

UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE

EVALUATING THE TEACHING OF AGRICULTURAL SCIENCE IN
SELECTED URBAN AND RURAL SENIOR HIGH SCHOOLS IN THE
NORTHERN REGION OF GHANA.

BY

RACHIA SADIQ
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the requirements for award of Master of Philosophy Degree in Agricultural

Education



MARCH 2018

DECLARATION

Candidate's Declaration

I hereby declare that this Dissertation is the result of my own original work and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Signature.....Date.....

Name: Rachia Sadiq

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University for Development Studies.

Principal Supervisor's Signature..... Date:.....

Name: Rev. Dr. Fr. Thomas Asante

Co-Supervisor's Signature..... Date:.....

Mr. Emmanuel Ansah



ABSTRACT

Presenting information by teachers in abstract form without practical demonstration is found to be one of the most popular methods for transmitting knowledge to students by teachers in most second cycle schools in Ghana. The purpose of this study was to evaluate the teaching of Agricultural Science in some selected urban and rural Senior High Schools (SHSs) in the Northern Region of Ghana. Using stratified and purposive sampling approaches, one hundred and seventy-six (176) respondents were sampled for the study. Simple random sampling was first used to select respondents (students and teachers) from the individual groups of the target population in the eight schools forming the strata. On the other hand, purposive sampling approach was used to sample the headmasters/mistresses to be part of the study's sample size. Questionnaire was the main instrument used to obtain the needed data for the study, since all the respondents were literates. Using frequencies and percentages presented in tables, as well as Chi-square analysis, the study adopted descriptive approach in analysing the study's data results. The study's findings revealed that there is significance difference in teaching methods used in urban and rural SHSs. Inadequate Agricultural Science teachers and lack of Science laboratories were also found to be some of the key challenges facing SHSs in the Northern Region. It was therefore recommended that the government of Ghana should, as a matter of urgency, train and employ more Agricultural Science teachers, and also provide more Science laboratories to improve academic performance of students in both rural and urban Senior High Schools in the Northern Region of Ghana.



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DEDICATION

This thesis is dedicated to my dearest husband, Samuel Apewe Kwokem, and my lovely children, Chelsea, Claudia, Donna, and Whitney.



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LIST OF ACCRONYMS

AAS	Agricultural Advisory Services
AGRA	Alliance for a Green Revolution in Africa
CAADP	Comprehensive Africa Agriculture Development Programme
CDT	Component Display Theory
CTE	Career and Technical Education
EFA	Education For All
FFA	Future Farmers of America
GDP	Gross Domestic Product
GES	Ghana Education Service
GLSS	Ghana Living Standards Survey (Round 6)
GNAT	Ghana National Association of Teachers
GSS	Ghana Statistical Service
IUPAC	International Union of Pure and Applied Chemistry
KNUST	Kwame Nkrumah University of Science and Technology
LEA	Less Endowed Admission
LeTUS	Learning Technologies in Urban Schools
NAGRAT	National Graduate Teachers Association



OECD	Organisation for Economic Co-operation and Development
PISA	Programme for International Student
SABER	System Approach for Better Results
SABER	System Approach for Better Results
SHS	Senior High School
SSA	Sub-Saharan Africa
TFP	Agricultural Total Factor Productivity
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United States of America
WASSCE	West African Senior Secondary Certificate Examination



CHAPTER ONE

INTRODUCTION

1.0 Background to the Study

There is growing global recognition of the urgent need to identify and implement strategies that make food systems more resilient in the face of increasing climate variability. Nowhere is this more evident than in Sub Saharan Africa (SSA) due to the numerous agriculture activities on the African continent (Ameyaw & Jayne, 2016). One key policy identified to solve problems related to agriculture and food security, is to introduce Agricultural Science courses in the secondary and tertiary institution across the world, most especially, in SSA (Badiane, Benin & Makombe, 2016). One way policy makers across the globe are helping to bring agricultural research closer to farmers is by, in addition to the already existing Agricultural Science courses in the Senior High Schools, building a new generation of agricultural universities that combine research, teaching, extension and direct farmer engagement that has resulted in increased efficiency and productivity at the farmer level (Juma, Tabo, Wilson & Conway, 2013).

Evidently, education, which was critical to structural transformation in Asia, remains low among Africa's workforce. Thus the educational attainment of the average working age individual is still below secondary education (Filmer & Fox, 2014). A large share of people employed in agriculture in Africa, have less than primary school education and often lack the requisite entrepreneurial and



productive assets to thrive. Learning assessments demonstrate that Africa's schools are not effectively imparting to its students basic numeracy, literacy and/or cognitive skills, including problem solving and critical analysis (Boone, Fazio, Jandhyala, Jayanty, Jayanty, Johnson, Ramachandrin, Silva & Zhan, 2014; Cloutier, Reinstadtler, & Beltran, 2011; Mullis, Martin, Foy, & Arora, 2012). With such low educational and skill levels among such a large portion of the labour force, a rapid transition of the workforce into well-paying non-farm jobs is infeasible in most areas (Kanu, Odhiambo, Yamdjeu, & Sile, 2016).

Developing the skills to move African continent towards a 21st Century Agriculture will require transforming the content and approach of agricultural education for all young people—those entering farming as a business, those entering downstream stages of the agri-food system, and those leaving the agri-food system entirely. Anticipating the nature of these shifts and strengthening local “educational supply chains” to provide these requisite skills is critical (Kanu, Odhiambo, Yamdjeu & Sile, 2016). Alliance for a Green Revolution in Africa's (2016) report recounts that education and the skills acquired influence the range of employment opportunities available to youth and their earning potential. According to Ulimwengu, Collins, Yeboah and Traub (2016), addressing the shortfalls in enrollment and quality in the educational system is critical to sustainable and inclusive growth in the long run.

Filmer and Fox (2014) also maintain that educating and equipping expanding labour force with the needed skills in Agriculture, could help raise labour productivity, increase income and consumption levels, and thereby



facilitate economic transformation. In their estimation, Ulimwengu, Collins, Yeboah and Traub (2016) expect that the trend of increasing educational attainment would continue in the next few decades as some studies have projected, but to varying degrees across countries depending on government policies and investment decisions. It is a fact that because most Africans' livelihoods and agri-food systems rely on rain-fed farming, Africa is one of the world's most vulnerable regions to climate change (Food and Agriculture Organization of the United Nations, 2010). This calls for scientific education in the area of agriculture to introduce modernized farming which has the tendency of reducing environmental degradation.

The good news, however is that, although not the solution to all African's problems, a vibrant agricultural sector will clearly promote food security and economic opportunities for all Africans (Badiane, Benin & Makombe, 2016). In this regard, G8 leaders in 2009, issued the L'Aquila Joint Statement on Global Food Security, committing: "...to provide resources in support of the Comprehensive Africa Agriculture Development Programme (CAADP) and other similar regional and national plans" and pledging to mobilize US\$20 billion to support agricultural and food security (G8, 2009). To assess various governments' commitment to Agriculture in terms of spending, Mogues, Fan and Benin (2015) provided a summary of findings on the impacts of different types of public spending in and for agriculture globally.

The findings show that: (1) different types of public agriculture expenditure have different effects on different outcomes, and that some types of



expenditures may not be productive at all; (2) different effects take different times to materialize; and (3) effects are different in different locations, reflecting the influence of conditioning factors. The best way to make agriculture attractive is to modernize all farming activities using science and technology. Mudenge and Otieno (2016) for instance have observed that the surge in Science and digital technologies have resulted in an increase in accessibility to and affordability of technological devices and infrastructure such as mobile networks. This has resulted in the radical transformation of the agricultural sector across the globe and in SSA primarily, helping improve the livelihood of smallholder farmers (Mudenge & Otieno, 2016).

UNESCO (2014) maintains that achieving the Education For All targets in Ghana will require more investment and interventions by governments into issues of quality education by checking internal efficiency of educational management. As part of their report, UNESCO (2014), made recommendation that the government, through Ministry of Education, should roll out a programme for the attainment of universal access to secondary education, and to also improve the quality of teaching and learning, especially for Mathematics and all Science related courses. In line with government of Ghana's policy, the Ministry of Education has responsibly reviewed agricultural education to ensure the development of well-trained agricultural work-force including managers and specialists of various kinds. In this regard, there has been an urgent need for a broad-based training in agriculture to equip agricultural students with scientific,



vocational and technological competencies to enable the trainees fit into various sectors of agriculture.

It is worth mentioning that in Ghana, the agricultural training offered at the Senior High School (SHS) level and particularly in the study of General Agriculture, lays the foundation for further work in agriculture at the tertiary level (Ministry of Education, 2010). In this regard, Ministry of Education (2010) in consultation with its major stakeholders have designed content of general agriculture syllabus in a way that will offer knowledge and skills to students for whom Senior High School education is terminal. According to Ministry of Education (2010), knowledge and practices acquired in the General Agriculture subject will enable such students to work on their own, or seek employment in agricultural establishments. Thus the syllabus provides adequate foundation knowledge and skills for students who will want to pursue further education and training in agriculture after SHS. With these effort made by the Ministry of Education, UNESCO's (2014) Education For All 2015 review report recognizes that Ghana has made significant progress in her quest to achieving the education for all (EFA) targets by 2015. The report emphasizes that the positive trends in enrolments in all educational levels, the improvement in gender parity index, and the over 20 percent improvement in literacy rate since 2003, through the implementation of several policy interventions attest to the fact that Ghana's educational system is on the right path (UNESCO, 2014).

However, the study of Darko, Yuan, Simmons, Abbey, Liu and Kumi (2016) shows that successive governments in Ghana have not shown greater



commitment to Agricultural sector of the country's economy, and this has negatively affected the sector. According to the IMANI Ghana (2015), as cited in Eshun and Cobbinah (2016), in 2016, out of a total of 50 billion Ghana Cedis captured in the national budget, the Ministry of Agriculture was allocated equivalent of 1% of the entire budget. The percentages of successive budget allocations to Agricultural sector from 2009 to 2016 are as follows: 2009 (3%), 2012 (1.9%), 2013 (1.03%), 2014 (1.07%), 2015 (1.1%) and 2016 (1%). These has contributed to a decline in growth rate from 7.4% in 2008 to 0.04% in 2015. The percentages of growth rate in the agriculture sector between 2009 and 2015 are as follows: 2009 (7.2%), 2010 (5.3%), 2011 (0.8%), 2012 (2.3%), 2013 (5.7%), 2014 (4.6%) and 2015 (0.04%). This figures clearly show that Ghana is not doing well in her commitment to boost agriculture sector.

The earlier educational reforms made by Ghana's previous governments regarding the introduction of Agricultural Science at the basic school level has been abolished. It is sad to learn that Agricultural Science has been removed from the list of subjects being taught in Ghana's Junior High Schools. Sadly, Eshun and Cobbinah (2016) have noted that most of the Senior High Schools in Ghana where Agricultural Science is supposed to be taught are not teaching the course due to lack of qualified teachers. On the other hand, majority of the schools that run Agriculture Science courses teach the course theoretically with little or no practicals to equip the students to acquire the necessary skills needed in the Agriculture sector (Eshun & Cobbinah, 2016). This observation has triggered two critical questions posed by Eshun and Cobbinah (2016), such as: what is the



problem with Ghana's education system? Should the country not introduce the children to the subject which is the backbone of Ghana's economy at their tender ages to see for themselves the beauty of Agriculture?

