC) guidelines (2007) demand that every school who intends to offer agriculture as part of the examination subject must have a school farm or demonstration field. It was also gathered from the WAEC syllabus (2007) that practical agriculture is an important requirement for the subject and that before any school would be certified fit to host or put in for agricultural science there must be provision for the practical aspect of the subject.

However Shimave, (2007) noted that most secondary schools do not have school farms, and where they exist at all, they fail to meet the standard and are thus ill-prepared to measure what school farms are set to measure. The implication is that, teachers become frustrated and students fail massively, students graduate without employable skills just to mention but a few.

In fact, extensive literature search have shown that most secondary schools do not have school farms, and where they exist at all, they fail to meet the standard and are thus ill-prepared to measure what school farms are set to measure (Shimave, 2007; Udo, 2008; Nsa *et al*., 2012) and this compel the teachers to impart only theoretical knowledge on the students. The implication therefore is that, SHS agricultural science graduates come to join the queue of the unemployed youth in the society.

2.7.10 Teacher attendance and punctuality

Teacher's attendance is one of the determinants of student's performance. The problem of teacher absenteeism has been found to be one of the teacher specific factors that militate against school system (Staffing Industry Report, 1999; Ramirez, 1996; Warren, 1988). This compelled school administrators to look for a substitute teachers to teach the students. Unfortunately studies have shown that substitute teachers do not measure up to the regular classroom teacher's routine and methods to stimulate students to learn (Darling-Hammond, 1995). Norton (1998) reported that 71% of education directors deemed absenteeism as one of the leading problems in schools. Studies have also suggested that economically disadvantaged students who desperately need continuity of instruction get it least (Pitkoff, 1993).

In support of this view Pennsylvania School Board association (1978) stated that, substitute teachers are not as effective in the classroom as regular teachers because of the lack of continuity in the educational programme. The end result is that, students perform marginally in their terminal examination. The work of Manlove and Elliot, (1977) showed that, students overall performance in a particular school was negatively affected by high teacher absenteeism. The authors further stated that teacher attendance does only affect students academic output but also affect school administrative activities in a school system. Scholars such as Jacobs and Kritsoni, (1997), Woods and Montagno, (1997) carried out their studies separately in different parts of the world involving third grade classes and found out that in schools student rank in class was also lowered, and overall school scores were down as a result where teachers absent themselves most, individual standardized test scores were lowered, of frequent absenteeism by teachers.

Woods and Montagno, (1997) reported that the teacher school attendance rate has an effect on student achievement in the states of Indiana and Wyoming. Studies have revealed that teacher sexual orientation and age influence teachers attendance. Unicomb *et al*., (1992), indicated that, gender and age play a significant role in determining the profiles of absentee teachers in the school environment. The study by Scott and McClellan (1990) indicate that, in an academic year few male teachers absent themselves as compared to their female counterparts. In quantitative terms the authors said that the ratio of male and female teachers who miss school is 3.39 days to 5.29 days per academic year. Among the weeks Wednesdays were the days teachers were more absent while Mondays recorded fewer number of absentee teachers from school (Unicomb *et al.,* 1992). Besides, teachers' poor attendance has negative effect on the morale of the teaching staff in a school environment. Bruno (2002) reports that "when there is a high teacher absence, it tends to lower the morale of remaining teachers resulting in high teacher turnover". There is also an element of financial burden educational institutions in that funds are required to maintain substitute teachers (Etrenberg & Rees, 1991). Wood (1996) analyzed costs of substitute teacher pay, in three individual school districts in northern Indiana. The results showed that nearly 1% of the total operating budget for these school districts was consumed by substitute teacher costs.

2.8Supports to SHSs Practical Agriculture

Failure of parents to support their children with their studies was also identified by the teacher as a hindrance to quality teaching and learning from taking place at Mandlethu FET School (Mbajiorgu, Oguttu, Maake, Heeralal, Ngoepe, Masafu & Kaino, 2014). This is expected given that Mandlethu FET School is located in rural South Africa Mbajiorgu *et al*.,

(2014). This situation acts as a barrier to involvement by the parents in their children's school activities the authors added. This is due to factors related to their low social status as observed by Hill and Taylor (2004). Lack of parental support has also been highlighted by Mmotlane, Winnaar, and WaKivilu, (2009), who also found that there was low parental participation in school activities in South African black schools.

Martin (2003) indicated that some parents do not participate in their children's school activities because they feel that it is not their job or that they have no interest because of attitudes or beliefs. Desforges and Abouchaar (2003) also indicated that poor parents with low socio-economic status find it difficult to support their children educational development. Parental socio-economic status has more influence on their participation in the education of the children more than other variables such as gender, age and marital status (Astone & Mclanahan, 1991; Grolnick, Benjet, Kurowski, & Apostoleris, 1997). Likewise the findings of Fox and Certo (1999) and Self (2001) also indicate that lack of parental support is negatively affecting teaching and learning in educational institutions. The authors therefore attributed teacher attrition to other sectors of the economy to lack of parental support to school activities.

In a related study by Ingersoll (2001) also revealed that, lack of community support is badly affecting teaching and learning process in educational institutions. Apart from that, empirical data suggest that poor administrative support to teachers is a serious problem that affects the teaching profession and for matter agriculture education programme (Fox & Certo, 1999; Ingersoll, 2001, 2003; Self, 2001).

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter explains the research methodology used in the study. Specifically it presents the research design, population/sample size, sampling techniques, the instrument used, testing validity and reliability of the research instrument (questionnaires). It also examines Data Collection procedure and ethical issues regarding data collection. This chapter also discusses the method used to analyze the data.

3.1 Research Area

The study was undertaken among Senior High Schools offering agricultural science in the Sagnarigu District of the Northern region of Ghana. Before its creation in 2012, the Sagnarigu District was part of the Tamale Metropolis with Tamale being both the regional and metropolitan capital. The two districts were selected because there are many SHSs there which are offering agricultural science as electives. The study was carried out in Tamale Senior High School, Kalpohini Senior High School, Business College International, Tamale and Islamic Senior High School.

3.2 Research Design

A cross sectional survey design was applied in guiding data collection and the execution of the study. This design was most appropriate because the data was sought from the subjects in their natural environment without any control or disturbance. Also the data collection

period was very short and research focus was not time series. The design was chosen to enable the researcher describe the pattern of relationship under investigation.

3.3 Study Sample

Four (4) senior High Schools in the Sagnarigu District were purposively selected for data collection. Purposive sampling technique was employed because the researcher was interested in only senior high schools which offer agricultural science. These schools included: Tamale Senior High School, Kalpohini Senior High School, Islamic Senior High School and Business College International, Tamale.

Categories of respondents interviewed in the study included: Agricultural Science Teachers, Heads of agriculture science departments and third year agricultural science students. These groups of people are directly involved in teaching and learning of practical agriculture. In all seventeen (17) elective subject teachers, four (4) heads of departments and two hundred and twenty eight (228) agricultural science students were selected for the study. Selection of agricultural science students and agricultural science teachers was done using purposive sampling technique in that the study was interested in teaching and learning of agricultural science education at the senior high school level. As such, only students pursuing agriculture and teachers teaching agricultural elective are qualified to response to the study questions. However, among students pursuing agricultural science, simple random sampling technique was applied in selecting the respondents for this study. The researcher obtained names of prospective research participants from each school. These prospective participants' names were written on different pieces of paper and were put into polytene bags and shook several times. After each shake a name was randomly selected the process continued until the

required number of agricultural science students was obtained. .This was done to ensure that each of the prospective research participants have equal chance of been selected.

3.4 Research Instrument

The instruments used in data collection includes, questionnaire, observation checklists and interview guide. Focus group discussion was also used as data collection methods.

3.4.1 Questionnaires

The researcher used this instrument for the following reasons: it is relatively cheap and provide opportunities for sampled respondents to express their opinions freely. For this reason the researcher used self-administered questionnaire since the participants were literates. The researcher used questionnaires to collect the primary data in the following areas: demographic characteristics of teachers and students, constraints affecting teaching and learning of agricultural science practical lessons in Sagnarigu District, hands-on experience perception in practical agriculture, teaching methods, assessment methods, agricultural science students knowledge /awareness about the prospects of senior high school agriculture education programme as well as agriculture science teachers and students perception about accessibility to funds.

3.4.2 Interview Guide

Interview schedule were prepared and used to collect information from heads of agriculture department in all the sampled schools in the Sagnarigu District. In other words the researcher employed this data collection instrument to solicit detailed information on issues concerning teaching and learning of practical agricultural science lessons in SHSs in the

Sagnarigu District from heads of agricultural science departments. This was the researcher felt that these people have in-depth knowledge on issues affecting teaching and learning of agricultural science practical lessons in their respective schools in the Sagnarigu District.

3.4.3 Observation Checklist

The observation checklist was also used to capture and document the facilities, equipment, type of animals, types of crops grown, used in the practical teaching of agricultural science in the Sagnarigu District. This instrument was used to enrich the information obtained using questionnaire and for triangulation purposes.

3.4.4 Focus Group Discussion

The researcher adopted this data collection method to obtained general views of SHSs agricultural science students on how agricultural science practical is taught in SHSs in the Sagnarigu district. The researcher decision to used this data collection method was also to enable research participants to freely express their general views on concerning issues affecting quality teaching and learning of agriculture practical lessons in SHSs in the Sagnarigu District which might not have been captured in the above mentioned research instruments.

3.5 Validity and Reliability of Instruments used

The content validity of the questionnaire was achieved right from the start of their construction. They were examined by experts, course mates, and colleague teachers for scrutiny. Adjustments were made and items which were relevant to the study were retained. The reliability of the questionnaire was established by computing the internal consistency of

the items after pre-testing them on a sample of 5 agricultural science teachers and 20 students.

3.6 Data Collection Procedure and ethical issues

Due to the involvement of human subject in the research process and the potential risks associated with the exposure of research participants. For this reason the researcher obtained an introductory letter from Faculty of Education, University for Development Studies was presented to the headmaster of the four (4) senior High Schools in the Sagnarigu District seeking permission to carryout research in their schools. The questionnaires were administered in each of the four (4) Senior High Schools by the researcher on the days convenient to the respondents. The questionnaires were received on the same day they were administered.

Interviews were carried out with heads of agricultural science departments to enrich the information obtained by using questionnaires on factors affecting teaching and learning of agricultural science practical lessons. These were always done after receiving back the questionnaires. Field observations were also carried out during data collection to gather data on school farms, laboratories, farming facilities, school library, workshops and animal projects, availability of teaching and learning materials

3.7 Data Analysis

Descriptive and inferential statistics were used to summaries and interpret quantitative data. Data from qualitative instruments were summarized through content analysis, inductive categorization of issues and formulation of themes to facilitate interpretation.

3.7.1 Analysing Students' Self-efficacy and Practical Competency

Students perceived practical competency is measured based on both self-efficacy and self-concept which contain common elements for assessing practical skills. However, self-efficacy and self-concept differ in the extent to which competence contributes to their composition. Self-efficacy on one hand is seen as dealing primarily with cognitive perceptions of competence. Self-concept, on the other hand, is typically seen as being comprised of affective perceptions as well as competency perceptions (e.g., Marsh, 1992). The framework for analysing practical self-concept and self-efficacy proposed by Pajares and Schunk (2002) was applied in analysing students' practical skill in agriculture. The framework distinguishes between the competency's elements of self-concept and self-efficacy. Self-efficacy perceptions are measured by asking "can" questions (e.g., Can I do mathematics? Can I make friends? Can I keep out of trouble?), whereas self-concept competency perceptions ask "being" questions (e.g., Am I good at mathematics? Do I make friends? Do I keep out of trouble?).

Guided by Pajares and Schunk's (2002) framework of self-concept and self-efficacy, during the data collection process, students were asked 'can' questions such as can you do germination test?, can you do animal feed formulation?, among others in order to measure their self – efficacy perceptions about their agricultural practical competency. Whereas their self-concept competency perceptions, students were asked "being" questions such am I good at doing germination test, am I good at formulating animal feed among others in order to measure their self-concept competency perceptions about practical agriculture. Responses gathered from students to these questions were analysed using description statistics and presented in frequent distribution tables.

3.7.1 Ranking of constraints to teaching and learning of practical agriculture

Students and teachers ranks of constraints to the teaching and learning of practical agriculture were analysing using Kendall's co-efficient of concordance to analyse the extent of agreement among the ranks and examine the most ranked constraint. Proposed by Maurice G. Kendall and Bernard Babington Smith, *W* is a measure of the agreement among raters or judges assessing a set of subjects in ranked order (Legendre, 2010). It is used to assess the degree to which respondents in a study provide common ranking on an issue with same general property.

The limits for *W* must fall between zero (0) and one (1). It is one (1) when the ranks assigned by each respondent are assumed to be the same as those assigned by other respondent and zero (0) when there is maximum disagreement among the rankings by the respondents. It should not be used to analyze sets of variables in which the negative and positive correlations have equal importance for the interpretation.

In this study, *W* was employed to measure the degree of agreement among teachers and students in the ranking of constraints to teaching and learning. Fourteen set of constraints were identified and farmers were asked to rank these constraints as it applies to them with score rank 1 being the most pressing and 14 being the least pressing. The total rank score for each item was computed and *W* calculated. The *W* is calculated using the formulae;

$$W = {}^{12(S)}\!\Big/\!_{m^2(n)(n^2-1)-mT}$$

Where ***n*** is the number of objects, ***m*** is the number of variables and ***T*** is a correction factor, ***S*** is a sum-of-squares statistic over the row sums of ranks R_i, and R is the mean of the R_i values computed first from the row-marginal sums of ranks R_i received by the objects:

$$S = \sum_{i=1}^{n} (R_i - \bar{R})^2$$

For tied ranks ***T*** is;

$$T = \sum_{k=1}^{g} t_k^3 - t_k$$

t_k= the number of tied ranks in each (k) of g groups of ties. The sum is computed over all groups of ties found in all m variables of the data table. T= 0 when there are no tied values and the equation becomes;

$$W = 12(S) \Big/ m^2 (n)(n^2 - 1)$$

W is an estimate of variance of the row sums of ranks Ri divided by the maximum possible value the variance can take; this occurs when all variables are in total agreement. Hence $0 \leq W \leq 1$

W of 1 represents perfect concordance (perfect agreement) and 0 indicates perfect disagreement in the ranking.

Hypothesis on *W*

Null Hypothesis (Ho): There is no agreement in the rankings of constraints to the teaching and learning of practical agriculture.