Akyina, Osei-Owusu, Oduro-Okyireh and Gongoli (2014) have also indicated that the neglect of Agricultural Science in the various second cycle and tertiary institutions has contributed to the persistent decline of the contribution of Agriculture sector to Ghana's GDP. For instance, it is on record that between 2000 and 2008, Agriculture contributed an average of 39% to GDP compared to 26 % for industrial sector and 31% for service sector. In recent times, however, the sector has become a pale shadow of itself, with a myriad of challenges that have made it highly unattractive and unproductive. The unattractiveness of Agriculture sector is reflected in the slump in its contribution to GDP over the last five years (Eshun & Cobbinah, 2016). IMANI Ghana (2015) reports that in 2010, the sector contributed 29.9 per cent to GDP; it declined to 25.6 per cent in 2011 and further dipped to 22.7 percent in 2012.

The dwindling fortunes continued in 2013, with the sector contributing 22.4 percent to GDP. In 2014, it fell further to 21.5 percent. There has been decline in growth rate from 7.4% in 2008 to 0.04% in 2015. The need to revive agriculture fortunes of Ghana has become crucial. Thus the best way to bring the downward trend of the productivity in the Agriculture sector on track is for all the stakeholders of the country to promote Agricultural Science education, and to also engage in intensive research in order to ascertain what could be done to boost the agriculture sector (Eshun & Cobbinah, 2016).



This acknowledgement calls for an urgent solution to what the World Bank (2014) has identified that formulating appropriate teacher policies to ensure that every classroom has a motivated, supported, and competent teacher remains a challenge in Ghana. An attempt to address this problem has necessitated the fact that teachers should be trained and equipped to develop strategies that will ensure active participation by learners to be practical and project oriented (Achor, Imoko & Uloko, 2009). In finding additional solution to this challenge, Abdulhamid (2013) adds to the suggestions made by several studies (Veselinovska, 2011; Williams & McClure, 2010; Achor, Imoko & Uloko, 2009) that teaching methods must be changed to reflect the modern society's need for more functioning, thinking-oriented, and decision-making students. Therefore the selection of an appropriate teaching method is important to the success of the teaching and learning process. To be successful, Science teachers should select and use a wide variety of teaching strategies. Abdulhamid (2013), has observed that the most suitable methods for teaching practical oriented subject like Agricultural Science are demonstration and discussion methods.

Assessing the teaching of Agricultural Science in the rural and urban Senior High Schools in the Northern Region of Ghana is not out of place. This is so because according to Ghana Statistical Service (2013), generally, about 9.6 percent of total households engaged in Agricultural in Ghana are in the Northern region. Statistics further show that close to 8.0 percent of the national urban households in Agricultural sector are in the Northern Region. Thus the average urban Agricultural household size that engage in Agriculture in the Northern



Region is 8.9 percent. Karaga District has the highest average household size of 10.2 persons per Agricultural household, while Bunkpurugu Yonyo District has the lowest urban household size of 6.0 percent (Ghana Statistical Service, 2013). However, the study conducted by Donkor and Deni (2016) in the Northern Region of Ghana found that most of the government's initiatives aimed at improving Science, Technology and Mathematics education are centered in the municipalities and in Wa, which happens to be the regional capital of the region, giving less opportunity to the rural schools.

There is therefore the need to provide Agricultural Science education for students in both rural and urban schools. This is so because Jayne, Chamberlin, Traub, Sitko, Muyanga, Yeboah and Kachule (2016) have observed that there is increasing evidence of the importance of urban-based farmers. Jayne et al. (2016) have found that the proportion of urban households owning agricultural land across six countries ranged from 24 percent in Ghana to 49 percent in Rwanda. Moreover, many other urban dwellers provide advice and inputs to relatives and friends who farm. This implies that providing urban dwellers with advice on agriculture is an important means of influencing agricultural practices (Jayne et al., 2016).

The context within which the variables rural and urban SHSs are used in some studies which was also adopted in this study cannot be discounted. Mostly, well-endowed schools are considered as urban schools, while deprived or less-endowed ones are described as rural school. For instance, in Ghana, some Senior High Schools are found in the District and Regional capitals but due to lack of



some key infrastructure and installations or logistics, such schools are classified as less-endowed or deprived schools. Yusif and Ali (2013) described less endowed schools as schools that are mainly located in deprived communities and lack basic facilities. These facilities include classrooms, potable water, electricity, as well as trained and experienced teachers. It is worth noting that there are a lot of deprived communities in even all the cities in Ghana.

Making the teaching of Agricultural Science more practical at the SHSs in the Northern Region where there is the widespread of Agricultural activities is also the right way to go, to impart the requisite skills to the students. This is crucial because according to Ampiah (2002) the teaching and learning of an applied science like Agricultural Science, consists of learning facts and figures, rules, laws formulae, and problem solving concepts, which require an understanding of basic scientific principles for the explanation of an observed phenomenon. 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 using scientific methods. It is more important, as Darko, Offei-Ansah, Yuan and Jun-ping (2015) have maintained, that all aspects of Agricultural Science, like any other basic scientific concepts, require of the student concerned, a problem solving ability based on observed phenomenon, better explanation and understanding. This can only be done when students are allowed to participate in practical aspect of Science lessons carried out on the field and at the laboratory (Okoli, 2011).



1.1 Statement of the Problem

Gradually, policies and programmes related to Agriculture are dwindling in Ghana, where agriculture has been cited as the backbone of the economy, and predominant source of employment and livelihood of the majority of the people in the country (Alliance for a Green Revolution in Africa [AGRA], 2016). Ojijo, Franzel, Simtowe, Madakadze, Nkwake and Moleko (2016), have observed that Agricultural Advisory Services (AAS) would be most effective when researchers are effective in generating innovations that are demand-driven and in economies where farmers have access to schooling, new technology, and extension. Although statistics show that in general, African's commitment towards Agriculture is not encouraging, some African countries have recently engaged in research in their second cycle institutions to examine the challenge both teachers and students face in the teaching and learning of Agricultural Science (AGRA, 2016).

However, Ghana's effort in this direction has not been good enough. For instance, whereas several studies (Olajide, Odoma, Okechukwu, Iyare & Khaimoh, 2015; Abdulhamid, 2013; Adah, 2011; Owoh & Idenyi, 2011; Olaitan, Asogwa & Umeh, 2009) have been carried out in Nigeria's Senior Secondary Schools to assess the teaching and learning of Agricultural Science, and how students' performances have been in the area of Agricultural Science, only a few Ghanaian researchers (Opoku-Darko, Yuan, Simmons, Abbey, Liu & Kumi, 2016; Akyina, Oduro-Okyireh & Ansah-Hughes, 2015; Agbaje, Martin & Williams, 2001) have devoted their time and energy in carrying out studies in the



area of Agricultural Science in the Senior High Schools in Ghana. Meanwhile, Ameyaw and Jayne (2016) have predicted, based on empirical evidence that Africa's agricultural transformation cannot happen without efficient, effective and productive agricultural research systems. Thus, research and research systems with appropriate research capacity and infrastructure would spur agricultural growth in Africa.

Conclusively, the 21st Century studies advocate for a change in teaching methods so that students participate fully and understand difficult Science-related concepts (Millar, 2010). In this regard, Mwangu and Sibanda (2017) maintain that students are supposed to understand processes and structures, develop skills in manipulation, processing of Science information and conducting scientific investigations. Contrary to these suggestions, Azure (2015) has observed that generally, the present state of teaching and learning of Science related courses in Ghana is poor. Several studies (Anamuah-Mensah & Benneh, 2010; Jones, 2008; O'Connor, 2002) have also shown that many of Ghanaian students tend to learn Science by rote and hence lack understanding of Science concepts, since no meaningful practical teaching and learning occur. Ndago (2012), and Anamuah-Mensah, Mereku and Ampiah (2010), have recounted several occasions where the quality of teaching and learning of Science-related courses in basic, Senior High Schools (SHS), and even tertiary institutions in Ghana is being criticized by parents, science educators, technocrats and some government officials. As a results of this development, studies (Anamuah- Mensah & Asabere-Ameyaw, 2011; Bello & Oke, 2011) have found that poor teaching and learning of General



Sciences, which include Agricultural Science, taught in Ghanaian schools, reflects the poor performance of Ghanaian SHS students who sit for West African Senior School Certificate Examination (WASSCE). The abysmal performance of most of the SHS students in Science-related courses disqualifies them from gaining admission into tertiary institutions for further studies (Azure, 2015). It is further found that Ghanaian students who complete training in Science related programmes are usually found wanting when it comes to the application of scientific knowledge to solve societal problems (Anamuah-Mensah & Asabere Ameyaw, 2011).

Sadly, most researchers who carry out research in the natural and physical sciences have shifted their attention to courses such as Biology, Physics and Chemistry, leaving out Agricultural Science, which also utilizes the usual scientific methodology. For instance, the study of Nasri, Yusof, Ramasamy and Halim (2010), which was carried out in Malaysia, focused on the problems Biology teachers face and found that lack of resources, limited lesson time, administration activities and large classes negatively affected the teaching of practical lessons in Biology. In Ghana, Buabeng, Ossei-Anto and Ampiah (2014), concentrated on an investigation into Physics teaching in Senior High Schools, while Adu-Gyamfi, Ampiah and Appiah (2013) also focused on Senior High School Chemistry students' performance in IUPAC nomenclature of organic compounds. It is therefore clear that only a few studies have attempted to evaluate the teaching and learning of Agricultural Science in Senior High Schools in Ghana, and it seems that even the few studies conducted in the area of the



teaching of Agricultural Science focused on only well-endowed schools in the urban centres, leaving out the less-endowed schools in the analysis. It is against this background that this study sought to bridge these research gaps by evaluating the teaching of Agricultural Science in selected urban and rural Senior High Schools in the Northern Region of Ghana.

1.1.1 Objectives of the Study

1.1.2 General Objective

The general objective of the study was to evaluate the teaching of Agricultural Science in selected urban and rural Senior High Schools in the Northern Region of Ghana.

1.1.3 Specific Objectives

In order to achieve the main objective, which is broad, the study sought to achieve the following specific objectives:

1. To identify the methods used by Agricultural Science teachers to promote teaching of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana.
2. To assess the performance of Agricultural Science students in urban and rural Senior High Schools in the Northern Region of Ghana.
3. To examine the challenges of teaching and learning of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana.



4. To examine association between teaching methods used in teaching Agricultural Science students in the urban and rural SHSs in the Northern Region.
5. To examine the association between teaching methods used in rural and urban SHSs and the proportion of Agricultural Science students who pass WASSCE and further to tertiary institutions.

1.1.4 Research Questions

In order to achieve the research objectives, the following questions were addressed in the study:

1. What methods are used by teachers in teaching of Agricultural Science and how the methods promote teaching of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana?
2. How different is the performance of Agricultural Science students in urban from rural Senior High Schools in the Northern Region of Ghana?
3. What are the challenges of teaching and learning of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana?

1.1.5 Research Hypothesis

In order to ascertain whether there is significant difference between teaching methods used in rural and urban SHSs in the Northern Region of Ghana, and to examine the association between teaching methods used in rural and urban SHSs in the Northern Region and the proportion of Agricultural Science students



who pass WASSCE and further to tertiary institutions, testable hypotheses were stated to that effect. In this regard, both null (H₀) and alternative (H_A) hypotheses were considered to ascertain the association that exist among the aforementioned variables.

1.2.1 Hypothesis I

H₀: Teaching methods used in teaching Agricultural Science students in the urban SHSs are not significantly different from the teaching methods used in rural SHSs in the Northern Region.

H_A: Teaching methods used in teaching Agricultural Science students in the urban SHSs are significantly different from the teaching methods used in rural SHSs in the Northern Region.

1.2.2 Hypothesis II

H₀: The teaching methods used in rural and urban SHSs in the Northern Region have no significant association with the proportion of Agricultural Science students who pass WASSCE and further to tertiary institutions.

H_A: The teaching methods used in rural and urban SHSs in the Northern Region have significant association with the proportion of Agricultural Science students who pass WASSCE and further to tertiary institutions.



1.2.3 Significance of the study

It is hoped that based on the findings of the study, policy makers will develop strategy for ensuring a better approach in teaching of Agricultural Science in urban and rural Senior High Schools especially, in the Northern Region Ghana. The significance of the study can be viewed from its contribution to knowledge, academics and policies. Simply put, the significance of the study can be observed from how it empirically affirms theoretical propositions and also helps future researchers to understand the tenets or assumptions underlying theories reviewed in the study. Similarly, the academic importance involves its contributions to future research, while the policy aspect looks at practical significance of the study in the agriculture sector of the Ghanaian economy as a whole. By reviewing the practices and local knowledge, as well as matters in addressing issues regarding teaching of Agricultural Science in urban and rural Senior High Schools in the Northern Region, the attentions of the planners and the policy makers are drawn to put in place the appropriate strategies in teaching of Agricultural Science in the study area. The study also provides the basis for planners and policy makers to understand the need to incorporate the eminent hindrances and the successes in the reformulation of strategies and plans for addressing the challenges the study has identified in the area of teaching and learning of Agricultural Science in Senior High Schools in the Northern Region.



1.2.4 Limitations of the Study

Even though the study recognised that there were many rural and urban Senior High Schools (SHS) in the three Northern Regions of Ghana that have similar characteristics of interest as the selected schools for the study, financial constraints limited the study to only eight Senior High Schools, namely Tamale SHS, Ghana SHS, Kalpohin SHS, Vitting SHS, Nalerigu SHS, Pong Tamale SHS, Wulensi SHS and Tolon Kumbungu SHS. In addition, there are several courses taught in SHSs in the Northern Region of Ghana which need to be examined by way of research, but this study focused on only the teaching of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana. More so, the data analyses of the study were limited to the use of chi-square, frequencies and percentages instead of the use of parametric analysis such as correlation and t-test or regression. This may limit the scope of the analysis towards teaching of Agricultural Science. To overcome these limitations, a pre-test was carried out to ascertain the feasibility of the entire studies. This was done purposely to operationalise the study within the available financial and time constraint. More so, both Agricultural Sciences students and teachers were sampled to ensure a fair representation of the study results.

1.2.5 Definition of terms

Agriculture Science

The term agriculture follows what Rubenstein (2003) defines as a deliberate effort to modify a portion of Earth's surface through the cultivation of



crops and the raising of livestock for sustenance or economic gain. On the other hand, Agricultural Science, used in the context of this study, is largely the application of scientific principles for successful production of crops and livestock and other uses for man's benefit (Talathi, Naik, & Jalgaonkar, 2011; Onu, Ugwoke, Agboeze, & Ikehi, 2014). Thus, Agricultural Science, as a subject in secondary schools, seeks to teach the students the principles of using scarce resources to produce crops and animals to feed the world's population and to service other related uses (Ikehi, Ifeanyieze, & Ugwoke, 2014).

Urban and rural Senior High Schools

Both urban and rural are defined based on Ghana living Standards Survey locality classification. Thus, the classification of localities into 'urban' and 'rural', is based on population size. According to Ghana Statistical Service (2014), localities with 5,000 or more persons are classified as *Urban*, while those with less than 5,000 persons are classified as *Rural*. However, in this study, 'urban' Senior High School is operationalised to mean all well-endowed schools in the Northern Region that have good academic facilities, while 'rural' Senior High Schools are deprived or less-endowed schools in the region that lack the requisite academic user facilities. The operationalisation was done to categorised SHSs into rural and urban schools because there some Senior High Schools in the District and Regional capitals in the Northern Region that are classified as less-endowed schools due to lack of infrastructure and other academic facilities in the schools.



1.3.1 Organisation of the Study

The study is organised into five chapters. Chapter one provides an introduction to the study. It covers the study's background, the statement of the problem, the objectives and the research questions of the study. Other aspects of the introductory chapter are the significance of the study, study's limitations and the operational definition of terms. Chapter two reviews the theoretical and empirical literature relevant to the study. Chapter three considered the research methodology with the study design. Chapter four deals with data collection, analysis and discussion of the results. Chapter five being the final chapter summarises the specific findings, conclusions and recommendations as well as suggestions for further research.



CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews relevant literature for the study. The rationale behind the review of literature for this study is that it gives theoretical basis for the research and also helps in determining the nature of the study. It also gives an evaluative report of studies found in the literature related to the topic under investigation (Boote & Beile, 2005). The literature review of this study was therefore divided into three main sections. The first section reviews theoretical underpinnings and their relevance to the study. The second section also reviews empirical literature from prior studies that are related to this study, and the third section focuses on conceptual framework and discussion of the study.

2.1 Theoretical Review

This section discusses the theories underpinning the study. Three theories that have been used in literature to evaluate teaching and learning were reviewed in this study. They include: Cognitive Theory, Component Display Theory, and Transformative Learning Theory.

2.1.1 Cognitive Theory

According to Ausubel's (1968) cognitive view in educational psychology, the student does not need to discover for a meaningful learning, students receive the information as a ready from rather than discovering it. Because of this reason, students should be prepared to receive the information organised by the teacher



(Genç, 2016). This view implies that both the teacher and the student have a role to play in the teaching of Agricultural Science course.

Cognitive theory is based on an information processing approach and is basically concerned with what goes on in the learner's mind within and outside the classroom. The cognitive theorists argue that the rewards and punishment that behavioural theorists call reinforcement, work in more complex ways than what the conditioning theories suggested (Huczynski & Buchanan, 2007). These proponents claimed that in reinforcement, people are always aware about the results of the past behaviour; thus a feedback on how successful a behaviour has been. Huczynski and Buchanan (2007), further stressed that knowledge is information which can be used to modify or maintain previous behaviour. Cognitive theory of learning is therefore not concerned with the relationship between stimuli and responses, but rather with the plans that people choose and the way they adopt to pursue and how these plans are modified by experience (Torrington, Hall & Taylor, 2005). Cognitive process assumes that people are conscious and active participants in how they learn.

Contrary to the views of cognitive theorists, constructivists see knowledge acquisition from different angle. Constructivism maintains that the notion that knowledge and understanding is developed from one's own construction of meaning has contributed largely to changes in contemporary teaching practices and learning processes of today's learners (Bruning, Schraw & Ronning, 1995).



The emergence of constructivism as a theory was a reaction to the disappointment with cognitive theories that often push students into learning isolated, non-personalised, and limited real-life application of skills and knowledge (Gredler, 1997). One of the basic tenets of constructivism is that people are active learners and must construct knowledge for themselves (Geary, 1995). Cognitive theory is relevant in the contemporary teaching and learning practices in terms of planning and decision making. This implies that both Science and non-Science teachers can apply cognitive theory to plans and adopt innovative methods of teaching based on previous and current experiences that would shape these plans.

However, as observed by Genç (2016), the problem of linking cognitive theory and practice usually arises when dealing with the subject of teaching and learning. For instance, in the experimental classroom, Seferoglu's (2006) students thought there was a lack of close connection between the course materials and practical application in real classrooms. Thus the students reported on the challenges with teaching strategies such as discussion strategies and lecture strategies, and on the problems with encouraging learners to be involved in active, collaborative or experiential learning. Consistent with Genç (2016), this observation simply means that what goes on in the learner's mind, as cognitive theory highlights varies in different instances, and therefore, teachers are supposed to develop teaching which moves from theory to real life situation.



2.1.2 Component Display Theory (David Merrill)

Merrill's (1983) Component Display Theory (CDT) classifies learning into two dimensions: content (facts, concepts, procedures, and principles) and performance (remembering, using, and generalities). The theory specifies four primary presentation forms: rules (expository presentation of a generality), examples (expository presentation of instances), recall (inquisitory generality) and practice (inquisitory instance). Secondary presentation forms include: prerequisites, objectives, helps, mnemonics, and feedback. The theory specifies that instruction is more effective to the extent that it contains all necessary primary and secondary forms. Thus, a complete lesson would consist of objective followed by some combination of rules, examples, recall, practice, feedback, helps and mnemonics appropriate to the subject matter and learning task. Indeed, the theory suggests that for a given objective, there is a unique combination of presentational forms in teaching and learning that results in the most effective learning experience by a learner. This emphasises König and Kramer' (2016) view that repeated activation of learning plans strengthens connections between elements within a scheme and enhanced activation of knowledge for categorising new information when salient cues are presented to students in the classroom. Merrill's CDT assumption is consistent with Hattie (2012) who writes that taking into account adequate mastery of classroom management is clearly related to student achievement and has significant practical implications (König & Kramer, 2016).



Merrill later presented a new version of CDT called Component Design Theory (Merrill, 1994). This new version has a more macro focus than the original theory with the emphasis on course structures (instead of lessons) and instructional transactions rather than presentation forms. In addition, advisor strategies in learning processes have taken the place of learner control strategies (Merrill, 1994). Development of the new CDT theory has been closely related to work on expert systems and authoring tools for classroom instructional design (Li & Merrill, 1991; Merrill, Li & Jones, 1991). CDT specifies how to design instruction for any cognitive domain. CDT provided the basis for the lesson design in for example, computer based learning system (Merrill, 1980). It also was the basis for the Instructional Quality Profile, a quality control tool for instructional materials (Merrill, Reigeluth & Faust, 1979). The relevance of Component Display Theory to this study which seeks to assess teaching of Agricultural Science in Senior High Schools is that the theory provides the necessary guidelines for teachers to design appropriate instructional methodology within the set objectives to ensure effective teaching and learning.

The significance of CDT theory to this study, supports Woolfolk, Winne and Shapka (2010), who assessed Ausubel's (1978) theory of advance organizer, which relates to CDT, and observed that in ensuring effective teaching, new information is introduced by the teacher from the general to the specific making use of appropriate deductions. In this way, discussions and conversations contribute to student's learning process. Thus teaching goes from general information to concrete examples (Akdeniz, Bacanlı, Baysen, Çakmak, Çeliköz,



Dogrue... & Karataş, 2016). For instance, Woolfolk, Winne and Shapka (2010) create classroom scenario that teacher could ask students to point out examples of right angles that they can find in the classroom. By asking students to do this, it helps relates the students' present knowledge of familiar classroom objects with the unfamiliar concept of a 90-degree right angle.