Testing the Significance of *W*

Friedman's chi-square statistic (χ^2) is obtained from *W* by the formula

$$\chi^2 = m(n-1)W$$

This quantity is asymptotically distributed like chi-square with *(n-1)* degrees of freedom; it can be used to test *W* for significance. This approach is satisfactory only for moderately large values of m and n (Kendall and Babington Smith, 1939; Legendre, 2010).

CHAPTER FOUR

RESULT AND DISCUSSIONS

4.0 Introduction

This chapter presents the result and discussions of the study. The chapter is being presented under five sections. Section one presents the demographic characteristics of the sampled respondents. Section two looks at awareness of the benefits of senior high school agricultural science education while the third section talks about some school factors that impede teaching and learning of practical skills in agricultural scienceprogramme in Senior High Schools in the Sagnarigu District. Section four presents the senior high school agricultural science teachers and students about funding of agricultural science practical lessons/field trips in the Sagnarigu District. The chapter is concluded by looking at in-service educational training needs agricultural science teachers in senior high school in the Sagnarigu District.

4.1 Demographic Characteristics of Agriculture Students

This section discusses demographic characteristics of students and teachers surveyed for this study. It also presents demographic information of parental background of students surveyed.

4.1.1 Sex Distribution

Descriptive statistics and frequency distribution of demographic characteristics of students surveyed for this is shown in the Table 4.1. The analysis revealed that, majority (82%), of the respondents were male while only 18 percent were female. This means that the study of

agricultural science at the senior high schools is being dominated by male students in the study area.

Table 4.1: Frequency distribution of SHS agricultural science students' sex

Sex	Frequency	Percentage (%)
Male	187	82.00
Female	41	18.00
Total	**228**	**100.00**

Source: Analysis of field survey, 2016

4.1.2 Age Distribution

According to the findings of this study majority (55.3percent) of the respondents were within the age group of 15 – 18 years old. About 39.5 percent of the respondents were within the age of 19 –21 years old. Similarly, 11 respondents, representing only 4.8 percent were in the age group of 22 – 24 years old. Only one student (0.4 percent) was above 24 years old among the sampled respondents as shown in Table 4.2. This means that majority of the Agricultural Science students at SHSs within the Sagnarigu District are within the ages of 15 to 18 years. The youngest respondent was about 15 years old while the oldest student was about 25 years with a mean age of 18.4 years. Similar age distribution among students pursuing Agricultural Science in the SHSs in the Sekondi-Takoradi Metropolis was found in a Darko *et al*., (2016). This is expected because per Ghana's educational system, one is expected to spend six years in primary school, three years in Junior High School, another three years in Senior High School and four years at University in pursuing degree, or three years High National Diploma (HND) or other courses at other tertiary institutions.

Therefore, by the time a student gets to the second year in the Senior High School, he or she would most likely not be less than 16years (Darko *et al.*, 2016). The findings of this study are therefore not surprising.

Table 4.2: Frequency Distribution of Respondents' Age Grouping

Age group	Frequency	Percentage (%)
15 – 18	126	55.3
19 – 22	90	39.5
23 – 26	11	4.8
27 and above	1	0.4
Total	**228**	**100.0**
Minimum age = 15 years	**Maximum age = 25 years**	**Mean age = 18.4 years**

Source: Analysis of field survey, 2016

4.1.3 Entry Grade of Students to SHSs

With regards to the entry grade obtained at the Junior High School to enter into Senior High School, majority (50.4%) of the sampled students obtained between aggregate 16 and 20 at the Basic Education Certificate Examination. More than 25 percent of the students obtained between aggregate 21 and 25 as entry grade into the Senior High School. About 8.8 percent of the respondents were able to obtained aggregate 11 – 15 while 9.2 percent obtained an aggregate above 25. Only 6.1 percent of the sampled students obtained an entry aggregate of 6 – 10. The best entry obtained among the sampled students was aggregate 9 and aggregate 34 was the worst aggregate obtained by the sampled agricultural science students with an average aggregate score of 19.6 as indicated in Table 4.3. It is therefore obvious from the

findings of this study that, most students pursuing agriculture in the selected Senior High Schools entered into the schools as average students.

Table 4.3: Frequency distribution of respondents' entering grade

Grade category	Frequency	Percentage (%)
6 – 10	14	6.1
11 – 15	20	8.8
16 – 20	115	50.4
21 – 25	58	25.4
26 above	21	9.2
Total	**228**	**100.0**
Best aggregate = 9	**Worst aggregate = 34**	**Mean aggregate = 19.6**

Source: Analysis of field survey, 2016

4.1.4 Students' Area of Residence

Regarding sampled students area of residence, majority (53.1 %) of them are residing in the rural areas while the remaining 44.9 percent were from urban communities. Agricultural activities and farming in particular, is mainly carried out in the rural area (MOFA, 2010), and as such students who are from rural communities stand the chance of observing or practicing agriculture which will in tend help in imparting practical skills on students. Also students' observations and practices of agricultural activities is more likely to influence their perceptions and attitude towards farming and this will influence their skills acquisition on agricultural practice.

Table 4.4: Place of residence of students surveyed

Area of Residence	Frequency	Percentage
Rural area	121	53.1
Urban area	107	46.9
Total	228	100.0

Source: Analysis of field survey, 2016

4.2 Parental Background of Students

Parental backgrounds of students have been proven to have effects on students' courses of study and career choices. It is common knowledge that, parental influence and job opportunities are among the major factors that influence students' decision to pursue Agricultural Science at the Senior High School. Family occupation and rewarding careers would undoubtedly influenced students' choice of Agricultural Science as aprogramme of study at the Senior High School level.

As such this studies presents analysis of the parental background of the sampled students. Analysis of students responses on the main occupation of their parents (Figure 4.1), reveals that majority (57%) of their parents were engaged in farming as their source of livelihood. Also, about 21 percent of parents were engaged in trading activities while 3 percent of the parents were doing both trading and farming. Also, 10 percent of parents were engaged in teaching as employees of the Ghana Education service. However, about 2 percent of the students did not want to disclose their parents' occupation and as such indicated that they cannot disclose their parents' occupational background.

With most of the students, having their parents involved in farming, it is expected that students will have some amount of exposure to practical reality of agriculture and this can help them in their practical lessons in their course of study as agricultural science students. At focus group discussion, most of the students whose parents were farmers indicated that they have been helping their parents in the farming activities and have acquired some practical experience in farming and other agricultural activities.

The parents of most of the students interviewed were aged with average age of 58 years and they lived in relatively large households with household size of nine persons per household. The parents were generally illiterate with only 24 percent of them indicating that their parents have up to second cycle level of education.

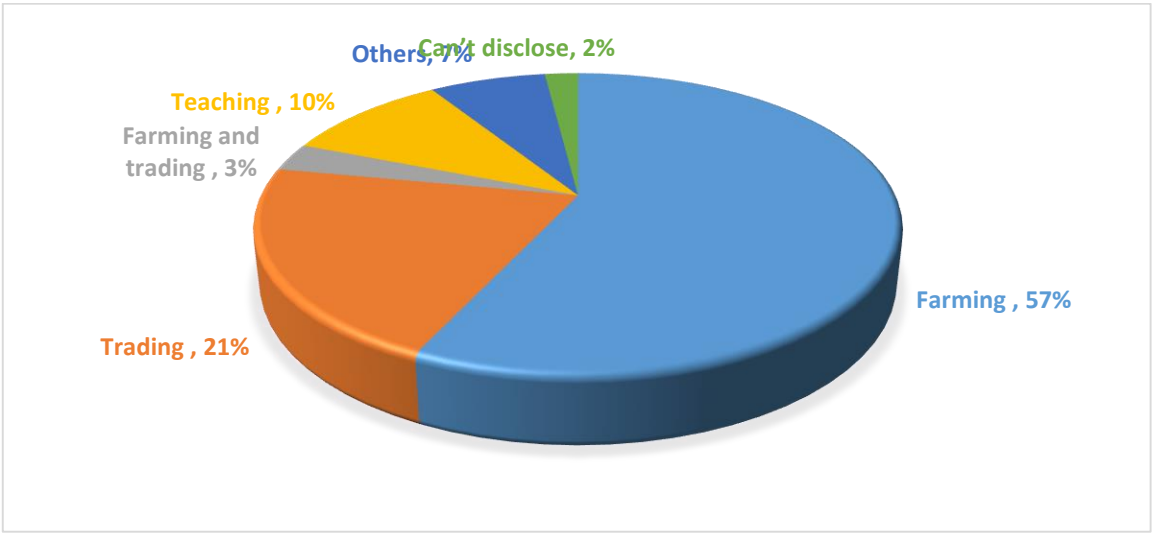

Figure 4.1: Pie Chart Showing Distribution of Parental Occupational Background

Source: Analysis of field survey, 2016

4.3 Demographic characteristics of Agricultural Science Teachers

This section presents results and discussion of some demographic characteristics of the sampled 17 agricultural science teachers interviewed for this study.

4.3.1 Sex Distribution of agricultural science elective teachers

Most (82.4%) of the agricultural science teachers interviewed in this study are males indicating male dominancy in science teaching profession in the schools surveyed. This trend could be due to fear of examination failure, lack of successful agricultural science teachers to serve as role models, misconception of agriculture/farming, lack of guidance and counseling services in schools etc.

Previous studies have also confirmed the male dominance in science teaching profession (Darko *et al.*, 2015 & 2016). Darko *et al*., (2015 & 2016) whose studies were carried out in separate locations found the issue of male dominance in agricultural science teaching profession. Their studies attributed the male dominance in science teaching profession to the poor enrolment of female students in agriculture and other science related programmes.

Table 4.5: Sex Distribution of agricultural science elective teachers

Sex	Frequency	Percentage
Male	14	82.4
Female	3	17.6
Total	17	100.0

Source: field survey data, 2016

4.3.2 Age of agricultural science teachers

According to the findings of this study, as indicated, most of the teachers of agricultural science programmes in the selected schools are within their youthful age with an average age of 35 years, while about 46.7 percent are between 33 and 40 years. The youngest teacher surveyed was 33 years old while the oldest was 58 years. It is evident from the results in this study that most of the teachers are within the ages between early 30s'and 40 years. The implication is that, the teaching force is dominated by young and energetic teachers and this will undoubtedly have positive influence on teaching and learning of agricultural science practical lessons provided all the other relevant educational resources are provided in adequate quantities.

4.3.3 Other Occupations of Agricultural Science Teachers

Apart from teaching, agricultural science teachers also engaged in other occupational activities for living. Some of the main occupational activities engaged in by agricultural science teachers are mainly in the agricultural sector including crop farming (28.6%), livestock rearing (14.3%) and selling of agricultural inputs (14.3%). Other sectors of the economy they engaged in were small and medium enterprises (42.9%) in commerce and manufacturing as illustrated in Table 4.6. The fact that most of the teachers interviewed also engaged in practical agricultural as second employment is positive because this will help sharpen their skills and impart same to students. Some of their farms were also located close to the school at the backyard of teachers which they said is being used for demonstration to students.

However, about 43 percent of the teachers interviewed engaged in other enterprises such as commerce, sale of general goods and artisanship and manufacturing which they usually undertaken outside the school environment.

Table 4.6: Distribution of Other Occupational Activities of teachers

Other occupation/work	Frequency	Percentage
Crop farming	4	28.6
Livestock farming	2	14.3
Selling of provision	2	14.3
Others	6	42.9
Total	**14**	**100.0**

Source: field survey data, 2016

4.3.4 Educational and professional background of Agricultural science teachers

Educational and professional qualification of teachers, ultimately affect the quality of their teaching and their ability to impart practical skills on their students. As such teachers were asked to indicate their educational and professional qualifications.

4.3.4.1 Programme offered at the Second cycle level

The programmes teachers pursued at the second cycle level are also expected to have a bearing on their ability to adequately handle practical agricultural lessons. The results from this study in Table 4.7 indicate that, majority (82.4%) of sampled teachers offered agriculture science in Secondary School/GCE O Level education. With this experience of acquiring agricultural science certificate at the secondary level is very important as it will

enhance teachers' delivery skills. They will also have the expected knowledge and skills to teach agriculture at the SHSs because they pursued similar programmes during their days in secondary schools.

Table 4.7: Frequency Distribution of Programme Offered by Teachers

Programme Offered At Secondary School Level	Frequency	Percentage
General Science	3	17.6
Agricultural Science	14	82.4
Total	**17**	**100.0**

Source: field survey data, 2016

4.3.4.2 Area of Specialization of Teachers

Results of this study in Table 4.8 demonstrates that majority (70.6%) of the 17 teachers specialised in agriculture education during their teacher training programme while (17.6%) specialized in general science education. Besides, the results also indicates, that 94.1% of the sample agricultural science teachers are University Graduates who hold First Degrees whereas 5.9 percent holds Masters Degrees. Those who hold first Degree, held B.sc General Agriculture (41.2%), BED Agriculture (35.3%), and the rest constitute only (23.5%) i.e. general science education. Thus most of the teachers teaching agricultural science elective subjects interviewed for this study specialised on the requisite area of agricultural science and general science with the exception of 2 teachers who indicated they specialized in Ghanaian language, although they later pursued a degree programme in agriculture after their college education.

Overwhelming majority (82.4 percent) of the sampled teachers are professionally trained agricultural science teachers. More so, the study also established that SHS elective subject teachers in the Sagnarigu District have specialized in Horticulture, animal science, community nutrition, general agriculture, and science. In brief the results of this study shows that majority of the teachers are first degree holders. The analyses of this study is not surprising because the minimum academic qualification for one to be allowed to teach at the Senior High School level in Ghana is that the person should hold first degree(bachelor degree).

Table 4.8: Frequency Distribution of area of specialization of Teacher

Area of Specialization	Frequency	Percentage
General Science Education	3	17.6
Agricultural Science Education	12	70.6
Ghanaian Language	2	11.8
Total	**17**	**100.0**

Source: Author's analysis field survey data, 2016

4.3.5Teaching experience of elective subject teachers

As teachers going through their profession, they are likely to acquire some additional skills and accumulate experience as they encountered new issues and challenges in their profession. These experiences are expected to improve upon the quality of their teaching and classroom management. As such experience of teachers, measured in years of teaching was examined in this study. As shown in the Table 4.9, the 17 teachers interviewed have been teaching between 11-20 years (58.8%), 1-5 years (23.5%), and 6-10 years (17.6%). This

implies that, elective subject teachers who teach agricultural science students in SHSs in the Sagnarigu District have the required teaching experience. Thus majority of the teachers surveyed have been teaching for over 10 years now. With more than ten years' experience in teaching, the surveyed teachers' should, be able to master their teaching skills and their ability to impart practical knowledge and skills on students.