2.1.3 Transformative Learning Theory (Jack Mezirow)

The Transformational Learning Theory originally developed by Jack Mezirow is described as being “constructivist, an orientation which holds that the way learners interpret and reinterpret their sense experience is, central to making meaning and hence learning” (Mezirow, 1991: 223). The theory has two basic kinds of learning: instrumental and communicative learning. Instrumental learning focuses on learning through task-oriented problem solving and determination of cause and effect relationships. Communicative learning involves how individuals communicate their feelings, needs and desires.

Meaning structures (perspectives and schemes) are a major component of the theory. Meaning perspectives are defined as broad sets of predispositions resulting from psychocultural assumptions which determine the horizons of our expectations (Mezirow, 1991). They are divided into three sets of codes: sociolinguistic codes, psychological codes, and epistemic codes. A meaning scheme is “the constellation of concept, belief, judgment, and feelings which shapes a particular interpretation” (Mezirow, 1994: 223).



Meaning structures are understood and developed through reflection. Mezirow states that “reflection involves a critique of assumptions to determine whether the belief, often acquired through cultural assimilation in childhood, remains functional for us as adults” (Mezirow, 1991). Reflection is similar to problem solving and Mezirow talks about how we “*reflect* on the content of the problem, the *process* of problem-solving, or the *premise* of the problem” (Mezirow, 1991: 223). Through this reflection we are able to understand ourselves more and then understand our learning better.

Mezirow (1991) also proposed that there are four ways of learning. They are “by refining or elaborating our meaning schemes, learning new meaning schemes, transforming meaning schemes, and transforming meaning perspectives” (Mezirow, 1991). Mezirow’s original theory has been elaborated upon by others, most notably Cranton (1997) and Boyd, Lankford, Loeb and Wyckoff (2004). The theory has commonalities with other theories of adult learning such as andragogy (Knowles), experiential learning (Rogers), and Cross. Transformative Learning theory is focused on adult learning, particularly in the context of post-secondary education (King, 2002).

From a theoretical perspective, education with the purpose of acquiring knowledge and skills in preparation for a job aligns with behaviourism, in that learning leads to an observable change in behaviour (Schunk, 2000). Although Doolittle and Camp (1999) made an eloquent argument that cognitive constructivism can provide a theoretical framework for Career and Technical Education (CTE), they acknowledged that behaviourism was the dominant



learning theory applied in CTE. Further supporting a behavioural framework for content-centered CTE, Doolittle and Camp (1999) explained that curricula composed of knowledge and skills derived from industry standards are externally imposed on the learner (Grady & Ball, 2009).

Behaviourism as the theoretical framework for content-centered agricultural education is also supported by examining contemporary teaching methods texts in agricultural education (Newcomb, McCracken, Warmbrod & Whittington, 2004; Talbert, Vaughn, Croom & Lee, 2007), which advocated instruction guided by objectives that view learning in terms of observable student behaviour (Mager, 1997). In other words, successful learning in agricultural education yields students with an observable set of skills that can be used for successful employment (Grady & Ball, 2009).

Using behaviourist framework on the other hand, for content-centered agricultural education, warrants a more in-depth look at skill acquisition. Schunk (2000) differentiated between specific and general skills. Specific skills are those abilities that apply to certain disciplines, whereas general skills are applicable in a variety of settings. From an examination of some of the earliest agricultural education curricula, it was obvious that the focus of the curricula was on specific skills (Stimson, 1920). However, over the decades, it is fair to say that the curricula expanded to include more general skills and a broader focus (Newcomb et al., 2004).

Current paradigm shifts in the purpose and philosophy of education as well as the nature and purpose of knowledge suggest a framework for thinking



about agriculture as a valid context for secondary agricultural sciences education. The changes brought about with an increasingly global and rapidly advancing body of science and technology at the turn of the third millennium suggest a new paradigms for education as cultivating habits of mind (Gardner, 2006). Specifically, the new educational paradigms according to Gardner (2006), include: (a) the disciplined mind (or specialised thinking within a particular discipline), (b) the synthesising mind (ability to make sense of large amounts of information from disparate sources), (c) the creative mind (ability to be ground breaking or innovative), (d) the respectful mind (the ability to understand different groups of people on their own terms), and (e) the ethical mind (the ability to understand self and work within the perspective of a greater societal good). Thus, it has been asserted that the foundational charge of formal education systems and subsequently the policy makers, who shape education in modern times, shift from a paradigm of education for social efficiency to education as cultivating the habits of mind that will be imperative for success and survival in the third millennium (Gardner, 2006).

Although not labeled as such, Dewey's (1990) assertions of developing habits of mind have served as a foundation of agricultural education in theory. Dewey (1990) purported that education should transcend beyond content and develop an attitude for lifelong learning among learners as well as prepare learners to be broadly educated contributors as a critical element in the foundation of a democratic society. Grady and Ball (2009) believe that the need for social efficiency through a highly skilled labour force at the turn of the 20th century



superseded the need for a liberally educated society of Americans with the passage of the Smith-Hughes Act. Yet Dewey's foundations for education as a context or a basis for learning through experience has informed the philosophical foundation for agricultural education programs (Knobloch, 2003).

The conceptual model for secondary agricultural education programs as learning through classroom/laboratory instruction, supervised agricultural experience, and participation in the Future Farmers of America (FFA) organisation, further support the notion of agriculture as a context for learning in agricultural education (Grady & Ball, 2009). In holistic education, the outcomes are the development and growth of the total student, and learning occurs within a particular context (Forbes & Martin, 2004). Although the three-circle conceptual model for secondary agricultural education did not originate with holistic education in mind, the current structure of agricultural education programs aligns with most of the basic principles of holistic education, and thus, at least in the conceptual sense, one might argue that educators in secondary agricultural education programs ultimately view education from a context-rich perspective (Grady & Ball, 2009).

Factually, agriculture science as a context for learning is anchored theoretically in constructivism. Constructivism began not as a learning theory, but rather as a philosophical perspective regarding the nature of learning (Schunk, 2004). Modern tenants of constructivism, forming a post-structuralist psychological theory (Fosnot, 1996), describe learning as, an interpretive, recursive, building process by active learners interacting with the physical and



social world. It is a psychological theory of learning that describes how structures and deeper conceptual understanding come about rather than one that characterises the structures and stages of thought or that isolates behaviours learned through reinforcement (Grady & Ball, 2009). In particular, dialectical or social constructivists assume that knowledge is a derivative of the interactions between people and their environment (Schunk, 2004).

Experiential learning has specifically been noted theoretically (Roberts, 2006) and empirically in agricultural education (Wulf-Risner & Stewart, 1997) as an underpinning of secondary agricultural education programs and has been noted as a sound psychological framework for learning in secondary agricultural education (Knobloch, 2003). Under this framework, agriculture forms the context for learning in that learning involves the construction of knowledge, engages students in an inquiry into the content, and demonstrates an overall value beyond school (Knobloch, 2003). The integration of agriculture content into Science curricula (Balschweid, 2002) and the integration of Science principles into agriculture curricula (Enderlin, Petra & Osborne, 1993) are two empirically-based applications for a model of agriculture as a context for learning in secondary agricultural education. Additional research has examined integration of math content into agricultural mechanics curricula (Parr, Edwards & Leising, 2008). These examples tested the model of a contextual approach to learning and, empirically, both student achievement (Parr et al., 2008). The transformation of agricultural education should not come as a surprise to proponents of community-based program planning (Phipps, Osborne, Dyer & Ball, 2007).



Significantly, it is evident that the application of Transformative Learning Theory by teachers in the teaching and learning processes would have the tendency to create a conducive atmosphere for students to benefit from all classroom and field work activities. Thus the way students interpret their experience and communicate ideas can be predicted by the teacher, leading to better classroom management. The important aspect of the Transformative Learning Theory, as far as teaching of Agricultural Science is concerned, was observed by Akdeniz et al. (2016) who maintain that traditional learning comprises teaching activities and explanations in class under the leadership of the teacher. According to Dewey (1997) and Piaget (1973; 1954) as cited in Akdeniz et al. (2016), basic foundations of discovery learning are learning occurring in the individual, teaching and learning strategies designed by the teacher, and the atmosphere created by using these strategies. Indeed, discovery learning is not a new theory. Principally, teaching models and strategies focusing on active and applicable learning opportunities for students aim at learning through discovery learning.

2.1.4 Empirical Review

This section highlights empirical review of prior studies that have been undertaken in relation to the study's problem and objectives. This review is carried out to examine the problems that have been studied in the area under investigation and the methodologies employed. Furthermore, the findings of



various literature were taken into account to provide empirical direction to the study's objectives.

To begin with, it is a fact that several studies (Hedges, 2004; Rockoff 2004; Campante & Glaeser, 2009) have shown that there is increasing interest across the globe in attracting, retaining, developing, and motivating great teachers (Hanushek & Woessmann, 2009). On the other hand, students achievements have been found to correlate with economic and social progress (Pritchett & Viarengo, 2009; Campante & Glaeser, 2009), and teachers are key. Other studies (Hanushek & Rivkin, 2010; Rivkin, Hanushek & Kain, 2005; Nye, Hedges & Konstantopoulos, 2004; Rockoff 2004; Park & Hannum, 2001) have also shown that teacher quality is the main school-based predictor of students' achievement and that several consecutive years of outstanding teaching can offset the learning deficits of disadvantaged students.

In assessing investment of factors that influence the performance of Science students in Kenya, Owino, Ahmad and Yungungu (2014) found in their study that lack of allocated practical lesson time affects students' performance and understanding. Thus it came out that Science teachers used both the demonstration method and hands on approach. The results of the study of Owino et al. (2014) confirm what was found by Gorghiu, Draghicescu, Cristea, Petrescu and Gorghiu (2015) who examined problem-based learning as an efficient learning strategy in the context of science lessons in the Senior High Schools. Oprea (2013) also evaluated effective teaching methods applied Science teachers used and found that group work is a stimulating activity, creating a contagious



behaviour and a competitive endeavour in solving complex tasks. Gatsby Foundation (2012) carried out a study in the United Kingdom and concluded that Science teachers failed to assess practical skills correctly.

The study of Owino, Ahmad and Yungungu (2014) further revealed that lack of allocated practical lesson time and irregularity of carrying out practical Biology lessons by teachers affect student performance and understanding. In the area of Agricultural Science, the study findings of Darko, Yuan, Simmons, Abbey, Liu and Kumi (2016) shows most of the Agricultural Science teachers in the Senior High Schools in Ghana adopt the lecture method of teaching. Wootoyitidde (2010) posits that Agriculture as a practical subject requires facilities like land, equipment and a well-equipped laboratory. According to Itodo (2004), most schools faced a lot of challenges when it comes to practical work in Agricultural Science.

According to Word Bank's (2014) System Approach for Better Results (SABER) report, successful education systems devote considerable time to activities at the school level related to instructional improvement, such as collaboration among teachers in analysing instructional practice, as well as mentoring and professional development (Darling-Hammond & Rothman, 2011; Darling-Hammond, 2010). The report further reveals that SABER-Teachers considers four policy levers that school systems can use to reach goal two: (1) requirements to enter the teaching profession; (2) competitive pay; (3) appealing working conditions; and (4) attractive career opportunities.