In other words assuming all other factors remain constant, with more than ten years' experience in teaching, the teachers' sampled should be able to perform the following tasks successfully as compared to inexperienced teachers: select appropriate instructional aids at a reduced cost, select appropriate teaching methods, organize effective field trip, mobilize funds to embark on field trips, motivate students to learn, guide and counsel students concerning their career choices base on students strength and weaknesses, and of course students backgrounds and manage their time effectively since practical lessons require more time.

Table 4.9: Frequency Distribution of professional experience of teachers

Number of Years in Teaching	Frequency	Percentage
1-5 Years	4	23.5
6-10 Years	3	17.6
11-20 Years	10	58.8
Total	**17**	**100.0**

Source: Author's computation, 2016

4.3.1. Number and Frequency of Practical Lessons

The number of practical lessons per week and the frequency of practical lesson within a term were examined to provide information on the importance attached to practical skills training which is very important in imparting practical skills among agricultural science students in our second cycle institutions. Per the records and time table of the agricultural science classes studied, about two-third of the teaching and contact hours are allocated to elective courses in the areas of agriculture while the remaining one-third is used for core subjects such as English language, mathematics, Integrated Science and Social studies. Per the time, one- third of the time allocated for elective agricultural courses were devoted for practical lessons. However interactions with students and teachers revealed that, not all the time allocated for practical lessons are actually utilized for same. They cited reasons such as: lack of time and funds to execute practical work, the need to complete syllabus, unavailability of school farms and general lack of interest in the part of both teachers and students in practical lessons, as why they are unable to use all the time allocated to practical lessons for practical work.

Analysis of the respondents of teachers to the question “how frequent do you organise practical lessons?” is presented in the Table 4.10a. As shown in the table, majority (52.9 percent) of the teachers interviewed indicated that they organised practical lessons less frequently. They were of the view that, they mostly organised practical lessons once a week instead the three days which appears in their lesson’s time table. About 12 percent and 18 percent indicated that, they have practical lessons very frequently and somewhat frequent respectively. However, 17.6 percent indicated that, they only organised a couple of practical lessons within a term. Most of the sampled elective subject teachers admitted that, they

sometimes have just two or three practical lessons in a term. It is therefore clear that much attention by way of time allocation and frequency of lessons delivery to theoretical lessons as compared with practical lessons.

Table 4.10a: Distribution of teachers' views of the frequent of practical lessons

Number and Frequent of Practical Lessons	Frequency	Percentage (%)
Very frequent (At least 3times a week)	2	11.8
Somewhat frequent(at least 2times a week)	3	17.6
Less frequent (once a week)	9	52.9
Not frequent at all (a just a coup in a term)	3	17.6
Total	**17**	**100.0**

Source; Analysis of field survey data, 2016

Responses of students regarding frequent of practical lessons as shown in the Table 4.11b were very similar to that of their teachers. Equally, majority (53.9 percent) of the students interviewed were of the view that the frequent of their practical lesson is less frequent (mostly once a week), while 11.8 percent and 14.9 percent respectively described the frequent of their practical lessons are very frequent and somewhat frequent respectively. However, about one – quarter (19.3 percent) described the frequency of their practical lessons as not frequent as shown in Table 4.10 b.

However the views of students regarding the frequency of their practical lessons were found to differ across schools, where students in the Tamale High School and Islamic Senior High School described the frequency of their practical lessons as very frequent, students of Kalpohini Senior High School and Business College International, Tamale described the

frequency of their practical lessons as not frequent at all. In brief students of all the four schools surveyed described the frequency of practical lessons as less frequent.

Table 4.10 b: Distribution of Students' views of the frequent of practical lessons

Number of practical lessons	Frequency	Percentage (%)
Very frequent (At least 3times a week)	27	11.8
Somewhat frequent(at least 2times a week)	34	14.9
Less frequent (mostly once a week)	123	53.9
Not frequent at all (a just a coup in a term)	44	19.3
Total	**228**	**100.0**

Source: Analysis of field survey data, 2016

4.4.4 Students' Learning of Practical agriculture

The education axiom that when a learner has not learnt that the teacher has not taught is true and directly relate to the concepts of teaching and learning as a process of inculcating the right values, attitudes, knowledge, modern life, long life skills acquisition necessary to make individuals benefit from the society as well as contribute meaningfully to the same society (Modebelu & Nwakpadolu, 2013). It is upon this well-established axiom that the study examined how the surveyed students are learning and acquiring practical skills in agriculture.

Students' active participation in practical session is imperative in their ability to acquire practical skills to build on their practical competency in agriculture. As a result, students were asked to indicate the extent to which their practical lesson allowed for active participation of every student. Likert type scale ranging from 1 = very actively participatory

to 4 = not participatory at all was developed to measure students' score on the extent to which their practical sessions allowed for their active participation. Analysis of their responses gathered is presented in the Table 4.11.

As shown in the table below, about half (49.7 %) of the 228 students interviewed indicated that the practical lessons' sessions allowed for less actively participation by all students while only 13.2 percent and 28.5 percent described their participation in practical lesson sessions as very actively participatory and somewhat actively participatory respectively. However, only 8.8 percent think that their practical lesson sessions do not allowed for their active participation at all.

Table 4.11: Frequent Distribution of Students' participation in practical lessons

Teaching method	Frequency	Percentage (%)
Very Actively participatory	30	13.2
Somewhat actively participatory	65	28.5
Less actively participatory	113	49.7
Not participatory at all	20	8.8
Total	**228**	**100.0**

Source; Analysis of field survey data, 2016

4.4.5 Students' Hands – on Experience in Practical Agriculture

Direct and hand–on experience with various agricultural practices is imperative in students' skills acquisition. As such, the study assessed students' hands– on experience in various activities in crop and animal production. Students were asked direct question 'have you ever had direct practical hands-on experience on the under listed agricultural activities?' and their

yes or no responses are summarised in the Table 4.12. As shown in the Table 4.13, majority (86.8 percent) of the students interviewed ever have hands–on experience in land preparation/garden bed raising, while 60 percent and 55 percent have hands–on experience in seed selection/germination test conducting and sowing/planting and transplanting respectively.

The study also established majority (95.0 %) of the sampled students said that, they have ever had hands –on experience in weeding. The study further established that, majority (61.0 percent, 53.9 percent and 89.9 percent) of the students sampled never had hands-on experience in practical agriculture in spraying weedicide/insecticides, Post-harvest handling and storage and plant sample collection / preservation respectively. The results also found out that, 88.2 percent, 84.7 percent, 82.5 percent, 79.8 percent and 65.8 percent of the sampled students have not had hands –on experience on practical agricultural activities in Castration, Vaccination administration, Disease identification, Breed selection and Feed Formulation respectively.

Results from focus group discussion discovered that, many of the students sampled never had hands –on experience in practical agriculture in compost preparation, post-harvest handling and storage, plant sample collection/preservation, Castration, Record keeping, Grafting, integrated weed and pest management, Vaccination administration, Disease identification, Breed selection and Feed Formulation. According to the group members (i.e. focus group members) those of them who had ever had hands-experience on each of the following agricultural activities: Castration, Vaccination administration, Disease identification, Breed selection and Feed Formulation Castration, Vaccination administration, Disease identification, Breed selection and Feed Formulation at their homes but not because

of the school agriculture practical lessons. They further explained that, agriculture is the main occupation and the main livelihood of their parents and that they follow their parents to farms where they assist them to carry out farming activities. The indication is that teaching and learning of agricultural science in the sampled schools neglect the practical aspect of the programme. This definitely does not promote practical skills acquisition among SHSs agricultural science students. This presents a bleak future agriculture growth and development in Ghana.

Table 4.12 Frequent Distribution of students' hands – Experience on Agricultural Activities

Agricultural Activities		**Yes**		**No**	
		Freq.	Percent (%)	Freq.	Percent (%)
Crop Husbandry	Land preparation/garden bed raising	198	86.8	30	13.2
	Seed selection(germination test)	137	60.0	91	40.0
	Sowing/Planting/transplanting	125	55.0	103	45.0
	Weeding	217	95.0	11	5.5
	Spraying of weedicides/insecticides	89	39.0	139	61.0
	Fertilizer application	122	53.5	106	46.5
	Harvesting	192	84.2	36	15.8
	Post-harvest handling and storage	105	46.1	123	53.9
	Plant sample collection/preservation	205	89.9	23	10.1
Animal Husbandry	Feed formulation	78	34.2	150	65.8
	Feeding and watering	180	78.9	48	21.1
	Pens cleaning	150	65.8	78	34.1
	Breed selection	46	20.2	182	79.8
	Disease identification	40	17.5	188	82.5
	Vaccination administration	35	15.3	193	84.7
	Castration	27	11.8	201	88.2

Source; Analysis of field survey data, 2016

4.5 Students' Perception about their Agricultural Practical Competency

This section presents results and discussion on students' perceptions about their agricultural practical competency. The section presents information addressing objective two of this study which sought to 'examine the perceptions agricultural science students have about their practical competency in agriculture'.

4.5.1 Students' Self-efficacy and practical competency in agriculture

Guided by Pajares and Schunk's (2002) framework of self-concept and self-efficacy, during the data collection process, students were asked 'can' questions such as can you do germination test?, can you do animal feed formulation?, among others in order to measure their self – efficacy perceptions about their agricultural practical competency. Whereas their self-concept competency perceptions, students were asked "being" questions such am I good at doing germination test, am I good at formulating animal feed among others in order to measure their self-concept competency perceptions about practical agriculture.

4.5.1.1 Students' Self-efficacy in practical Agriculture

Analysis of students' responses to the question 'can you do the following agricultural activities?' which was used to measure their self-efficacy perceptions in practical agriculture is presented in the Table 4.13. The results as shown in the Table 4.13, demonstrates that overwhelming majority (83.3 percent) of the 228 students interviewed indicated that they can undertake Feeding and watering and Pens Cleaning. The results also revealed that 95.0 percent of the number of students perceived that they can prepare land /raise garden bed and weed, while about 62.3 percent and 57.0 percent said that they can do seed selection (germination test) and sowing/planting/transplanting respectively.

During the focus group discussion it was discovered that, most of the agricultural science students in SHSs in the Sagnarigu District perceived that, they cannot perform the following tasks in agriculture: prepare compost, accurately measure fertilizer, formulate feed, administer Vaccine, Graft plant, experiment. The implication therefore is that, the students are less efficacious so far as practical skills acquisition is concern. It also implies that, students lack measurement skills, experimentation skills, problem solving skills, manipulation skills this clearly show that the requirement of the practical skills training needs of the agricultural science students as indicated in the teaching syllabus have been defeated. It also has implication on student's attitude towards agriculture. In other words students inability to perform to prepare compost, accurately measure fertilizer, formulate feed, administer Vaccine, Graft plant, experiment would lead to development of poor attitude towards agriculture in general and practical agriculture in particular. Besides that, students inability to prepare compost, accurately measure fertilizer, formulate feed, administer Vaccine, Graft plant, experiment negatively affect the occupational proficiency of agricultural science students.

Results from focus group discussion also revealed that, students are less efficacious in the following agriculture activities practically: prepare compost, accurately measure fertilizer, formulate feed, administer Vaccine, Graft plant, experiment would lead to development of poor attitude towards agriculture in general and practical agriculture in particular. This certainly does not present a good picture for agriculture growth and development agenda in Ghana.

Table 4.13: Frequency Distribution of student's self-efficacy perceptions in practical agriculture

Can you do the following agricultural Activities		Yes		No	
		Freq.	Percent (%)	Freq.	Percent (%)
Crop Husbandry	Land preparation/garden bed raising	217	95.0	11	5.5
	Seed selection(germination test)	142	62.3	86	37.7
	Sowing/Planting/transplanting	130	57.0	98	42.0
	Weeding	217	95.0	11	5.5
	Spraying of weedicides/insecticides	105	46.1	123	53.9
	Fertilizer application	125	54.8	105	45.2
	Harvesting	200	87.7	28	12.2
	Post-harvest handling and storage	105	46.1	123	53.9
	Plant sample collection/preservation	217	95.0	11	5.5
Animal Husbandry	Feed formulation	85	37.3	143	62.7
	Feeding and watering	190	83.3	38	16.7
	Pens cleaning	160	70.2	68	29.8
	Breed selection	65	28.5	163	71.5
	Disease identification	50	21.9	178	78.1
	Vaccination administration	40	17.5	188	82.5
	Castration	35	15.3	193	84.7

Source; Analysis of field survey data, 2016

4.5.1.2 Students' Self-Concept in practical Agriculture

Analysis of students' responses to the question 'are you good at doing the following agricultural activities?' which was used to measure their self-concept perceptions in practical agriculture is presented in the Table 4.14.

Results of the analysis of students' responses to the question 'are you good at the following agricultural activities revealed mixed perceptions of students about their self-conceptions about their agricultural practical competency?. As shown in the Table 4.15 more than half (59.0 percent) of students interviewed indicated that they are good at land preparation/garden bed raising, while 41.7 percent and 39.2 percent were of the view that they are good at Seed selection (germination test) and sowing/planting/transplanting

respectively. According to the results of this study majority (78.1 percent, 86.8 percent, 89.0 percent, 92.5 percent and 93.4 percent) of the students perceived that they were not good at Feed formulation, Breed selection, Disease identification, and Castration and Vaccination administration respectively.

Results from focus group discussions showed that many students are good land preparation/garden bed raising, seed selection and harvesting. Members of focus group discussion also said that, they were not good at compost preparation, accurate measurement of fertilizer, Breed selection, Vaccination administration, Castration, Grafting, and Experiment. The results is not surprising because land preparation/garden bed raising, seed selection and harvesting do not require special training before one can perform such agricultural activities unlike compost preparation, Accurate measurement of fertilizer, Breed selection, Vaccination administration, Castration, Grafting, and Experimentation which need special practical skill training before one can perform these agricultural activities creditably. This means that these students can not undertake sustainable agriculture activities because they cannot prepare their own compost and for that matter would have to rely on synthetic fertilizer this would undoubtedly leads to high cost of production and low profit margins. Student's low self-concept in accurate measurement in fertilizer application means that they cannot apply the right quantity of fertilizer in their farm lands. In other words, student's low self-concept in accurate measurement of fertilizer application means that, they either apply small quantity of fertilizer or high quantity of fertilizer in their farm lands. This also has both cost implication as well as environmental implication. The cost implication is that, much amount of money would be spent to purchase fertilizer. This would also bring about low profit. The environmental implication is that, high quantity of fertilizer

application leads to environmental pollution which has detrimental effect on health of both human beings and animals.

Students attributed their inability to perform these tasks namely: land preparation/garden bed raising, seed selection and harvesting prepare compost, accurately measure fertilizer, formulate feed, administer Vaccine, Graft plant, and experiment practically to lack of hands-on experience in practical agriculture in school.