In recent years, attempts to validate value-added measures also have focused on their relationship to external constructs including teaching quality. For many, this comparison is important given that value-added scores are assumed to represent “good teaching and, by extension, good teachers” (Hill, Kapitula & Umland, 2011: 795). This has been made possible by observation instruments that quantitatively capture the nature and quality of teachers’ instruction. Chetty, Friedman and Rockoff (2014) extended this work to a quasi-experimental design that exploited variation in teacher effectiveness as a result of turnover across schools. Together, these analyses provide strong empirical support of value-added models to produce unbiased estimates of teacher effectiveness.

Theory and prior research (West & Chingos, 2009; Hill, Kapitula & Umland, 2011) suggest that another important aspect to consider when making sense of value-added rankings is the district in which they are measured. A broad literature (Rivkin, Hanushek & Kain, 2005; Nye & Hedges, 2004; Rockoff 2004) on teacher recruitment, retention, and turnover indicates that teachers’ decisions about where to teach are influenced by a variety of factors (Jacob, 2007). Using data from New York State, Boyd et al. (2004) found that teachers choose jobs close to their hometowns. Aligned with labour market theory, teachers’ preferences also are related to salary (West & Chingos, 2009). Further, teacher transfers across districts are related to their effectiveness at raising test scores (Goldhaber, Gross & Player, 2011) and to the test scores and demographic characteristics of their students (West & Chingos, 2009) which is a validity argument approach to evaluating teacher value-added scores.



Findings of Aneke's (2015) study also show that teachers adopt demonstration, farm field experience, individual teaching method, etc. as instructional methods for enhancing skills acquisition in secondary schools. The present finding is in line with the view of Ogwo and Oranu (2006) that skill acquisition is enhanced when concepts are demonstrated and that it is better used for subjects which are practical oriented like Agriculture Science. Ogwo and Oranu (2006) stated that skill acquisition proceeds habit formation which in turn leads to perfection. The present finding is also in consonance with Okoli (2011) who affirms that involving the students in practical exercise meant for training and supervising them effectively by the teacher will enhance their creative ability.

In assessing the effective teaching methods in secondary schools, Okoli (2011) found that demonstration methods used in Agricultural Science were carried out in the farm, workshop, and laboratory. Olaitan and Mama (2001) had already agreed that the use of demonstration 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. Olaitan and Mama (2001) maintain that if teachers fail to take their students to the school farm to demonstrate skills and put the acquired-skills into practice, the students cannot acquire the needed skills that will make them competent to be self-employed or compete with others in the labour market. Similarly, Esomonu (2012) found that field trip which was found in present study as a relevant tool for enhancing skill acquisition of Agricultural Science students helps students to experience various areas performing replica functions.



The finding of Owoh and Idenyi (2011) who carried a study to determine the extent to which exposing students to utilise the school farm to help to improve their skill acquisition in farming, and it was found in their study that students exposed to field experiences such as in the farm are very competent, create labour opportunities for others and highly enterprising. Aktamis and Ergin (2008) on the other hand, found in their study, that the adoption of scientific process skills in teaching students helps promote their scientific creativity, attitudes towards Science, and achievements in Science. Turpin and Cage (2004) however found in their study that activity-based methods rather had some effects on achievement in students' practical skills but they did not find any changes in attitudes towards Science courses. Turpin and Cage (2004) therefore concluded that teacher behaviours are more influential on students' attitudes than the teaching methods they adopt. Yager and Akçay (2010) indicated that student use and understanding of Science skills and concepts in the inquiry sections increased significantly more than they did for students enrolled in typical sections in terms of process skills, creativity skills, ability to apply Science concepts, and the development of more positive attitudes.

Results from Programme for International Student (PISA) 2009 show that, in general, students perform better in schools with more disciplined classrooms, partly because such schools tend to have more students from advantaged socio-economic backgrounds, who generally perform better, partly because the favourable socio-economic background of students relates to a climate that is conducive to learning, and partly for reasons unrelated to socio-economic factors.



Results from PISA 2009 also show that even though the learning environment in schools and classrooms is partially shaped by the resources, policies and practices of the systems and schools, disciplined classrooms themselves tend to go hand in hand with higher performance (OECD, 2010). Public policy can improve conditions for effective teaching if it addresses such factors as school climate, teaching beliefs, co-operation among teachers, teacher job satisfaction, and professional development and teaching techniques (OECD, 2009).

School systems that track students early into different educational programmes show lower levels of equity, but do not achieve higher levels of average performance than systems that track students later in their school careers (OECD, 2010). This finding is consistent with prior research showing that inequality is greater in more differentiated school systems (Causa & Cahpuis, 2009; Schütz, West & Woessmann, 2007). Research into what makes schools effective finds that learning requires an orderly and co-operative environment, both in and outside the classroom (Jennings & Greenberg, 2009). In effective schools, academic activities and student academic performance are valued by both students and teachers (Taylor, Pressley & Pearson, 2002).

Positive teacher-student relations are crucial in establishing an environment that is conducive to learning. Research (Schunk, 2004; OECD, 2010) find that students, particularly disadvantaged students, learn more and have fewer disciplinary problems when they feel that their teachers are devoted to their academic success (Gamoran, 1993) and when they have good working relations with their teachers (Crosnoe, Johnson & Elder, 2004). One explanation is that



positive teacher student relations help transmit social capital, create communal learning environments and promote and strengthen adherence to norms conducive to learning (Birch & Ladd, 1998).

Moreover, using a sample of 78 respondents involving 60 Agricultural Science students and 18 Agricultural Science teachers, Darko, Offei-Ansah, Yuan and Jun-ping (2015), found in their study that the major challenges facing the teaching and learning of Agricultural Science include frequent use of lecture method in teaching, large class size and poor remuneration of teachers. Others include inadequate teaching and learning materials and their availability, difficulty in planning field trips as well as laziness and truancy on the part of teachers. It was also found out from the study that many students do not have interest in the subject. All the teachers and the students who responded to this statement responded in the affirmative. When the researcher probed the issue further, it came to light that students have wrong perception about Agricultural Science. They believe Agricultural Science is not a well-paid job and also farmers do not have prestige. This wrong perception often influences the choice of Agricultural Science programme as a career.

Akyina, Osei-Owusu, Oduro-Okyireh and Gongoli (2014) found factors like interest in Agricultural Science, employment avenues in Agriculture, high academic ability in Agriculture and influence by teachers and parents as factors that influence female students' choice of Agricultural Science programme. With respect to household Agricultural activities, survey findings, as indicated by Ghana Statistical Service's (2013), reports that Northern Region has an average



rural household size of 8.4 persons per household which surprisingly is lower than the urban average of 8.9. Kpandai District recorded the lowest rural average household size of 6.8 persons per Agricultural household. There is an indication of male dominance in Agricultural in the Northern region. In all, 90.7 percent of male-headed households as against 9.3 percent of female-headed households are into Agricultural. This pattern is observed across all districts in the region. Bunkpurugu Yonyo District has as high as 27.3 percent of female-headed households in Agricultural.

According to Awuku, Baiden, Brese and Ofori (2001), the performance of students in Agricultural Science should match student's interest and practice of the subject. Awuku, Baiden, Brese and Ofori (2001) further stated that lack of instructional materials, educational qualification of teachers, poor funding of practical Agricultural, intellectual ability of the teachers etc. are some of the factors that influence the outcome of the teaching– learning process. Izumi and Evers (2002) buttressed this point by saying that teacher quality is the most important among other critical factors like quality curricula, funding, small class size and learning situation. Johnson and Wardlow (2004) attributed poor achievement of students in Agricultural Science to teacher qualification, inadequate instructional materials as well as administrative factors. Common problems of teaching Agricultural practicals in developing country like Nigeria include: inadequate facilities, low professional and efficiency levels of teachers, poor attitudes of teachers, poor funding, school administrators and parents towards Agricultural education, and political lapses (Amedzake & Amuah, 2009).



The findings corresponds with opinions of Abe and Adu (2013) a who opined that teaching qualification or teacher qualification is one of the academic and professional degrees that enable a person to become a registered teacher in primary or secondary school. Orodho (2014) found out that some students are of the perception that Agricultural Science has no future prospects for them. Others believe that it is not as important as Mathematics and English Language which they view as core subjects needed to get employment or admission into tertiary institution.

In their study, Olajide, Odoma, Okechukwu, Iyare and Khaimoh (2015), assessed the perception of Agricultural Science teachers with regard to teaching Agricultural practicals in Secondary Schools and found that the experience Agricultural Science teachers have towards teaching Agricultural practicals in Secondary Schools was negative. Most of the students sampled in their study believed that Agricultural Science is not as important as Mathematics and English Language which they view as core subjects. Also, students erroneously associate Agricultural Science with the local farmer tag.

Pratley (2008) for instance cited that Agricultural education in Australia and other parts of the world is at a critically important stage. The current estimated demand for tertiary agriculture graduates in Australia is around 2000 per year, the supply of only around 800, leaves the industry in a position where only 7 percent of the workforce hold a degree compared to 22 percent in the overall workforce (Pratley, 2008). Declining university enrolments are a major issue for the agricultural sector with the potential for significant impacts on



productivity and the ability of the industry to address climate change and sustainability challenges (Pratley & Copeland, 2008).

The development of a modernised secondary curriculum in the United States of America (USA) has led to an increase in tertiary enrolments, particularly from students from urban or non-farming backgrounds (Dyer, Breja & Andreasen, 1999, Greene & Byler, 2004).

To achieve the goals of sustainable agriculture, agricultural education needs to be integrated into the school curriculum and agriculture subjects upgraded to meet the needs of the 21st Century food and fibre system (Williams, 2000). Agbaje et al. (2001) advocate an approach in which learners are confronted with the severe problems facing mankind in every discipline. Real-world application to learning used by Alvarez and Rogers (2006) found the definitive and reductive approaches to sustainability to be inadequate, whereas an approach where sustainability was presented as a contested discourse suitably reflected the complexity of sustainability issues. Williams and Dollisso (1998) and Parr, Trexler, Khanna and Battisti (2007) suggest that sustainable agricultural education requires integrated, interdisciplinary, experiential, systems oriented and progressive curricula in which social and environmental contexts are used to ground theory to practice.

Fortunately the evolution of agro ecology and sustainable agriculture has coincided with the emergence of alternative educational theories and practices suited to interdisciplinary learning (Parr et al., 2007). Studies of teacher and student perceptions in Iowa revealed that teachers perceived themselves as



needing to learn more and students rated themselves as knowing ‘a little’ about sustainable agricultural practices (Williams & Wise, 1997).

Agbaje et al. (2001) found that teachers only valued sustainable agriculture if it was profitable and felt that farmers only use sustainable practices for economic reasons. Williams (2000) found that student and teacher knowledge and perceived impacts of sustainable practices paralleled the agricultural industry in general, i.e. social and environment impacts were high (beneficial) but economic impacts not as high. Whilst positive about the impacts of sustainable practices there is a lack of understanding in both teachers and students about interactions between sustainable practices, suggesting a lack of appreciation in the systemic nature of sustainable agriculture and demonstrating the lack of first-hand experience (Williams & Wise, 1997).

Flint (2000) also suggests that lack of recognition of connectedness is partly responsible for many of the environmental, social and economic failures of modern societies and advocates an interdisciplinary approach to curriculum development. Agbaje et al. (2001) found that sustainable agriculture topics with systems or multidisciplinary dimensions such as Integrated Pest Management (IPM), insect resistant crops, herbicide-resistant crops, and reduced use of chemicals and fertilizers, were only taught to a moderate degree, whereas crop rotation, soil testing, and soil erosion control were taught to a high degree. Peake, Duncan and Ricketts (2007) found that teachers felt the most important competency was teaching about agriculture’s relationship with the environment. This discrepancy between the perceived importance of relationships and the



actuality of teaching suggest a need for curriculum development with a focus on sustainable agriculture and sustainable systems.

Further research is required into community awareness, views and support for agricultural education to determine the benefits to students and community when developing the curriculum (Atkinson, 1988, Myers & Washburn, 2008). The curriculum development process contains four essential interacting elements; objectives, content, program of activities, and evaluation (Atkinson, 1988). Tentatively defined objectives are the logical place to begin as these determine the *why* of teaching *what* and *how*, and may be modified as the process considers what ‘selections’ from culture and knowledge are most relevant now and in the future (Atkinson, 1988). Roberts and Ball (2009) suggest replacing the polarising content versus context argument in agricultural education with a holistic and integrated approach aimed at producing a skilled agricultural workforce and agriculturally literate life-long learners.

Interdisciplinary techniques used in environmental education are also relevant to agriculture as they develop the problem solving, critical thinking and decision making skills needed to address sustainability (Flint, 2000). For curriculum changes to achieve greater levels of success, teachers need assistance to adjust teaching and learning (Williams & Dollisso, 1998, Bellah & Dyer, 2009). Methods for evaluating the depth and breadth of innovation adoption that consider teacher concerns, the levels of use, and methods used in implementing curriculum changes are also needed, rather than relying on simple ‘use’ or ‘non-use’ as measures of success or failure (Bellah & Dyer, 2009).



The integration of Science into the agriculture curriculum has been demonstrated to enhance student achievement and interest and renew the credibility of agriculture as a subject (Williams & Dollisso, 1998). Teachers have reported that their students have demonstrated improved problem solving abilities (Myers & Washburn, 2008) and enhanced understanding of Science when integrated in agriculture (Balschweid, 2002). The redesign of courses with greater focus on the applications of Science to agriculture has demonstrated increases in enrolments particularly from higher achieving students (Osborne & Dyer, 2000). Myers and Washburn (2008) question if agriculture is currently serving a disproportionate number of low achieving students and therefore if it is appropriate to target higher achieving students through integrating more Science. Scales, Terry and Torres (2009: 102) highlight that the support of stakeholders, curriculum and policies require consideration when integrating Science into agriculture curriculum, however, “the most important factor is the teachers’ willingness and ability to teach the content”.

A lack understanding and awareness of agricultural issues is magnified in urban settings (Warner & Washburn, 2009). This is of particular concern in Australia as the most urbanised nation in the world with only 15 percent of the population living in rural areas (Pratley, 2008). Halsey (2009) proposes a *city to country* education initiative to address the disconnection between urban and rural populations, giving urban students positive experiences of rural communities, and therefore awakening them to potential career opportunities.



The integration of agriculture as a cross curricular theme is seen as a suitable solution that can be applied in every school (Cribb, 2010). Balschweid (2002) provides evidence in support of integrating agricultural examples through the positive effect on student attitudes towards agriculture following participation in a biology program that used agricultural animals as a basis. Warner and Washburn (2009) outline the main challenges to teaching agriculture in urban settings as a lack of understanding in parents, administrators and guidance counsellors regarding the relevance of agriculture, and the large numbers of students consequentially limiting resources and funding.

The research literature regarding agriculture in high schools highlights the need to address pre-service and in-service teacher professional development, particularly regarding new practices and advances in technology (Williams & Wise, 1997, Peake, Duncan & Ricketts, 2007, Boone & Boone, 2009). Scarlet Consulting (2005: 5) identified professional development in Australia as perhaps “the most pressing issue to address in education about agriculture”. Peake et al. (2007) suggest that the increasing number of inexperienced agriculture teachers in the US state of Georgia necessitates a re-evaluation of pre-service teacher training and professional development opportunities. Scales et al. (2009) found that although many US teachers felt confident of delivering Science content in agriculture, testing revealed the majority were not competent and less than 10 percent scored high enough to be considered proficient in biological Sciences.



Stephenson, Warnick and Thompson (2008) identified a need for professional development opportunities to promote collaboration between agriculture and Science teachers. Stephens and Little (2008) discuss the value of student teacher exchange programs to address limited exposure to agricultural diversity and thus address the problem of lack of engagement in global societies. Agbaje et al. (2001) stress the need for collaboration with Universities in continuing professional development.

2.1.5 Education and Literacy in the Northern Region

Findings from the 2010 Population and Housing Census reported by the Ghana Statistical Service (2013), indicates that literacy, which is low (37.5%) in the region, varies from district to district and is lower for females than for males in all districts. Apart from Tamale Metropolis, the proportion of non-literate population is higher for rural localities as compared to urban localities. The least proportion of urban literate is in Tolon Kumbugu District (4.3%). In all districts except Tamale Metropolis, more than half of females aged 6 years and older have never been to school. The highest level of education attained for most of the population in all the districts is primary education. As usual, the difference between the male and female proportions increases with higher levels of educational attainment.

According to GSS Population and Housing Census (2010), the total population of females in non-Science based SHS programmes is worthy of note. There are far more males than females who enroll in Agricultural Science



programme. This confirms the finding in a study by Ajayi and Buessing (2013) that over 25 percent of females applying to SHSs in Ghana choose Home Economics and General Arts, while males normally dominate in programmes like Agricultural Science and General Science. The high level of interest in Agriculture indicated by the respondents is very significant. This shows that a lot of females are interested in Agriculture, thus attesting to the reason why there are a number of females working in that sector. Most of them are involved in less skilled jobs in farming.

2.2.1 Households in Agriculture by District and Agricultural Activity

The findings of GSS Population and Housing Census (2010) touch on the main Agricultural activities and how they are distributed in the Northern Region. The findings indicate that most households are into crop farming (90.5%) and livestock rearing (30.1%) while tree growing (0.9%) and fish farming (0.1%) are the least practiced Agricultural activity. The large percentages for both crop farming and livestock rearing may be explained by households engaging in more than one activity. The Savelugu Nanton District, which forms part of the study area of this study, has the highest proportion of households in crop farming involving 94.3 percent of households. The Bunkpurugu-Yunyoo District has the highest number of households in livestock rearing (66.7 %).



2.2.2 Households in Agriculture by District, Locality, Activity and Sex of Head (conceptual issues)

The findings of GSS Population and Housing Census (2010) further indicate that out of the 49,537 urban households in Agriculture in the Northern Region, 90.2 percent are engaged in crop farming, 1.6 percent in tree growing, 0.2 percent in fish farming and 30.1 percent in livestock rearing. It is worth noting that, some households are involved in more than one Agricultural activity. For example a household could be involved in tree growing as well as livestock rearing. According to the GSS report, Gushiegu has the largest proportion of households in crop farming (98.4%) while the Central Gonja District leads in tree growing (GSS, 2010).

2.2.3 Operationalisation and conceptualisation of rural and urban SHSs

In this study, ‘urban’ Senior High School and ‘rural’ Senior High Schools are respectively operationalised to mean well-endowed Senior High Schools and deprived or less-endowed Senior High Schools in the Northern Region of Ghana. According to Osei-Mensah (2011), as at now, there are three classes of Senior High Schools (SHSs) in Ghana. These are: the “Clarendon” schools, most of them established by the faith-based churches during the colonial days; the Ghana Education Trust Schools, established in the 1960s during Kwame Nkrumah’s regime; and Community Rural Schools most of them established after 1987.

Most of the first two classes of school are classified as well-endowed schools in Ghana, while most of the latter class of schools fall within the deprived or less-



endowed schools. According to Ahiatrogah and Bervell (2013) due to the prestigious of well-endowed SHSs, they are usually over-subscribe every year, and it appears the doors to the well-endowed SHSs are virtually closed to pupils from certain social and economic background. This is perhaps the reason why some prior studies (Yusif, Ishak & Abu-Hassan, 2011; Addae-Mensah, 2000) have found that one of the major predictors of one's success in Ghanaian secondary schools is quality of the Senior Secondary School attended. In 2002 out of the roughly 600 secondary schools in the country, 297 forming about 49.5%, were classified as less endowed (Ghana Education Service, 2011). This number has since not changed even though the number of SHSs increased to about 697 in 2009.

According to Yusif and Ali (2013) the less endowed schools are mainly found in rural communities and even some deprived communities in cities, and lack basic academic facilities. These facilities include classrooms, potable water, electricity, as well as trained and experienced teachers. The less endowed schools are associated with students from disadvantaged families or those from rural communities and in most cases, a large proportion of them are less prepared for university entry. On the other hand, well-endowed SHSs are mostly found in the regional capitals of Ghana, and have good academic facilities and qualified teachers. It should therefore be noted that due to lack of academic facilities and qualified teachers, many less endowed schools, though located in urban centres, are even unable to supply students who have the basic requirements to enable them benefit from the less endowed admission (LEA) policy which was first



introduced by KNUST since 2003 (Yusif & Ali, 2013). With respect to regional distribution of less-endowed Senior High Schools, Volta and Eastern regions formed about 23% and 21% respectively of those who were enrolled into the university. This is not surprising because of the 297 less endowed schools in 2002, Volta had 50, followed by Eastern, 49. However, four regions, i.e. Greater Accra, Northern, Upper East and Upper West constituted about 11.4% of the students who enrolled to benefit from LEA (Yusif & Ali, 2013)