Table 4.14: Student's self-concept perceptions in practical agriculture

Are you good at doing the following agricultural Activities		Yes		No	
		Freq.	Percent (%)	Freq.	Percent (%)
Crop Husbandry	Land preparation/garden bed raising	170	59.0	58	20.1
	Seed selection(germination test)	120	41.7	108	37.5
	Sowing/Planting/transplanting	113	39.2	115	39.9
	Weeding	203	70.5	25	8.7
	Spraying of weedicides/insecticides	70	24.3	158	54.9
	Fertilizer application	102	35.4	126	43.8
	Harvesting	178	61.8	50	17.4
	Post-harvest handling and storage	97	33.7	131	45.5
	Plant sample collection/preservation	179	62.2	49	17.0
Animal Husbandry	Feed formulation	50	21.9	178	78.1
	Feeding and watering	150	65.8	78	34.2
	Pens cleaning	120	52.6	108	47.4
	Breed selection	30	13.2	198	86.8
	Disease identification	25	11.0	203	89.0
	Vaccination administration	15	6.6	213	93.4
	Castration	17	7.5	211	92.5

Source; Analysis of field survey data, 2016

4.5.2 Students' perceptions about the effectiveness of their practical lessons

The effectiveness of practical lessons as perceived by students in terms of it contribution to students' agricultural skills acquisition and competency were captured from the responses of students to the question 'on a Likert scale of 1 – 5, (where 1 means very effective and

4means not effective at all') score your perception of the effectiveness of practical lessons in the school in terms of its contribution to your agricultural skills acquisition?' Results of the analysis of students' responses to the question is shown in the Table 4.15

As shown in the Table 4.15, only 26.3 percent of the 228 students ranked the effectiveness of the practical lessons organized by the school as very effective in contributing to their agricultural practical skills acquisition and competency. However, majority (52.6 percent) of the 228 students ranked the effectiveness of school agricultural science practical lessons as somewhat effective in contributing their agricultural practical skills acquisition and competency while only 12.2 percent and 8.7 percent respectively ranked the contribution of practical lesson to their agricultural skills acquisition as less effective and not effective at all respectively.

Thus in general, there is mixed feeling among students concerning the effectiveness of their practical lessons in contributing to their agricultural skills acquisition and competency. However, majority of the students have positive attitude towards the effectiveness of practical lessons organized in schools in contributing to their agricultural skills acquisition and competence building in handling agricultural tasks.

Table 4.15: Frequent Distribution of Students' effectiveness of practical lessons

Teaching of practical lessons	Frequency	Percentage (%)
Very effective	60	26.3
Somewhat effective	120	52.6
Less actively effective	28	12.2
Not participatory effective	20	8.7
Total	**228**	**100.0**

Source; Analysis of field survey data, 2016

5.5.3 Assessment method used by elective subject teachers

To find out the mode of assessment commonly used by agriculture elective subject teachers, agricultural science students were asked to indicate the various assessment methods used by their teachers during focus group discussions. Besides that, students were asked to indicate the frequency of assessment. The results from focus group discussions indicates that elective subject teachers who are teaching agricultural science students in the schools sampled used different methods to assess their students. All these methods are used to evaluate students' understanding of concepts, theories and principles of Agricultural Science. Among the assessment methods used by elective subject teachers include: home assignment, class exercise, project work, class test and end of term examination.

According to the Agriculture Science students in the four Senior High Schools, their general agricultural science, physics and chemistry teachers frequently used assignment methods whilst animal husbandry, crop husbandry and horticulture teachers frequently used class exercise assessment methods to assess them during teaching and learning of Agriculture

science programme. The result also established that project work and end term exams are among the assessment methods that the teachers do not frequently used.

Table 4.16: Frequency of assessment of students

Frequency of assessment	Frequency	Percentage (%)
Once a week	109	52.2
Twice a week	59	28.2
Three times a week	22	10.5
Four times a week	4	1.9
Others	15	7.2
Total	209	100.0

Source: Analysis of field survey data, 2016

According to the results of this, majority (52.2%) of the student reported that they are assess once in a week whilst a fraction (1.9%) of the student said that they are assessed four times in a week as shown in Table 4.16 above. The inability of the teachers to frequently assess their students can be attributed to large number of students and other co-curricular activities assign to teachers.

4.4 Teaching and Learning of Agriculture in SHSs

This section presents analysis of the approaches and methods used in the teaching and learning of both theoretical and practical agriculture in the sampled schools. This section sought to address the third specific objective of this study. The objective three of this study sought to assess the teaching and learning methods and techniques mostly employed in the

teaching and learning of SHSs agricultural science practical lessons among SHSs in the Sagnarigu District.

4.4.1 Teaching Methods use in the teaching and learning of agriculture science

Agricultural science in SHSs in Ghana is taught as both vocational and science curricula, as students are expected to have the understanding of agriculture as science and they should be able to have the skills to practices it as a vocation or profession. As such the approaches and strategies used in teaching agriculture science is different from theory base subjects. The teaching syllabus for general agriculture science in SHSs in Ghana, have the following as the scope of the content of the syllabus: Introduction to Agriculture and Agricultural Education, Soil uses and Management, Farm Mechanisation, Crop Production, Animal Production, Agricultural Economics, Agribusiness and Extension.

'The content of this syllabus has been designed in a way that will offer knowledge and skills to students for whom Senior High School education is terminal. Knowledge and practices acquired in this subject will enable such students to work on their own, or seek employment in agricultural establishments. The syllabus also provides adequate foundation knowledge and skills for students who will want to pursue further education and training in agriculture after SHS' (MOE, 2010).This was the guiding principles for enquiring into how agriculture is taught in the SHSs in order to achieve the above objective and scope of agricultural science education in Ghana. In proceeding the study sought to find out the views of teachers on the methods used in the teaching of Agricultural science, the choice of method used, whether the lecture method permits rapid cover of materials and also whether the teaching

techniques and methods used by them impart the requisite knowledge and skills envisaged in the general agricultural syllabus and curricula development by the Ministry of education.

Analysis of data gathered in a focus group discussion with teachers teaching agriculture and in-depth interviews with Head of Agricultural science Departments in all the sampled school revealed that, teachers mostly used lecture, discussions and questions and answers methods in teaching theoretical lessons in agriculture while demonstration methods, laboratory works, equipment measurement and calibration, filed visits, plants and animal sample collection and identification and simulation exercise in teaching practical skills in agriculture.

The teachers in the focus group discussion indicated that, they usually teach the theoretical lessons first before introducing students to the practical. They were however of the view that the various elective course taught in agriculture science require different practical sessions. They indicated that while chemistry and physics practical are mostly undertaken in laboratory that of horticulture, animal husbandry, biology and general agriculture are usually undertaken both in the laboratory and out in the field and school farms and garden. But the general lack of school farms and gardens in the sampled school they observed presents practical difficult for them in handling practical lessons.

Also analysis of responses to the questions which of the teaching methods do you mostly use in teaching students is presented in Table 4.17. As shown in Table 4.17 below, the question relating to the method used by respondents in the teaching of Agricultural Science reveals that 35.3% of the respondents used the lecture method, 11.7% of the respondents either use field trip and Hands-on experiment while 17.6 mostly used demonstration teaching method, and 23.5% used discussion teaching method mostly. Most of the teachers indicated that

lecture and discussion methods are mostly favoured because they permit rapid coverage of syllabus and are also cheap and less difficult to organize. Similar findings were observed in Awuku, *et al*., (1991) and very recently in Darko, *et al*., (2015).

The frequent used of discussion and lecture teaching methods as reported in this study is contrary to (Vandenbosch *et al*., 2006) who said that Agriculture education and training is special in relative to other forms of education and training in that agriculture cannot be learned mainly through the field or the classroom. The author indicated that, practical training such as traditional training should be complemented with more formal learning to enable many aspects of agriculture and rural development to be seen in their true perspective. The results of this study however agrees with Ngesa (2006) who indicated that teachers of agriculture in Kenya use lecture, class discussion and group discussion methods. The findings of this study is in line with Alkali (2010) who said that with the current approach of teaching and learning which consists mainly of lecture method for example; only 3% of those who were trained in agricultural institutions take to agriculture after leaving school. The author attributes this to ill preparation of the products whose training does not equip them to acquire useful knowledge and practical skills in agriculture.

With regard to field trips and hand-on experience, the teachers interviewed indicated that, they require approval from school authority and funds to be released before they can execute the task when they want to use these methods. The teachers disagreed that the choice of teaching method to use is entire the decision of the teacher arguing that issues such as releasing of funds and vehicle to take on a field trip, acquiring reagents and plant and animal sample is pure a management decision and the teacher have very little influence on such decision. The only thing require of the teacher is to request but it is management decision to

release funding for such activities. This contradicts the findings of Darko *et al.,* (2015) which argued that the choice of method used in teaching greatly is dependent on the teacher.

Table 4.17: Frequency Distribution of teacher's views on the Most used Teaching Method

Number of Years in Teaching	Frequency	Percentage
Lecture	6	35.3
Field trip	2	11.7
Demonstration	3	17.6
Hands-on experience	2	11.7
Discussion	4	23.5
Total	17	100

Source: Analysis of field survey data, 2016

4.4.2 Students' views on the teaching methods mostly used by their Teachers

Students were also asked of the teaching methods and strategies mostly used by their teachers in the teaching of agriculture. They mentioned lecture methods, discussion methods, question and answer methods and project teaching methods. The students were further asked which of the teaching methods is mostly used by their teachers in teaching each of the specific agriculture science electives subjective. Responses to the question were taken for each of the elective agriculture science subjective. The elective agriculture science courses were 'general agriculture' crop husbandry, animal husbandry, physics and chemistry. Results of the analysis of their responses to the question 'which of the teaching

method is mostly used by their teachers?' is presented in Table 4.17a, 4.17b, 4.17c, 4.17d , 4.17e, and 4.17f.

Table 4.17a: Teaching method use by general agricultural science teacher

Teaching method	Frequency	Percentage (%)
Lecture teaching method	143	46.1
Discussion teaching method	54	24.2
Demonstration teaching method	16	7.2
Question and answer teaching method	6	2.7
Project teaching method	2	0.9
Enquiry teaching method	2	0.9
Total	**223**	**100.0**

Source; Analysis of field survey data, 2016

For general agriculture, all the sampled students were pursuing as such they responded to the question 'which of the teaching method is mostly used by your general agriculture teacher?' The analysis of their responses as shown in Table 4.17a indicates that lecture teaching methods is mostly favored by general agriculture science teachers, as about 46.1 percent of students interviewed said their general agriculture science teachers mostly use the direct lecture method in delivery most of their lessons. The lecture method is closely followed by discussion method (24.2%), demonstration method (7.2%), question and answer method (2.7%) and project method being the least favored only 2 students indicating that they viewed their teachers to be using the project method more frequently. The general agriculture is expected to introduce students to various areas of agriculture and the basic

concepts and issues in the study of agriculture (GES, 2010). It is therefore not surprising to have the finding that lecturing method is mostly favored by general agriculture science teachers.

Table 4.17b: Teaching method use by crop husbandry teacher

Teaching method	Frequency	Percentage (%)
Discussion teaching method	28	48.3
Lecture teaching method	9	15.5
Demonstration teaching method	12	20.7
Question and answer teaching method	3	5.2
Project teaching method	5	8.6
Inquiry teaching method	1	1.7
Total	**58**	**100.0**

Source; Analysis of field survey data, 2016

For the teaching of crop husbandry, close to half (48.3%) of the 58 students who were offering crop husbandry were of the view that their teachers mostly used discussion teaching method in delivery their lessons in horticulture. However, about 15.5 percent said their teachers mostly used the lecture teaching method, while 5.2 percent and 8.6 percent indicated that, their teachers mostly used question and answer method and project method respectively. The results of this study revealed that most of the crop husbandry teachers frequently used discussion, lecture and demonstration teaching methods but only a few of them occasionally used questions and answers, project and inquiry teaching methods.

The analyses from this study therefore reject the findings of (Annor-Frempong, Zinnah & Adam, 2003) who study show that most agricultural science teachers often used a questions

and answers technique (62.5%), textbooks (47.5%), and writing of notes on the blackboard for students to copy (77.5%) during teaching and learning of the subject. According to these authors during Focus group discussions with some teachers revealed that teachers preferred these methods because they did not need extensive preparation before using these methods. The results from personal interviews with some teachers and students in this study also show that teachers in all the four sampled schools have never used resourced persons, and exhibition. The results therefore is similar to findings of (Annor-Frempong, Zinnah & Adam, 2003.) who also reported that majority of the agricultural science teachers have never used resource persons (87.5%), visits to nearby farms (62.0%) and exhibitions (77.5%) to teach agriculture . the authors also indicated that sometimes teachers use lecture methods (47.5%), posters and charts (60%), demonstrations (47.5%) and problem solving/discovery methods (55%) to teach agriculture.

The crop husbandry syllabus of the SHS agriculture science programme also covers basic principles of horticulture, cultural practices in the cultivation of horticultural crops, identification of horticultural crops and landscaping among others (GES, 2010). It is expected to involve more practical lessons to adequately equip students with the basic skills and technical competency in the cultivation of crops including horticultural crops. Therefore the fact that, demonstration and project teaching methods are not mostly used by teachers in the teaching of crop husbandry and horticulture is worrying.

Table 4.17c: Teaching methods used by Animal husbandry teachers

Teaching method	Frequency	Percentage (%)
Discussion teaching method	81	57.4
Lecture teaching method	17	12.1
Demonstration teaching method	22	15.6
Question and answer teaching method	12	8.5
Project teaching method	5	3.5
Enquiry teaching method	4	2.8
Total	141	100.0

Source; Analysis of field survey data, 2016

The 141 students who were pursuing animal husbandry as an elective course viewed that their teachers mostly used discussion teaching method, with more than half (57 %) indicate that their teachers mostly used discussion teaching method to teach animal husbandry. About 12 percent of the students interviewed think their teachers mostly used lecturing method in teaching animal husbandry, while 15.6 percent and 8.5 percent indicated that their teachers used mostly demonstration teaching method and question and answer respectively. With project teaching method and enquiry teaching method being least used teaching methods in teaching animal husbandry.