2.2.4 Conceptual Framework

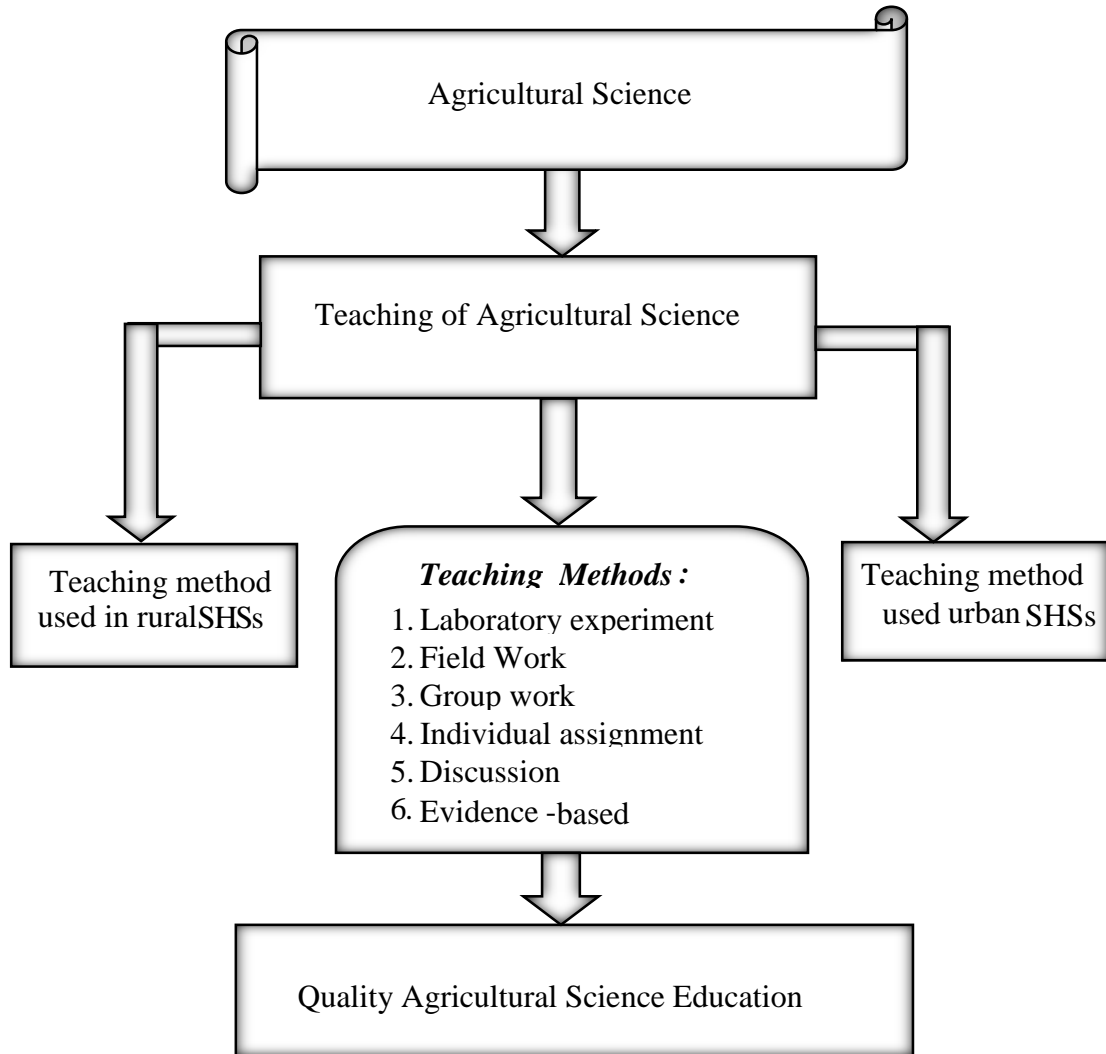


Figure 2.1.1: Conceptual Framework for teaching of Agricultural Science in rural and urban SHSs

Source: Author's own construct, 2016

The conceptual framework of the study provides interaction that exist among the key concepts which the objectives of the study sought to address in evaluating the teaching of Agricultural Science in some selected urban and rural Senior High Schools in the Northern Region of Ghana.



The main concepts underpinning the study include: quality Agricultural Science education, teaching of Agricultural Science, teaching methods, urban Senior High School and rural Senior High School. Figure 2.1.1 shows the link that exists among Agricultural Science, being the main subject under discussion, the teaching of Agricultural Science, teaching methods used in the urban and rural SHSs and the possible outcome which may bring about quality Agricultural Science education in both rural and urban Senior High Schools. It is therefore observed from Figure 2.1.1 that a course like Agricultural Science requires different approaches which will aid teaching in both rural and urban Senior High Schools. However, although the mode of teaching at different environment may differ, it was assumed that the various teaching methods used in both rural and urban Senior High Schools would cover laboratory experiment, field Work, group work, individual assignment, discussion and evidence-based instructions. These teaching methods are in tandem with Daluba's (2013) recommendation that a more interactive teaching method such as the demonstration method as it is found to have a significant effect on students' achievement compared to the conventional lecture method. A combination of these methods will ensure teaching of Agricultural Sciences, which in the long run lead to quality Agricultural Sciences education. The assumption of the conceptual analysis is in line with study findings of Aneke (2015) which show that, teachers adopt demonstration, farm field experience, individual teaching method, etc. as instructional methods for enhancing skills acquisition in secondary schools.



2.2.5 Rational behind the introduction of Ghana's Agricultural Science into SHSs Syllabus

According to Abalu (2001), the rationale for the introduction of Agricultural Science education, particularly in the various secondary schools was to dispel the apparent negative students' attitude towards farming, and to further expose students to the knowledge and skills that they would require in agricultural production, should they become farmers one day. Among the aims of the Agricultural Science programme in the Senior High School are to help learners develop self-reliance in agriculture, demonstrate that farming is a dignified and profitable occupation, and to enhance skills needed in carrying out agricultural practices (Vandenbosch, 2006).

As indicated in the 2010 teaching syllabus for General Agriculture Science, in a course like General Agriculture Science, there are three profile dimensions required for teaching, learning and testing. These include: Knowledge and understanding 40%, application of Knowledge 30% and practical Skills 30%. This involves the demonstration of manipulative skills using tools, machines and equipment to carry out practical operations and to solve practical problems. The teaching and assessment of practical skills should involve experiments, projects, case studies and field studies. Skills required for effective practical work are the following seven (7) processes: Equipment handling, observation, manipulation, measuring, recording, reporting, creativity and communication (Ministry of Education, 2010).



According to Ministry of Education (2010) combining these three dimensions in the teaching and learning process, will ensure that General Agriculture Science will be taught and studied not only at the cognitive level, but will also lead to the acquisition of practical skills in the subject. This will ensure maximum student participation in the lessons. It is stated categorically in the teaching syllabus for General Agriculture Science for SHSs that in instructing Agricultural Science students, the teachers must void rote learning and drill-oriented methods and rather emphasize participatory teaching and learning, and also emphasize the cognitive, affective and psychomotor domains of knowledge in their instructional system wherever appropriate to improve students' performance (Ministry of Education, 2010).

In 2010, however, the Chief Examiner of Africa Examination Council's Report on Agriculture Science indicated that fundamentals of agriculture and knowledge of practical agriculture were ignored by students (West Africa Examination Council [WAEC], 2010). The report further stated that most students failed to perform simple experiments. A similar observation was indicated in the 2011 report, which added that it appeared most students never stepped into a laboratory during the course of study. This phenomenon, according to Darko, Yuan, Simmons, Abbey, Liu and Kumi (2016) could be attributed to the fact that teachers have little understanding of the use of teaching aids and does not employ the use of teaching and learning aids in their lesson delivery.



2.3.1 The teacher and Agricultural Science

According to Okoli (2011), Agriculture is the pillar of the nations' welfare, and sound economic development and technological advancement. A teacher of Agricultural Science was described by Olaitan, Asogwa and Umeh (2009) as someone who has undergone a teacher preparatory programme in the area of agricultural studies and is charged with the responsibility of managing the learning behaviour of the students. Aneke (2015) described a science teacher as someone who teaches especially as a professional in the teaching area such as Agricultural Science. Owodunni (2010) stated that the onus of learning rests with the student, whether he learns or not depends on the teachers' effectiveness in giving instructions in the way that augments and promotes learning on the part of the students. It is therefore, paramount that any teacher of Agricultural Science who wants the students to learn and become skillful must have good grasp of the knowledge. He is required to be well trained and equipped in the methodology to guarantee him effectiveness in instructional delivery in any location –rural or urban, he/she is posted to teach. However, the Agricultural Science teacher cannot promote learning if he/she is ignorant of what it takes to learn or to be conversant with strategy or method which can promote learning (Aneke, 2015).

2.3.2 Concept of Practical Teaching

Teaching of practical subject such as Agricultural Science requires tools and equipment to be available and that teachers need to utilise them to make concept clearly. If a particular school cannot afford the tools and equipment



needed for teaching and learning, the teacher is required to improvise to make sure that he/she carries out his teaching task to enhance learning (Elobuiké, 2010). Aneke (2015) noted that 90 percent of what we use our hands to do is retained, and this situation can become real when the tools are available and adequate for the students to use and learn.

According to Olisa (2009), quality teaching is a professional task that takes years of preparations, careful planning and skillful execution which include: formulation of objectives, careful selection of instructional materials to match the subject topic, and methods and for ease execution, using modern equipment. These help to keep the learner current with the new technologies in Agricultural production Aneke (2015). If the teachers of Agricultural Science are competent to use the teaching methods which can promote understanding of concepts and skills acquisition for secondary schools students, most of the youth who studied Agricultural Science and are roaming about the street after graduation, would not go into other job not related to Agricultural Science as reported by Olaitan in Okoli (2011). This may be as a result of the poor teaching methods adopted by some teachers to inadequately prepare students for the job market.

2.3.3 Modern ways of teaching Science

Pedagogy, the art and Science of teaching, transforms in the digital age to an emphasis on the act of learning as students oscillate between consuming and creating (Beetham & Sharpe, 2013). Teachers have always needed to be life-long learners, but in the face of changing technology the need is even greater. In this



time of transition not all teachers are ready to effectively integrate technology for teaching and learning in meaningful ways (Stolle, 2008).

Research has shown that teachers and student teachers are more likely to use technology as a supportive instructional tool than to empower students to ask questions and find their own answers using new literacies (Choy, Wong, & Gao, 2010; Palak & Walls, 2009). To prepare teachers to teach new literacies in these student-centered ways, educational systems need effective forms of professional development and teacher education.

At the America's Center for Learning Technologies in Urban Schools (LeTUS), a research center funded by the National Science Foundation, a key focus was to develop a theory of the conditions under which a technology-supported innovation in Science could be used by a wide range of teachers (Blumenfeld, Fishman, Krajcik, Marx & Soloway, 2000). In urban schools, if technology is to be usable, there must be a "fit" of the innovation to school culture, technical capability, and policies (Blumenfeld et al., 2000). If the gap between the capacity of a system and the requirements of an innovation along any of those three dimensions is large, a technology-supported innovation will be less usable. Where gaps are large, designers have a choice to scale down the demands along one or more dimensions or to intervene to enhance system capacity, improving chances that an innovation will be usable.

Few pre-service teachers, however, observe and participate in new literacies integration in methods courses or field experiences (Ertmer & Ottenbreit-Leftwich, 2010). Addressing practitioner knowledge and the



challenges of teacher education, Gutierrez (2008) calls for a “Third Space” where practitioner knowledge in schools is merged with academic knowledge in universities in new ways to enhance pre-service teachers’ learning. This transformative space can be less hierarchical so knowledge from cooperating teachers, university methods instructors, and supervisors/coaches is equally valued as providing expanded learning for everyone involved. Similarly, Zeichner (2010) calls for a more conversational relationship between equals as cooperating teachers and professors learn with pre-service teachers. In the study of Zeichner (2010), he observed that the university supervisors used a coaching model to create a space in which both cooperating teacher and student teacher integrate new literacies, an area where each partner can contribute teacher knowledge of content, pedagogy, and technology.

The methods of informal learning have traditionally been used in, for example, the teaching of biology (Goldschmidt Scharfenberg & Bogner, 2016), geography learning (Rennie, Feher, Dirking & Falk, 2003), Science education (Braund & Reiss, 2007), mathematics (Fenyvesi, Koskimaa & Lavicza, 2015) and art education (Salmi, Vainikainen & Thuneberg, 2015). The first essential research concerning informal education was clearly related to biology and field education (Falk & Halmi, 1982; Patterson & Bitgood, 1988). Such results have since been multiplied in the literature (Braund & Reiss, 2007; Sturm & Bogner, 2010; Tran, 2011). To advance public understanding of Science, new forms of education were actively sought (Holbrook & Rannikmae, 2009; Frantz-Pittner, Grabner & Bachmann, 2011; Salmi, Thuneberg & Vainikainen, 2015). It is a fact



that learning does not take place only in the actual world of school but in the presented world of nature, parks, yards, Science centres, gardens and the media, as well as through the virtual worlds of the internet and social media (Braund & Reiss, 2007). Despite this development, there has been less theoretical or empirical research in the informal sector (Osborne & Dillon, 2008). Recently, informal learning has become a more accepted part of Science education (Fenichel & Scheinburger, 2010).