Table 4.17d. Teaching method used by Physics teachers

Teaching method	Frequency	Percentage (%)
Discussion teaching method	51	36.2
Lecture teaching method	52	36.9
Demonstration teaching method	27	19.1
Question and answer teaching method	2	1.4
Project teaching method	6	4.3
Inquiry teaching method	3	2.1
Total	141	100.0

Source; Analysis of field survey data, 2016

For teaching methods mostly used by physics teachers as perceived by the 141 students pursuing chemistry as one of their electives in the general agriculture science, the results of the analysis is presented in 4.17d. As shown in the Table 4.17d, about 36 percent think that their teachers mostly used discussion teaching methods in covering the syllabus in elective physics, while about 40 percent and 19 percent indicated that their teachers mostly used lecture teaching method and demonstration respectively. Question and answer teaching method, project teaching method and enquiry teaching method are rarely used by physics teachers. With only 1.4 percent, 4.3 percent and 2.1 percent indicated that their physics teachers mostly used question and answers teaching method, project teaching method and enquiry teaching method respectively. With less use of project teaching method in teaching physics which is practical related subject is worrying.

Table 4.17e: Teaching method used by Chemistry teachers

Teaching method	Frequency	Percentage (%)
Discussion teaching method	85	38.6
Lecture teaching method	70	31.8
Demonstration teaching method	44	20.0
Question and answer teaching method	10	4.5
Project teaching method	4	2.3
Inquiry teaching method	6	2.7
Total	**220**	**100**

Source; Analysis of field survey data, 2016

The analysis of students' responses about which teaching method is mostly used by their chemistry teachers is presented in Table 4.17e. As shown in the Table 4.17e, about 39 percent, 32 percent and 20 percent indicated that their teachers mostly used discussion, lecturing teaching methods and demonstration teaching method respectively. However, question and answer teaching method, project teaching method and enquiry teaching method have been found to be rarely used by chemistry teachers. As shown in the table, 4.18e only 4.5 percent, 2.3 percent and 2.7 percent respectively indicated that their chemistry teachers mostly used question and answer teaching method, project teaching method and enquiry teaching method in delivery their lessons.

Table 4.17f: Teaching method used by Horticulture teachers

Teaching method	Frequency	Percentage (%)
Discussion teaching method	32	37.2
Lecture teaching method	18	20.9
Demonstration teaching method	24	27.9
Question and answer teaching method	3	3.5
Project teaching method	7	8.1
Inquiry teaching method	2	2.3
Total	**86**	**100.0**

Source; Analysis of field survey data, 2016

Also discussion teaching method, lecture method and demonstration method were mostly seen by students as the mostly frequent used teaching method by their teachers in delivery horticultural lesson. As presented in Table 4.17f about 37 percent, 21 percent and 28 percent respectively indicated that their horticultural teachers mostly used discussion teaching method, lecture method and demonstration method. However, question and answer teaching method, project teaching method and enquiry teaching method were rarely used by their teachers in delivery horticultural lessons. Only 3.5 percent, 8.1 percent and 2.3 percent respectively indicated their teachers mostly used question and answer teaching method, project teaching method and enquiry teaching method.

4.4.3 Method Use in Teaching Practical Agriculture

This sub-section presents results and discussion on teaching and learning of practical agriculture. The 17 elective agriculture teachers interviewed in this study were asked to

indicate which methods they often used in teaching practical agriculture lessons. Analysis of their responses is shown in Figure 4.2. In-depth interviews with the sampled teachers revealed that the teachers use fieldtrips where students are taken out of the school to observe farms, tools, implements, animal and other agricultural products and activities. The teachers also use demonstration methods to execute their practical lessons. Hands – on experience where students are allowed to have a practical feel of their object of study through experiential learning techniques, is also being used by teachers to deliver their practical lessons. Also discussion teaching method is a teaching method, where teachers hold discussions with their students during teaching and learning of practical lessons is employed.

Demonstration (29.4 percent), discussion (29.4 percent) and hand – on experience (23.5 percent) are the most frequent used methods in the delivery of practical lesson by the agricultural science teachers surveyed in this study. Only 17.6 percent of the 17 teachers interviewed indicted that they mostly used fieldtrips in delivery of their practical lessons.

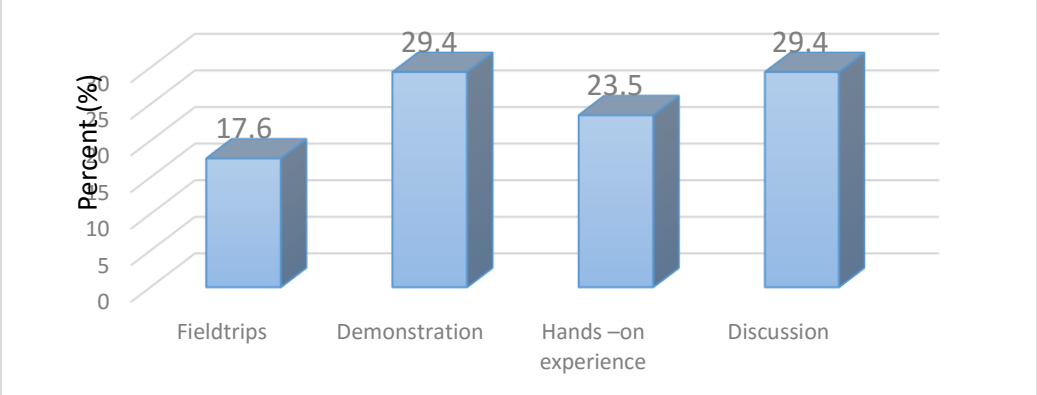

Figure 4.2 Bar Graph of Method of teaching practical agriculture

Source; Analysis of field survey data, 2016

4.6 Constraints Affecting teaching and learning of Agriculture Practical Lessons

The study assessed the constraints and challenges teachers, school authorities and students are faced with in facilitating the teaching and learning of practical agriculture. This section presents the results of quantitative data of the assessments of constraints and challenges facing the teaching and learning of practical agriculture. On the part of teachers, school authorities and heads of agricultural science departments, analysis of their responses to the question 'what are the challenges or constraints facing teaching and learning of practical agriculture in your school' indicate wide range of challenges. The challenges elaborated by teachers included work overload, lack of teaching and learning materials and aids, lack of funds and resources to carry out practical lessons, large class size making teaching of practical skills difficulty, lack of school farms/garden and well-resourced laboratories and workshops.

With regard to the students, they were asked to list the constraints they faced in the teaching and learning of practical agriculture and rank them in the order of severity. Kendall's co-efficient of concordance was applied to assess the level of agreement among the ranks and most severe constraints facing the teaching and learning of practical agriculture. Results of the analysis of the Kendall's co-efficient and mean rank is shown in the Table 4.18.

As shown in the table, the Kendall's W = 0.696, (χ2(cal) =1728.2); χ2 (tab) = 39.819; Level of sig=0.05) indicating that about 70% of the ranked scores by 228 students were in agreement at 5% level of significant. The results of the analysis of Kendall's co-efficient and mean rank shown in Table 4.18 has therefore established that, Inadequate teaching and learning materials(rank 1) was considered the most important factor that negatively affect teaching and learning of Senior High School Agricultural science practical lessons in the

Sagnarigu District. It was followed by Students overloaded with other subjects (rank 2) and Limited time allocated to practical lessons (rank 3) was considered the third important factor that affect teaching and learning of Senior High School Agricultural Science practical lessons in the Sagnarigu District, whilst Lack/poor attitude of school authority towards practical (rank 14) was considered the least militating factor. The implication is that, effective and learning would be negatively, be affected.

Table 4.18: Constraints to the teaching and learning of practical agriculture

Constraint	Mean Rank	Rank
Lack/poor attitude of school authority towards practical	*12.39*	***14***
Inadequate teachers and farm workers/lab assistants	*11.84*	***13***
Limited/poor field trips for practical	*10.20*	***12***
Lack of opportunity for hand – on experience	*10.19*	***11***
Teachers overloaded with teaching and other assignments	*9.77*	***10***
Inadequate Access to laboratory and workshops	*9.62*	***9***
Poor students' attitude and interest on practical lessons	*7.93*	***8***
Lack of adequate resources/funds for practical	*7.18*	***7***
Large student numbers	*5.67*	***6***
Unavailability of school farm/garden	*5.24*	***5***
Poor teacher attitude and interest on practical lessons	*4.44*	***4***
Limited time allocated to practical lessons	*4.35*	***3***
Students overloaded with other subjects	*3.99*	***2***
Inadequate teaching and learning materials	*2.18*	***1***

Sample size (n) =228; Number of constraints ranked=14; df=13; Rank 1=most important, Rank14=least important; Kendall's W=0.696; χ^2(cal)=1728.2); χ^2 (tab) = 39.819; Level of sig=0.05

Source: Analysis of Field Survey Data, 2016

4.6.1.4 Inadequate Funding for SHSs Agriculture Science Practical in the Sagnarigu District

According to the findings of this study majority (52.9 %) of the sampled elective subject teachers indicated that they do receive funds for practical lessons in agricultural science whilst 47.1% also indicated that they do not receive funds for practical lessons in agricultural science as demonstrated in the pie chart. The findings of this study also established that all the sampled teachers were of the view of that the funds provided for practical lessons are not adequate.

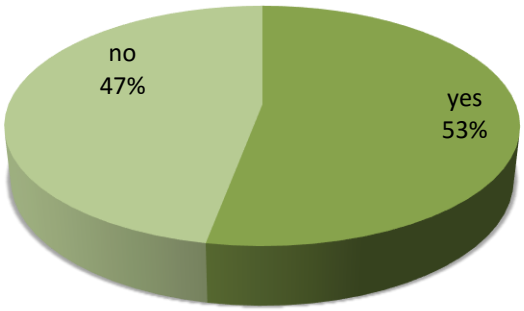

Figure 4.3 Funding of agricultural science practical lesson

Source: Analysis of Field Survey Data, 2016

Consequently, teachers purchase only few instructional aids, put students into groups, improvise, organize practical lessons once a year, levy each agricultural science students to pay GH¢5.00, teachers own funds to be able to organize practical lessons. The results also established that funds are received once a year.

On the issue of teachers' perception about school administration support to the Agriculture education programme, a four point scale rating of very good, good, poor and very poor was

use to rate administration support for agricultural science programme. Majority (69%) of the teachers have said that their school administration support to agricultural science programme was good whiles 19% and 2%of the 16 teachers who rated their perception of school administrators support to agricultural science programmes were found to be poor and very poor respectively, as shown in the figure 4.4. This is indicated by the bar chart below. According to the result of this study sample teacher said that apart from the school administration that provide financial support teachers also obtain funds from student contribution, teachers own funds, NGOs.

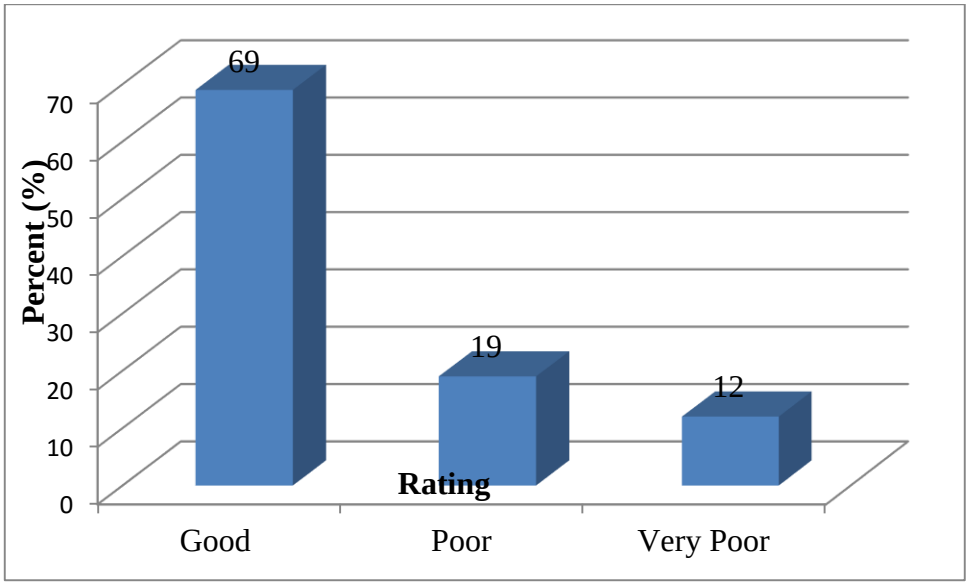

Figure 4.4: Frequency distribution of teachers' perception about funding

Source: Analysis of Field Survey Data, 2016

With regards to funds specific constraints, teachers perceived that inadequate funds, delay in the release of funds are some of the factors that negatively affects teaching and learning of agriculture.

4.6.2.1 Agriculture Science Teachers Work Loads

Teaching loads on teachers were assessed using the number of teaching period covered by a teacher per week. Teaching period consists of 45 minutes of contact hours. According to the results of this study as shown in the Table 4.19, majority 6 (35.3%) of the teachers interviewed teach 24 periods in a week, 4 (23.5%) of them teach 18 periods per week, while 11. 8 percent teach 20 periods and 25 periods per week and the rest teach 22, 27 and 29 periods/lesson per week which constitute 5.9 percent. According to GES standards each teacher should teach a minimum of 24 periods in a week and a maximum of 36 periods in a week. The implication is that majority of the elective subject teachers in SHSs are teaching the minimum periods in a week. It can therefore be argued that by GES's standards the teachers are not overloaded and as such they will have time to adequately cover the course outline for the benefit of students.

Table 4.19: Frequent Distribution of teaching load per week

Number of Periods taught per week	Frequency	Percentage
18	4	23.5
20	2	11.8
22	1	5.9
24	6	35.3
25	2	11.8
27	1	5.9
29	1	5.9
Total	**17**	**100**

Source: Author analysis of field survey data, 2016

4.6. Number of Subjects being taught

Apart from number of contact hours, the number of subjects allocated per teacher is also important as it has a bearing on the teacher time, experience and ability to master teaching. The results on the number of subjects allocated per teacher as shown in the Figure 4.5 show that 58.8 percent of the sampled teachers teach 2 subjects while 41.2 percent teach one subject.

The elective teachers are not overloaded with so many subjects and this create conducive environment for them to master and specialise in the subjects they are teaching which is important in making them teach effectively. It was also reported that subject allocation in important in making them teach effectively. It was also reported that subject allocation in all the four schools are done with due consideration to the area of specialisation of the teachers in their tertiary level. With less, subjects to teach the teachers can plan and prepare detail lesson notes to bring about effective learning.

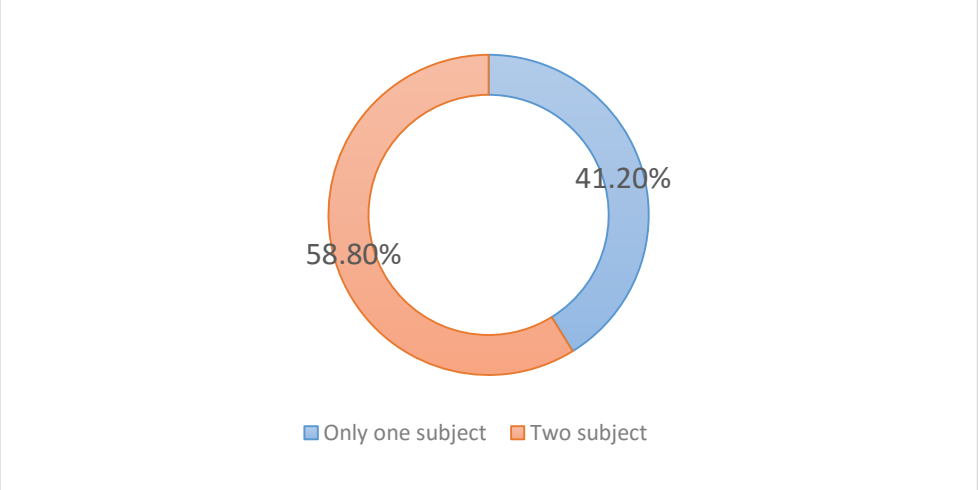

Figure 4.5 Illustrating Number of subjects taught by teacher

Source: Analysis of Field Survey Data, 2016

4.6. Class size per lesson and teacher

On the issue regarding the number of students an elective subject teacher teach shows as shown in the Table 4.20 indicate majority (29.5 %) of the 17 teachers surveyed teach more than 350 students per subject with only 17.7 percent teaching less than 200 students per subject.The results also established that, about 23.6 percent and 11.8 percent of the teachers were teaching between 200 – 250 and 251 – 300 students respectively. It is also clearly shown in the results that the minimum number of students per teacher in the Sagnarigu District is 150 students' for the elective, while the maximum number of students an elective subject teacher teaches is 530 students. Apart from teaching load, the teachers are assigned with other responsibilities in their schools namely: Form Masters/Mistress, School Secretary, Head of Departments, House Master/Mistress, Welfare Officers, Guidance and Counseling, etc. This means that, teachers are assigned with many responsibilities in their schools.

The large size of class handled by the teacher surveyed will in no doubt impact negatively on their ability to ensure effective teaching necessary for learning to take place. Such large classes put a lot of stress on practical lessons as a result of students having share tools and equipment during practical sessions. Also taking such large numbers for fieldtrips have been observed by the teachers to be difficult in arrangement for transportation and arranging adequate space, tools, equipment and material needed to teach practical lessons.

Table 4. 20 Number of Students taught per subject per teacher

Number of Students	Frequency	Percentage
<200	3	17.7
200 – 250	3	17.7
251 – 300	4	23.6
301 – 350	2	11.8
More than 350	5	29.5
Total	**17**	**100.0**

Source: Author's analysis of field survey data, 2016

This findings is in-line with the findings of Awuku *et al.,* (1991), and Wootoyitidde (2010) which show that teaching and learning of practical agriculture is hindered due to a number of constraints namely: inadequate instructional aids, poor funding, lack of support, lack motivation, low wages and salaries of teachers, absence of school farm. The results also corroborate with the findings of Amuah, (2009) who also mentioned inadequate facilities, low professional and efficiency levels of teachers, poor attitudes of teachers, poor funding, school administrators and parents towards agricultural education, and political instability as Common problems of teaching agricultural practical in developing country like Nigeria. Similarly the findings of this study, is in agreement with the work of Ingersoll (2001) who said that large class sizes; inadequate time to prepare and lack of community support are some of the constraints affecting teaching and learning process.

4.6.1 Constraints and challenges affecting teaching and learning of practical agriculture

Environment and setting have always been noted as having effect on teaching and learning and therefore critical in assessing constraints and challenges affecting the teaching and learning of practical agriculture in the sampled schools. This section therefore provides information on the qualitative data of this study which sought 'to describe constraints and challenges affecting and learning of agricultural science practical lessons among SHSs in the Sagnarigu District'. In this section results and discussion of the availability of learning facilities and materials, infrastructure, laboratories, workshops, learning aids, school farms and gardens, logistics for movement among others were assessed in all the sampled schools with the views of understanding their effects on teaching and learning of agriculture.

4.6.1.1 Inadequate teaching and learning materials

Availability and accessibility of teaching and learning materials or aids in the four sampled schools were assessed based on the information recorded on the observation check list used during the data collection phase of the study and interactions with school authorities. Field observation results in this study shows that, the sampled schools lack basic teaching aids and important instructional materials for teaching of practical skills. From the observation check lists and interactions with school authorities, following instructional aids are not available in all the four sampled schools:

- Audio-visual aids for demonstrations and simulation purposes. Video demonstration of important agricultural tasks such as castration, dehorning, identification, creep feeding etc, are critical in imparting practical agricultural skills on students. The GES's approved syllabus of agricultural science

requires schools to have Video and pictures of different systems of keeping animals ; Pictures and CDs of useful plants species and some wild forest animals ; video of forest scenes, video and pictures on uses of timber and non-timber species ; videos on processes of deforestation; CDs and pictures of vegetables, field crops, tree and plantation crops, animals feeds (grasses and legumes etc);

- Functional animal farm/pen for practical teaching of animal husbandry practices. According to GES agricultural science syllabus, SHSs offering agricultural science should have functional animal farm consisting of sheep / goat pen with at least ten (10) animals; video and pictures of diseased, animals and animal diseases, pest/parasites, pathogens; a Six-unit piggery or a poultry farm (with a least 60 birds of jobs; Rabbits / guinea pigs/glasscutter farm (with at least 20 animals);
- Functional and maintained crop museum/herbarium to preserve plants and other fauna products for teaching and learning purposes. Plant herbarium helps preserve plants and plant materials for demonstration to students and for plant identification and for examination. Also, pictures and videos of plants and plant materials mostly sowed in digital form may also be kept in herbarium for teaching and learning of practical agriculture. It is therefore important for every agricultural school to keep and maintain functioning plant museum/herbarium to aid its practical lessons and to expose students to real plants and plant materials. Therefore to have this important facility lacking in all the schools sampled in this study is worrying as it will

definitely have negative effects on teaching and learning of practical agriculture. Students are made to keep plants albums to make up the lack of plant museum/herbarium.

- Basic agricultural equipment and tools for use in skill training and agricultural practice by students. Apart from hoes and cutlasses, the sampled school lacks most important agricultural tools equipment such soil PH kit, Gunter, chain, measuring tape, prismatic compass, theodolite, dumpy level, abney level, tripod stand, Global placement system (GPS). Total station (TS) among others. Agricultural machineries and farm implements such as tractors, harvesters, ploughs, harrows, ridgers, slashers, irrigation facilities among others used for teaching purpose is completely lacking in all the six sampled in this study. Also teaching models of these machineries and implements are not available in the schools. Teachers and school authorities indicated that they usually take students on field tour to see and observe the operations of these machineries and implements, which they observed rarely organized because of lack of funds.

4.6.1.2 Availability of School Library

Field observation results in these study show that all the schools have libraries. However the libraries are not well resourced with agricultural science and related subjects books. Especially handbooks on agricultural activities and manual for various crop productions are lacking in the various libraries of the sampled schools. Both teachers and students

complained of unavailability of reference reading materials in the various sampled schools. Also the few available related books and reading materials in the various libraries are outmoded and lack relevance in the context of agriculture education in Ghana and Africa. In other words these libraries do not have up to date reading materials that can be used as reference materials for both teachers and students for research and private study. It can be argued that libraries in the various schools will not be able to adequately fulfil their traditional function such as systematic provision of information, to improve and to increase the reading skills of students as well as enable student to develop the habit of learning.

The study also established that none of the schools have the following materials in their libraries; Video tapes recordings of all types, slides, academic journals of agriculture education, magazines of agriculture education, agriculture education bulletin, study kits that can be used by both teachers and students for study as well as for entertainment purposes. Consequently teachers and students alike more often than not depend on pamphlets and the electronic media for their source of educational information. The researcher also observed that, none of the school libraries, physical space is large enough to even be able to accommodate at least quarter of the student population at a time.

Besides, the researcher found out that, some of the reading materials are too foreign to Ghanaian students. The implication is that, such reading materials might not be relevant to student training needs in the country. The possibility is that, such materials are likely not to be used by teachers and students and will therefore continue to occupy space and continue to gather dust in the shelves of school libraries and for that matter need to be weeded to pave way for modern and relevant stock of books and other reference materials.

4.6.1.3. Availability of school laboratory

Three out of the four sampled schools have buildings they called laboratory where some practical lessons can be done. However, one of the schools does not even have a building they can call school laboratory at all. Rather what they have is an improvised schools laboratory in that the said school laboratory is a classroom that the school authority has converted into a laboratory. One can imagine the sort of laboratory practical skills training that goes on in such a school.

Even schools that have school laboratory are not up to standard in terms of structural design of the building and the resources (equipment) available in the laboratory. For that matter, certain laboratory practical skills training cannot take place in the school laboratory. Teachers being aware of the deficiency of their schools laboratories sometimes organized field trips to University for Development Studies laboratory at Nyankpala Campus where students are taking through certain experiments. Even at the University laboratory the level of participation (hands on experience on agriculture practical) is usually limited due to the delicate nature of laboratory equipment, short time contact as well as the processes involved in experimentation. Consequently students do not perform well in the practical examination in their final year.It also implies that students are not even familiar with some of the laboratory chemicals and equipment let alone know how to use these chemicals and equipment in the laboratory. Students inability to perform well in the practical examination will undoubtedly affect their overall grade thereby affect their chance of getting admission at the tertiary institutions particularly at the Universities. The results of this study therefore is in consonance with, that of Jones (1990), Barrow`s (1991) in Saudi Arabia, Black *et al*. (1998) in Uganda as well as (Alebiosu, 2000; Onipede, 2003) in Nigeria which show that,

many schools do not have science laboratories. The researchers reported that, where science laboratories exist they are usually not well resourced.

4.6.1.4 Availabilities and Accessibilities of School farms and Garden

Field Observation in the four sampled senior high schools in the Sagnarigu District shows that only one school (Tamale senior high school) has a relatively good school farm, even with this school the concentration is on crop production which is also done only during the rainy season after rainy season which means that no, practical lessons can be done on the field during the dry season because crop production depend on natural rainfall. This means that teachers cannot teach agricultural science students about certain agronomic practices such as land preparation, weed management, pest and disease management etc, during the dry season which coincides with the first term and second term of the academic year.

In this particular school (Tamale senior high school), the only animals present include cattle and pigs, living in a deteriorated building structures. The students do not know any husbandry practice so far as teaching and learning of practical lesson is concern. In other words field observation revealed that animal production sector of the school farm in the said school has been neglected by the school authority. The implication is that, agricultural science students cannot acquire any practical skills such as castration, vaccination, dehorning, disbudding identification of diseases of farm animals etc.

As an agriculture science teachers upon knowing the limitation of their school farm sometimes embark on field trips to places such as Pong-Tamale agricultural station, Savannah agricultural research institute (SARI), parks and gardens etc. to augment their practical skills training needs of agricultural science students. This mean that any time

agricultural science teachers wants to teach practical lessons that requires that students go to field ,the teacher has no option than to send students out of the school compound this undoubtedly goes with expenses. Two schools have only one species of animals namely Kalpohini Senior School have one only species of animals that is the school has six pigs whereas Business College International, Tamale does not have any of the livestock mentioned. Tamale Islamic science senior school on the other hand do not have anything at all.

What this means is that in such schools they will not be hands on experience on agricultural practical skills training particularly those practical skills training that requires field training in the school premises unless they go to other places for practical lessons. The indication is that schools without school farms incurred a lot of cost in order to travel to agriculture station and research institutes such as Pong-Tamale agricultural station, Savannah agricultural research institute etc. There is also the issue of tiredness of student's, short time contact between the teacher or the resource person and the students is not long enough to take care of individual student training needs at these agricultural station and research institute. In other words any time students arrive at the place of interest the student are already exhausted, this affect students attention during practical lesson at the station and research institute is not usually long enough for resource persons to take the individual students through a particular process or procedure for him or her to adequately understand the processes or procedure involve.

In brief none of the four sampled schools have the following : 2 hectare plots of farm land as required in the syllabus ; 2 Farm assistants (one for crops and one for animals); Video demonstration of castration, dehorning, identification, creep feeding etc; sheep / goat pen

with at least ten (10) animals; video and pictures of diseased, animals and animal diseases, pest/parasites, pathogens; a Six-unit piggery or a poultry farm (with a least 60 birds of jobs; Rabbits / guinea pigs/glasscutter farm (with at least 20 animals) as required in the GES teaching syllabus.

4.6. Level of Supports Schools, Society, Politicians, Civil Society (Ngos), Mofa Provide for SHSs Agricultural Science Practical Lessons

The results of the study as shown in Table 4.21 below indicate that, majority of agricultural science teachers get funds for practical lessons from the school administration through school fees (41.2%) aside the school fees, student dues constitute (35.3%) is the second major source of funds for the practical lessons. While the remaining23.5 percent of sampled teachers said that, they sometimes use their own resources whenever the two major sources of funds are not forth coming. The implication is that teachers have limited access to funds to successfully establish school farms, embark on field trips and for that matter teach practical lessons. This makes them to become frustrated during teaching and learning of practical lessons. It is also clear from the results of this study that, the communities where these schools are situated do not support the school agriculture education programme.

It is also obvious that individual philanthropist equally do not show interest in the senior high school agriculture education programme. It can also be deduced from the findings of this study that not even the non-governmental organization can be relied upon so far as financial assistance of senior high school agriculture education programme is concern, despite the existence of agriculture related non-governmental organizations in the Sagnarigu District. In other words not even the so called agriculture non-governmental organizations in

the Sagnarigu District who portray themselves as charitable organizations have been able to extend their Charity to senior agriculture science education programme.

Furthermore, the analysis of this study indicate that ministry of food and agriculture embarrassingly do not also care about the kind of training agricultural science student in the senior high school receive let alone provide any kind of support to senior high school agriculture science education programme, despite the fact that, the present day agricultural science students in our senior high schools would be the future staff of the ministry.

The analysis from this study also established that the parent teacher association in the Sagnarigu District which are known for their role in supporting several school projects in the Sagnarigu District do not also seem to know about the existence of financial and material needs of senior high school agricultural science education programme or probably they do not care about the kind of training agricultural science students are receiving from these schools? Or they simply are not interested in agricultural science education programme?

The analysis further indicate that member of parliament from the Sagnarigu District are either not aware of the plight of agricultural science teachers and students or they are simply turning a blind eye to the financial needs of senior high school agricultural science teachers and students needs in their constituencies. The analysis of this study therefore is in alignment with the findings of Mbajiorgu, Oguttu, Maake, Heeralal, Ngoepe, Masafu and Kaino (2014) who reported that, failure of parents to support their children with their studies was also identified by the educator as a hindrance to quality teaching and learning from taking place at Mandlethu FET School.

Table 4.21: What are the sources of funds for agriculture in your school?

Responses	Frequency	Percentage
School Fees	7	41.2
Students dues	6	35.3
Teachers own funds	4	23.5
Total	**17**	**100.0**

Source: field survey data, 2016

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents on the summary, conclusion and recommendation of the findings of this study.

5.1 Summary

About (86.8%) of the students interviewed ever have hands – on experience in land preparation/garden bed raising, while 60 percent and 55 percent have hands – on experience in seed selection/germination test conducting and sowing/planting and transplanting respectively. The study also established majority (95.0%) of the sampled students said that, they have ever had hands –on experience in weeding. Apart from that, the results found out that 100.0 percent of the sampled students have not had hands –on experience on practical agricultural activities in feed formulation, breed selection, disease identification, vaccination administration, castration, record keeping, grafting. The indication is that teaching and learning of agricultural science in the sampled schools neglect the practical aspect of the programme.

The analysis demonstrates that overwhelming majority (100.0%) of the 228 students interviewed indicated that they can undertake Feeding and watering and Pens Cleaning. The results also revealed that 95.0 percent of the number of students perceived that they can prepare land /raise garden bed and weed, while about 62.3 percent and 57.0 percent respectively said that they can do seed selection (germination test) and

sowing/planting/transplanting. However all the sampled students (100.0%) perceived that, they cannot perform the following tasks in agriculture: prepare compost, accurately measure fertilizer, formulate feed, administer Vaccine, Graft plant, experiment.

Results of the analysis of students' responses to the question 'are you good at the following agricultural activities revealed mixed perceptions of students about their self-conceptions about their agricultural practical competency?. As shown in the table 4.16 more than half (100.0 %) of students interviewed indicated that they are good at land preparation/garden bed raising, Seed selection (germination test) and Harvesting while 100 percent were of the view that they are not good at compost preparation, Accurate measurement of fertilizer, Breed selection, Vaccination administration, Castration, Grafting, Experiment.

The study have established that, elective subject teachers used discussion teaching method, lecture teaching method, demonstration teaching methods, inquiry teaching method, questions and answers teaching method, project teaching method to teach SHSs agricultural science students in the Sagnarigu District. In other words elective subject teachers who are teaching agriculture science students in the schools sampled used different teaching methods to teach their students. The analysis revealed that most of the elective subject teachers frequently used discussion teaching methods and lecture teaching method while inquiry teaching methods and project teaching method are least frequently used by elective subject teachers in the Sagnarigu District as shown in Tables 4.18a, 4.18b, 4.18c, 4.18d, 4.18e and 4.18f.The results further indicates that elective subject teachers who are teaching agriculture science students in the schools sampled used different methods to assess their students. All these methods are used to evaluate students' understanding of concepts, theories and principles of Agriculture Science. Among the assessment methods used by elective subject

teachers include: home assignment, class exercise, project work, class test and end of term examination. According to the result, majority (52.2%) of the students reported that they are assess once in a week whilst a fraction (1.9%) of the student said that they are assessed four times in a week as shown in Table 4.19 above.

The challenges elaborated by teachers included work overload, lack of teaching and learning materials and aids, lack of funds and resources to carry out practical lessons, large class size making teaching of practical skills difficulty, lack of school farms/garden and well-resourced laboratories and workshops etc. The results of the analysis of Kendall's co-efficient and mean rank shown in Table 4.19 has therefore established that, Inadequate teaching and learning materials(rank 1) was considered the most important factor that negatively affect teaching and learning of Senior High School Agricultural science practical lessons in the Sagnarigu District. It was followed by Students overloaded with other subjects (rank 2) and Limited time allocated to practical lessons (rank 3) was considered the third important factor that affect teaching and learning of Senior High School Agricultural Science practical lessons in the Sagnarigu District, whilst Lack/poor attitude of school authority towards practical (rank 14) was considered the least militating factor.

According to the result of this study majority of agricultural science teachers get funds for practical lessons from the school administration through school fees (41.2%) aside the school fees, student dues constitute (35.3%) is the second major source of funds for the practical lessons. Sometimes teachers use their own resources (23.5%) whenever the two major sources funds are not forth coming. The results also revealed that, Society, Politicians, Civil Society (Ngos), Mofa do not provide any form of support for SHSs Agricultural Science Practical Lessons in the Sagnarigu District.

5.2 Conclusions

With regards to SHSs agricultural science student's hands –on experience, self-efficacy and self –concept perceptions in practical agriculture in the Sagnarigu District. It can be concluded that, almost all of the sampled students have never had hands –on experience in; castration, administered vaccines, measured fertilizer accurately, formulated animal feed, grafted plants, selected breed, record keeping.

Regarding the teaching methods mostly used by elective subject teachers in the Sagnarigu District, the study can conclude that teaching methods use differ from one subject to another. However amongst all the teaching methods used inquiry teaching method was the least used by elective subject teachers.

It can also be concluded that lack of instructional aids is the dominant factor that affect teaching and learning of practical lessons. It can further be concluded that teachers do not get any form of support from external source.

5.3 Recommendations

Based on the findings of this study it is recommended that:

- Teachers should emphasize hands-on experience by making it possible for students to try their hands during practical lessons.
- Periodic assessment of SHSs agricultural science students self-efficacy and self-concept perceptions in practical agriculture be done to know what kind of agriculture activities students can perform as well to determine how good students are in performing certain agriculture activities.

- Teachers should be encouraged to used student centred teaching methods.
- School authorities should provide the needed practical teaching and learning materials to aid effective practical lessons.
- Communities, civil society, ministry of food and agriculture as well as the politicians in the Sagnarigu District must a matter of agency provide the necessary support to senior high school agricultural science education programme.

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APPENDICES

APPENDIX I

Field Observation Checklist

Availability of Teaching and Learning Aids and schools facilities

2 hectare plot of farm land of

A laboratory

Approved textbooks

2 Farm assistants (one for crops and one for animals)

Animal production

- Video demonstration of castration, dehorning, identification, creep feeding etc.
- Sheep / goat pen with at least ten (10) animals.
- Video and pictures of diseased, animals and animal diseases, pest/parasites, pathogens
- A six-unit piggery or a poultry farm (with a least 60 birds of jobs.
- Rabbits / guinea pigs/glasscutter farm (with at least 20 animals) of jobs
- Video and pictures of different systems of keeping animals of

Forestry

Pictures and CDs of useful plants species and some wild forest animals

Video of forest scenes, video and pictures on uses of timber and non-timber species

Videos on processes of deforestation.

Crop production

A store for seeds, Fertilizers

- CDs and pictures of vegetables, field crops, tree and plantation crops, animals feeds (grasses and legumes etc)
- A crop museum or herbarium
- Pictures and video clip of crops, good husbandry practices, biological processes, crop diseases and pest colour pictures and video clips of invasive alien species observe.

Soil

a. Rock samples of rocks
b. Soil augur
c. Soil pH kit
d. Pictures of soil profile, landscape, different soil structures, soil texture, eroded soils, types of erosion, mulching and cover cropping.
e. A video showing soil compositing.

Economics and extension

Pictures and video clips of agricultural extension agents in action.

Surveying tools / Equipments

- Pictures of ranging poles, Gunter's chain, measure tape, prismatic compass, theodolite, dumpy level, abney level, tripod stand, Global placement system (GPS). Total station (TS) etc
- Video clips on how to use the various instruments, maps and charts.

Measuring Equipment

Weighing scales (mechanical and electronic).

Micrometer screw gauges, verniercalipers, garden line, volumetric measures (measuring cylinders, pipeffes, burettes, bowls)

Agriculture Laboratory

Laboratory chemicals, pesticides, supplies: Herbicides, fungicides, fumigants and nematicides.

Mechanization

- ***Land tilling machines and implements***: Tractor / power tiller, plough, harrow, slasher, ridger, hoes, cutlasses, pick axes, mattocks, rakes, hand forks, hand trowels, garden / foot forks, shovels.
- ***Storage facilities***: refrigerators, Electricity, tools and equipment store, seed store and agro chemical store, storage barn.
- ***Maintenance equipment***: spanners, screw drivers, pliers, hack saw and blades, files pictures and CDs of all equipment.
- ***Harvesting equipment*** eg: secateurs, sickle, shears go-to-hell, Malaysian sickle, push trucks, wheel barrows.
- Other equipment: Knapsack sprayer, axes
- ***Drainage / irrigation equipment*** sprinkle, watering can, pumping machines, P.V.C. pipes

APPENDIX II

Heads of Agricultural Departments

Interview Guide

Date:

…….....

1. Does the school administration support Agriculture education programme? Yes [ ] No [ ]
2. What kind of support does the school administration support Agriculture education programme?.....
   .....
3. Does the school administration provide funds for Agricultural education programme?

   Yes [ ] No [ ]

4. If yes, are the funds adequately? Yes [ ] No [ ]

5. Does the school have a tractor? Yes [ ] No [ ]

6. If yes does it work? Yes [ ] No [ ]

7. Does the school have a farm? Yes [ ] No [ ]

8. Does the school have video clips/ films to help in explaining certain Agriculture concepts, principles ad theories in Agriculture? Yes [ ] No [ ]

9. Does the school have pictures to use as instructional aids during teaching and learning of agricultural science? Yes [ ] No [ ]

8. Does the department have adequate number of professional teachers? Yes [ ] No [ ]
9. In your own opinion do you think elective subjects like elective mathematics, chemistry and physics teachers in SHS in the Tamale metropolis are able to relate to the subjects they each to agriculture practical skills (farming)? Yes [ ] No [ ]
10. Does school time table have a portion meant specifically for the practical lessons? Yes [ ] No [ ]
11. If yes is the time allocated for practical lesson ample? Yes [ ] No [ ]
12. If No how do elective subject teachers manage teaching and learning of practical lessons?.....
13. How many subjects does an elective subject teachers teach…….....
14. How many subjects do you think at most an elective subject teacher in your department is teach ?.....
15. How many period /lessons do you feel /think teachers in your department teach is the least (work load) assign?.....
16. How many periods/lessons do you feel/think elective subjects teacher under agricultural science education programme is the most (work load)assign?.....
17. Have the school department/ individual elective subject teachers ever invited resource persons such as agricultural extension agents, veterinary officers, researchers to principles and theories in agricultural science students? Yes [ ] No [ ]
18. In your own opinion what are some of teaching methods do you think elective subjects teachers frequently used?.....

19. Do elective subject teachers assess agricultural science students about knowledge on practical skills acquisition in agriculture? Yes [ ] No [ ]
20. Does the school administration provide in-service training education to elective subjects teachers in SHS in the Tamale metropolis? Yes [ ] No [ ]
21. If yes how frequently is it? …….....
22. If yes do you think teachers apply the knowledge obtained from in-service training / education? Yes [ ] No [ ]

Constraints/Challenges

Do you face any challenge in your department in Teaching Practical Lessons in Agricultural Science? Yes [ ] No [ ]

If yes, what are some of the challenges you as an agricultural science teacher face in Teaching Practical Lessons in Agricultural Science? (Please list them).....

.....

Headmasters/headmistresses' perception about Funding(support) of agricultural science practical lessons in Senior High Schools in Tamale

Do you receive funds for practical lessons in agriculture science? Yes [ ] No [ ]

If yes, are the funds adequate for practical lessons in agricultural science programme? Yes [ ] No[ ]

3. If no, how do you manage with the inadequate funds for practical lessons in agricultural science programme? Briefly explain.....
4. How often do you receive funds for practical lessons? A. once in a term B. twice in a term C. once in a year D. twice in a year, Others specify.....…….....

5. How would you rate the school administration support to the Agricultural education programme in the school? A. Excellent B. Very good C. Good D. Poor E. Very poor

6. What are your other sources of funding other than the school administration?.....

.....

7. What specific constraints do you have concerning funding of agricultural programme in the school? .....

.....

Suggestions/Recommendation

What do you suggest/Recommend be done to enhance effective teaching and learning of practical lessons in agricultural science education in Senior High Schools in Tamale – Ghana

……

…….....

APPENDIX III

UNIVERSITY FOR DEVELOPMENT STUDIES

FACULTY OF EDUCATION

Topic

ASSESSMENT OF TEACHING AND LEARNING OF AGRICULTURAL SCIENCE PRACTICAL LESSONS IN SENIOR HIGH SCHOOLS IN THE SAGNARIGU DISTRICT, GHANA

INTRODUCTION

Dear Respondent

My name is **MBA–ONNI SIMON SAMON** a post graduate student at the faculty of Education, University for Development Studies. I am conducting a study on the topic; Assessment of teaching and learning of agricultural science practical lessons in Senior High Schools in the Sagnarigu District, Ghana**.** I would therefore be grateful if you could assist me with information regarding this topic by responding to the following set of questions given. Answers in this regard would be treated with confidentiality.

Thanks

INSTITUTIONAL QUESTIONNAIRE FOR AGRICULTURAL SCIENCE TEACHERS IN SENIOR HIGH SCHOOLS IN THE SAGNARIGU DISTRICT

NAME OF INSTITUTION……..

DATE OF INTERVIEW……..

Demographic Characteristics:

Sex of respondent male [ ] Female [ ]

Age of respondent……..

Occupational status of respondent. A. Part time B. National Service personnel C. Full time (Permanent staff) D. Volunteer teacher others specify …….....

Apart from teaching what other work do you do? A. Farming B. Livestock rearing C. Selling of provisions D. Selling of food staffs, Others specify …….....

Which occupations are/were parents engage in? A. Farming B. Trading C. Fishing D. Hunting, Others specify …….....

Educational Background of Respondents

Which programme did you offer in secondary school/GCE O level education? A. General Science B. Agricultural Science C. Business D. Visual Art E. General Art, Others specify.....

2. Which discipline did you specialize in during your Teacher Training course? A. General Science Education B. Agricultural Science Education C. English Language D. French E. Ghanaian Language, others specify the language learnt…….....

3. What is your highest level of education? A. University B. Polytechnic C. Agricultural College D. Teachers Training College, Others specify.....

4. Which programme did you pursue/offer during your tertiary Education? A. B.SC General Agriculture B. B.ED Agriculture C. B.ED English Language D. BSc Political Science, Others specify.....

5. Which area did you specialized/major in? A. Horticulture B. Agronomy C. Agricultural D. Economics E. Agricultural Extension, other specify.....

fessional status of respondent

Are you a professionally trained agricultural science teacher? Yes[ ] or No [ ]

If no, what is your area of expertise/specialty? ……

How long have you been teaching? A. Less than a year. B.1 -5years C. 6 – 10 years D. 11-20 years, others specify.....

During your professional training/educational career which teaching method did your lecturers/ tutors/ trainers frequently used in training you? Please list them from mostly used to least used. …….....……

.....

ɔject(s) taught by respondent

Which subject(s) do you teach? (Please list them)……..……

For how long have you been teaching that subject(s)?.....

Agricultural Science Teachers work load

1. How many periods/lessons do you teaching within a week?.....
2. How many subjects do you teach?.....
3. How many students do you teach?.....
4. What other responsibilities do you have in the school?.....

5. How many students are in a classroom?.....
6. How many classes/forms do you teach?.....

Teaching method used by senior high school agricultural science teachers in Tamale

Teaching methods used by Agricultural Science Teachers in Senior High School in the Sagnarigu District

1. Which subject(s) do teach?.....

2. Which of the following teaching method(s) do you used frequently during teaching and learning of practical agriculture? **A.** Lecture teaching method B. Discussion teaching method C. Demonstration teaching method D. Project teaching method E. Inquiry teaching method F. Question and answer teaching method

2. Where do you always teach you practical lessons in Agriculture science?.....

3. Why do you prefer these teaching methods to other teaching methods? Please briefly explain…….....

.....……

4. In your own opinion which of the teaching(s) is best/good in teaching a practical oriented subject course like agricultural science in senior high schools? Please list them from most to least……

……

Teachers' Views of the Frequency of Teaching and Learning of Practical Lessons

1.Do you teach practical lessons**?** Yes[ ] No [ ]

2. How often do you teach practical lessons? A**.** Very frequent (At least 3times a weeks)

B. Somewhat frequent(at least 2times a week)C. Less frequent (once a week)

D. Not frequent at all (a just a coup in a term)

3. How would you describe the level of participation of your students during teaching and learning of practical lessons? A. Very Actively participatory B. Somewhat actively participatory C. Less actively participatory D. Not participatory at all

3 How would you describe the effectiveness of practical lessons? **A.** Very effective **B.** Somewhat effective **C.** Less actively effective **D.** Not participatory effective

1. Where do your elective subject teachers teach their practical lessons in the school?….....
2. Amongst the place you have listed, which of them do they frequently use?.....
3. Which of them do they scarcely use?.....

Assessment methods used by Senior High School Agricultural Science Teachers in Tamale

How do you assess your students about practical skills acquisition in agricultural science?

.....

.....

2. What kind of practical skills do you teach agricultural science students? please list them

.....

.....

Constraints/Challenges

1. Do you face any challenge as an agricultural science student face in teaching and learning of Practical Lessons in Agricultural Science? Yes [ ] No [ ]
2. If yes, what are some of the challenges you as an agricultural science student face during teaching and learning of Practical Lessons in Agricultural Science? (Please list them from most serious to least serious).....

.....

Further probe concerning constraints and challenges affecting practical teaching and learning of Agricultural Science

Does the school have a farm? Yes[ ] No[ ]

If no, how do you manage the practical lessons?.....

Does the school have farm tools? Yes[ ] No[ ]

If yes, are the farm tools adequate? Yes[ ] No[ ]

Please list the farm tools present in the school……

Do you think Senior High School Agricultural science curriculum is equipping Agriculture science students with knowledge and skills? Yes[ ] No[ ]

In Ghana Agriculture and farm related businesses are lucrative? Yes[ ] No[ ]

Agriculture in Ghana presents a high potential for self- employment for the teaming youth in Ghana? Yes[ ] No[ ]

9. Educational and school administrators are providing the needed support to educate agricultural science students in both theoretical and practical in Agriculture science? Yes[ ] No[ ]
10. In your own opinion what are some of the school specific constraints and challenges that influence teaching and learning of agricultural science practical lesson…..…

Teachers' perception about Funding of agricultural science practical lessons in Senior High Schools in Tamale

1. Does the school administration provide support to Agricultural science teachers? Yes [ ] No[]

2. Do you receive funds for practical lessons in agriculture science? Yes [ ] No [ ]

3. If yes, are the funds adequate for practical lessons in agricultural science programme? Yes [ ] No[]

4. If no, how do you manage with the inadequate funds for practical lessons in agricultural science programme? Briefly explain.....

How often do you receive funds for practical lessons? A. once in a term B. twice in a term C. once in a year D. twice in a year, Others specify.…….....

How would you rate the school administration support to the Agricultural education programme in the school? A. Excellent B. Very good C. Good D. Poor E. Very poor

What are your other sources of funding other than the school administration?

……

What specific constraints do you have concerning funding of agricultural programme in the school? .....

Suggestions/Recommendations

What do you suggest/Recommend be done to enhance effective teaching and learning of practical lessons in agricultural science education in Senior High Schools in Tamale – Ghana.....

APPENDIX IV

UNIVERSITY FOR DEVELOPMENT STUDIES

FACULTY OF EDUCATION

Topic

ASSESSMENT OF TEACHING AND LEARNING OF AGRICULTURAL SCIENCE PRACTICAL LESSONS IN SENIOR HIGH SCHOOLS IN THE SAGNARIGU DISTRICT, GHANA

INTRODUCTION

Dear Respondent

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Thanks

INSTITUTIONAL QUESTIONNAIRE FOR AGRICULTURAL SCIENCE STUDENTS IN SENIOR HIGH SCHOOL IN SAGNARIGU DISTRICT

NAME OF INSTITUTION……..

DATE OF INTERVIEW……..

Form of Respondent……

Demographic Characteristics of Agricultural Science Students

1. Sex of students…….
2. Age of students…….
3. Entry grade obtained at Junior High School level (BECE)…….

Occupation of parents of Agricultural Science students

.. Which occupations are parents/guardians engage in?.....

Place where Agricultural Science student live (reside) i.e. rural or urban area

.. Where do you live (reside)?A. Rural area B. Urban area

Elective subjects studied by Agricultural Science students in Senior High School

.. How many elective subjects do you study? …….....

!. Name them …….....

Teaching methods used by Agricultural Science Teachers in Senior High School in the Sagnarigu District

1. Which teaching method(s) does the General Agriculture science Teacher frequently use?

A. Lecture teaching method B. Discussion teaching method C. Demonstration teaching method D. Project teaching method E. Inquiry teaching method F. Question and answer teaching method

2.Which teaching method (s) does crop Husbandry frequently use during teaching and learning process? **A.** Lecture teaching method B. Discussion teaching method C.

Demonstration teaching method D. Project teaching method E. Inquiry teaching method F. Question and answer teaching method

3.Which teaching method does Animals Husbandry Teacher frequently use during teaching and learning process? A. Lecture Teaching method B. Discussion teaching method

C. Demonstration teaching method D. Project teaching method E. Inquiry teaching method

F. Question and answer teaching method

3. Which teaching method does the physics teacher frequently use during teaching and learning process? A. Lecture teaching method B. Discussion teaching method C. Demonstration teaching method D. Project teaching method E. Inquiry teaching method F. Question and answer teaching method
4. Which teaching method does the Chemistry teacher frequently use during lessons? **A.** Lecture Teaching method B. Discussion teaching method C. Demonstration teaching method D. Project teaching method E. Inquiry teaching method F. Question and answer teaching method
5. Which teaching method does Horticulture Teacher frequently use during teaching and learning process? **A.** Lecture teaching method B. Discussion teaching method C. Demonstration teaching method D. Project teaching method E. Inquiry teaching method

F. Question and answer teaching method

6. Where do your teachers always teach you practical lessons in Agriculture science?

.....

Teaching and learning of practical lessons

1.Do your teachers teach you practical lessons**?** Yes [ ] No [ ]

2. If yes how often do they teach practical lessons? (Please Tick)A**.** Very frequent (At least 3times a week B**.** Somewhat frequent (at least 2times a week) C. Less frequent (once a week)

D. Not frequent at all (a just a coup in a term)

3. How would you describe your level of participation (involvement) during teaching and learning of practical lessons? A. Very Actively participatory B. Somewhat actively participatory C. Less actively participatory D. Not participatory at all

How would you describe the effectiveness of practical lessons? **A.** Very effective **B.** Somewhat effective **C.** Less actively effective **D.** Not participatory effective

4. Where do your elective subject teachers teach their practical lessons in the school?.....
5. Amongst the place you have listed, which of them do they frequently use?.....
6. Which of them do they scarcely use?.....

Assessment methods used by Agricultural science teachers to assess Agricultural science students' understanding of principles, concepts and theories in Agricultural science education.

1. Which assessment method (s) does the General Agriculture science Teacher frequently use? A. project work B. Assignment C. class exercise D. Home work
2. Which assessment method (s) does crop Husbandry frequently use during teaching and learning process? A. project work B. Assignment C. class exercise D. Home work

3. Which assessment method does Animals Husbandry Teacher frequently use during teaching and learning process? A. project work B. Assignment C. class exercise D. Home work
4. Which assessment method does the physics teacher frequently use during teaching and learning process? A. project work B. Assignment C. class exercise D. Home work
5. Which assessment method does the Chemistry teacher frequently use during lessons? A. project work B. Assignment C. class exercise D. Home work
6. Which assessment method does Horticulture Teacher frequently use during teaching and learning process? A. project work B. Assignment C. class exercise D. Home work
7. How often do they assess you? A. once a week B. twice a week C. three times a week

D. four times a week, E. Others specify…….....

onstraints/Challenges

3. Do you face any challenge as an agricultural science student face in teaching and learning of Practical Lessons in Agricultural Science? Yes [ ] No [ ]

ł. If yes, what are some of the challenges you as an agricultural science student face during teaching and learning of Practical Lessons in Agricultural Science? (Please list them from most serious to least serious).....

Further probe of agricultural science students about the constraints and challenges that affect teaching and learning of practical lessons in Agricultural Science in Senior High Schools in the Sagnarigu District.

1. Does the school have adequate number of professional agricultural science scholars? Yes [ ] No [ ]

2. If no, how is that affecting teaching and learning of practical lessons in Agriculture science in the school?.....
3. Does the school have a farm? Yes [ ] No [ ]
4. If no, how do you manage the practical lessons?.....
5. Where do you carry out your practical lessons? ……
6. How do you carryout practical lessons? ……
7. Does the school have farm tools? Yes [ ] No [ ]
8. If yes, are the farm tools adequate? Yes [ ] No [ ]
9. Please list some of the farm tools the school has? ……
10. Do you think Senior High School Agricultural science curriculum is equipping Agric students with adequate knowledge and skills? Yes [ ] No[ ]
11. In Ghana Agriculture and farm related businesses are lucrative? Yes [] No[ ]
12. Agriculture education in Ghana presents a high potential for self employment for the teaming unemployed youth in Ghana? Yes [ ] No[ ]
13. Educational and school administrators are providing the needed support to educate agricultural science students in both theoretical and practical skills in Agriculture? Yes[ ] No[ ]
14. Teachers of elective subjects like Elective Mathematics, Physics and chemistry are able to relate the content to agricultural science for students to understand why they are studying them as electives in agricultural science programme. Yes[ ] No[ ]
15. Inadequate number of professional agricultural science teachers is negatively affecting teaching and learning of practical lessons in agricultural science education programme in the school. Yes[ ] No[ ]

16. The availability of the school farm is stimulating students' interest in agricultural science education programme. Yes[ ] No[ ]
17. The unavailability of the school farm does not make the subject interesting. Yes[ ] No[ ]
18. Inadequate farm tools (instructional aids) in the school, is negatively affecting teaching and learning of practical lessons in agricultural science education programme in the school. Yes [] No[]
19. The school has a laboratory. Yes[ ] No[ ]
20. Even though the school has a laboratory but it is not well resourced. Yes[ ] No[ ]
21. Agricultural science teachers scarcely (rarely) use the school laboratory to teach practical lessons in agricultural science. Yes[ ] No[ ]
22. Most of the agricultural science teachers in the school do not have adequate knowledge on how to use the laboratory themselves. Yes[ ] No[ ]
23. The school does not have adequate funds to enable Agricultural science students to embark on field trips. Yes[ ] No[ ]
24. The school does have adequate funds to provide in-service training for agricultural science teachers. Yes[ ] No[ ]
25. Lack of in-service training for agricultural science teachers is affecting the quality of teaching and learning of agricultural science practical lessons. Yes[ ] No[ ]
26. The school has a large class size. Yes[ ] No[ ]
27. Large class size in the school is negatively affecting teaching and learning of agricultural science practical lessons. Yes[ ] No[ ]
28. The school time table does not provide ample time for practical lessons in agricultural science. Yes[ ] No[ ]

29. Most of the agricultural science teachers in the school do not utilize their time (lessons) meant for practical lessons in agricultural science. Yes [ ] No[ ]

Suggestions/Recommendations

What do you suggest/Recommend be done to enhance effective teaching and learning of practical lessons in agricultural science education in Senior High Schools in the Sagnarigu District– Ghana.....

.....

Students' Hands – Experience on Agricultural Activities

4. Have ever used your own hands to perform the following tasks in agriculture during practical lessons?

Agriculture tasks	Yes	No
Land preparation/garden bed raising		
Seed selection(germination test)		
Sowing/Planting/transplanting		
Weeding		
Prepare compost		
Accurate measurement of Fertilizer application		
Harvesting		
Post-harvest handling and storage		
Plant sample collection/preservation		
Feed formulation		
Feeding and watering		
Pens cleaning		
Breed selection		
Disease identification		
Vaccination administration		
Castration		
Record keeping		

Student's Self-Efficacy Perceptions in Practical Lessons

7. Can you do the following agricultural Activities?

Agriculture tasks	Yes	No
Land preparation/garden bed raising		
Seed selection(germination test)		
Sowing/Planting/transplanting		
Weeding		
Prepare compost		
Accurate measurement of Fertilizer application		
Harvesting		
Post-harvest handling and storage		
Plant sample collection/preservation		
Feed formulation		
Feeding and watering		
Pens cleaning		
Breed selection		
Disease identification		
Vaccination administration		
Castration		
Record keeping		

Student's Self-Concept Perceptions in Practical Agriculture

Are you good at doing the following agricultural activities?

Agriculture tasks	Yes	No
Land preparation/garden bed raising		
Seed selection(germination test)		
Sowing/Planting/transplanting		
Weeding		
Prepare compost		
Fertilizer application		
Harvesting		
Post-harvest handling and storage		
Plant sample collection/preservation		
Feed formulation		
Feeding and watering		
Pens cleaning		
Breed selection		
Disease identification		
Vaccination administration		
Castration		
Record keeping		