Teaching methods such as inquiry teaching, problem solving, problem based learning and project based learning rely heavily on the effective use of the Science process skills by students to complete an investigation (Colley, 2006). Inquiry Science teaching is teaching Science by having students engage in more Science activities and exercises and encourages children to learn Science and learn about Science (Olson & Louks-Horsley, 2000). Also, students engage in simple inquiry, and also engage in processes such as observing, comparing, contrasting and hypothesising (Cuevas, Lee, Hart & Deaktor, 2005). One area of contemporary research on inquiry is related to children's understanding and use of Science process skills in designing investigations (Keys & Bryan, 2001). Scientific inquiry exercises typically serve as the primary source of Science process skill development and inquiry is used to teach Science process skills (Wilke & Straits, 2005).

According to Minner, Levy and Century (2010), the term inquiry has figured prominently in Science education, three distinct categories of activities: what scientists do, how students learn, and a pedagogical approach that teachers



employ. From a Science perspective, inquiry-based Science teaching engages students in the investigative nature of Science. Inquiry involves activity and skills, but the focus is on the active search for knowledge or understanding to satisfy a curiosity. According to Ketpichainarong, Panijpan and Ruenwongsa (2010) inquiry teaching and learning methods affect student performances, for example in solving problems, reflecting on their work, drawing conclusions, and generating prediction. These qualities are necessary for a high-achieving graduate.

2.3.4 Methods of Teaching Agricultural Science

Teaching methods was defined by Wang and Baker (2015) as a plan of action designed to achieve learning programme design for a learner. It could be a master plan or program procedure schedule to achieve a particular objective. Heinrich and Russel (2003) describe instructional methods as procedures of instruction, selected to assist the learner achieve the objectives of teaching. This means that instructional method for teaching Agricultural Science could be procedure adopted by the teacher to aid students acquire knowledge, attitude and skills to manipulate Agricultural produce for self-reliance. Teaching methods were categorised by Osinem (2008) into field related and non-field related teaching methods.

Field-related teaching include, teaching carried out within or outside the school setting. It may be orgnised trip or visit to a place of interest, experiment, in the laboratory, workshop, demonstration of concepts or any other outdoor teaching. In this method of teaching, learners are actively involved, hence skill



acquisition is emphasised. Osinem (2008) noted that teachers could use the discussed scientific instructional methods to enhance learning of Agricultural Science. Other field methods of teaching as noted by Wang and Baker (2015) include: inquiry guided learning, inter-disciplinary teaching, community learning, teaching with cases, giving assignments to students, giving project to students, team-based learning, exhibition of Agricultural produce, workshop practice, task instruction sheets among others.

The non-field teaching methods are mainly those instructions giving to the students, which involves more of theories. Osinem (2008) described the non-field teaching methods as classroom based strategies of teaching. Some of these methods include discussion, problem solving, humor in the class, team based teaching, role play, problem solving, and the use of textbooks. According to Ogwo and Oranu (2006), the use of text book aids the learners to get primary source of information and detail explanations covering the fundamental operations as well as other relevant information that have bearing on the subject under discussion, while discussion enables the learner to understand concepts to be learnt.

According to Aneke (2015), Agricultural Science is geared towards the development of manual skills as well as knowledge and attitude required to manage Agricultural resources and this requires that the teacher plans, executes and evaluates his teaching using various methods which emphasise skill acquisition. In teaching Agricultural Science, the teacher is required to involve the students actively in the farm, and laboratory activities; take them on field trips;



and to give them projects and individual portions in the farm for private practice. On his part however, Okoli (2011) affirmed the importance of involvement of the students in practical exercise by stating that the training of would-be farmers today is the duty of the teacher and that the teacher would make sure that the trainees (students) are fully involved in their training package and more importantly is being supervised effectively by the trainer (teacher). In other words the teacher is supposed to give close supervision to the learners to know their weak points and help them out Aneke (2015).

2.3.5 Teachers' Performance Assessment

According to World Bank's American Caribbean Forum Report (2014), prepared by Bruns and Javier (2014), increasingly abundant student test data, especially in the United States, which allow researchers to measure the "value added" of individual teachers over the course of a single school year has generated eye-opening evidence of widely varying teacher effectiveness, even within the same school and same grade. Students with a weak teacher may master 50 percent or less of the curriculum for that grade; students with a good teacher get an average gain of one year; and students with great teachers advance 1.5 grade levels or more (Hanushek & Rivkin 2010; Rockoff, 2004)

Horn and Little (2010: 184) state that "focusing on selected group-level conversational routines provides an important and strategic means for conceptualising and investigating opportunity to learn within workplace settings". It is agreed, and have been found that teacher interactions reveal key beliefs and



knowledge that shape, and sometimes determine, teachers' work. In schools characterised by a learning community, teachers are oriented toward surfacing problems of practice and view these as opportunities for generative conversation about instruction, student thinking, and interpretations of content goals (Gallimore, Ermeling, Saunders & Goldenberg, 2009). Routines in schools, such as those that teachers use to structure conversations about teaching and learning in teams, serve as important resources for teachers' own learning and growth assessment (Horn & Little, 2010).

2.3.5 Summary

Overall, the study employed some key theories underpinning the study in the literature discussion. Notable among these theories include Cognitive Theory, Component Display Theory, and Transformative Learning Theory. From both the theoretical and empirical literature gathered for the study, it was observed that teaching and learning are in tandem, since the action taken by a teacher has both direct and indirect relationship with students' performance. For instance, the theory of social learning suggests that learning theories that have the most impact on current classroom practices are social cognitive, social cultural, and social critical theories. The conceptual framework gathered for the study also shows some links and relationship among concepts such as teaching of Agricultural Science, rural and urban Senior High Schools and the possible teaching methods which may be used by Agricultural Science teachers in both rural and urban Senior High Schools.



CHAPTER THREE

METHODOLOGY

3.0. Introduction

The chapter begins with the research design employed for the study, followed by description of the study area and discussion of background characteristics of the target population which was investigated. The chapter further highlights discussion of sampling procedures used in the study, data collection instruments, data collection procedures and ethical considerations of the study. The last sections of this chapter of the study considers data processing and analysis.

3.1. Research Design

The study adopted descriptive survey design. This was because the data collected for the study lend themselves to descriptive approach. This approach used in the study served as a blueprint which defined the framework of a study. Thus, the approach provided the framework for the collection and analysis of data. In addition, the study adopted descriptive survey due to the peculiar features of the study's target population. Gravetter and Forzano (2006: 143) indicated that "a descriptive survey typically involves measuring a variable or a set of variables as they exist naturally." Creswell (2014) also emphasised that a survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population.



In this regard, a quantitative approach was employed in gathering the data used in the study, while chi-square, frequencies and percentages were employed to analyse the data results descriptively. In gathering the data however, questionnaire was used as the main tool that was designed with the purposes of comparing and establishing association among the key variables used in the study. The strength of this design was that it was organised within appropriate framework and methodology. However, due to time constraint, the study's design was structured in a manner that would favour the researcher to complete the study within the time scheduled.

3.1.1 Study Area

The study took place in eight (8) selected Senior High Schools in the Northern Region of Ghana. The eight schools include: Tamale SHS, Ghana SHS, Kalpohin SHS, Vitting SHS, Pong Tamale SHS, Nalerigu SHS, Wulensi SHS and Tolon Kumbungu SHS. The Northern Region, which occupies an area of about 70,384 square kilometres is the largest region in Ghana in terms of land mass. It shares boundaries with the Upper East and the Upper West regions to the north, the Brong Ahafo and the Volta regions to the south, Togo to the east, and Côte d'Ivoire to the west. The land is mostly low lying except in the north-eastern corner with the Gambaga escarpment and along the western corridor. The region is drained by the Black and White Volta Rivers and their tributaries such as the Nasia and Daka rivers. The Northern Region has a total population of 2,479,461 in 2010 with more females (1,249,574) than males (1,229,887).



The population of the region increased by 36.2 percent between 2000 and 2010, making it the fastest growing region in the country after the Central (38.1 %) and Greater Accra (38.0 %) regions (Ghana Statistical Service, 2013).

Prior to 2012, the region had twenty (20) districts. In 2012, six additional districts were created for the region. The region had 26 constituencies prior to the creation of the new districts in 2012. Five more constituencies were created in 2012 for the region following the creation of the new districts increasing the number of constituencies in the region to thirty-one. The majority of people in the region are engaged in Agriculture. The crops that they produce include yam, maize, millet, guinea corn, rice, groundnuts, beans, soya beans and cowpea. At Gushie in the Savelugu-Nanton District, there is a large plantation of grafted mangoes cultivated by outgrowers. Bontanga in the Tolon Kumbungu District has a big irrigation dam where farmers engage in large-scale rice cultivation during the dry season (Ghana Statistical Service, 2013).

According to Ghana Statistical Service (2013) report, the Northern region has a predominantly rural population (69.7%). Tolon Kumbungu (92.5%), Saboba (90.6%) and Kpandai (90.0%) have very high rural populations. With the exception of Tamale Metropolis (73.0%), Savelugu/Nanton (39.7%), West Gonja (32.7%) and East Mamprusi (32.4%) Districts, the remaining districts have less than 30.0 percent of their populations living in urban areas.



3.1.2 Justification for selecting the Study Area

The Northern Region of Ghana was considered the most appropriate for this study because the area is noted for a lot of agricultural activities, due the availability of vast land and the land's topography. According to Ghana Statistical Service (2013), the majority of people in the region are engaged in Agriculture. Moro so, the choice of Northern Region of Ghana as appropriate study area for this study was informed by its socio-economic history and how it has tended to shape agricultural activities. For these reasons, carrying out a study to assess teaching of Agricultural Science in rural and urban Senior High School would be suitable for no other place than Northern Region of Ghana where a lot of agricultural activities take place.

Figure 3.1. 1: Map of the Northern Region and its Districts



Source: Ghana Statistical Service, 2013



3.1.3 Target Population

The target population of the study were Agricultural Science teachers, Agricultural Science students, and headmasters/headmistresses in the eight (8) senior high school (SHS) in the Northern Region of Ghana. The target population of Agricultural Science teachers, students and headmasters/headmistresses in the selected schools was estimated to be 232. The details of the target population are presented in Table 3.1.

Table 3. 1: Distribution of Target Population by School and District/Town

School	District/Town	Population		
		Teachers	Students	Headmasters
Tamale SHS	Tamale	6	45	1
Ghana SHS	Tamale	6	30	1
Kalpohin SHS	Kalpohin	5	20	1
Vitting SHS	Tamale	6	24	1
Wulensi SHS	Wulensi	3	18	1
Tolon Kumbungu SHS	Tolon Kumbungu	4	15	1
Nalerigu SHS	Nalerigu	4	16	1
Pong Tamale SHS	Tamale	4	18	1
Total		38	186	8

Source: Field Data, 2016

Table 3.1 presents distribution of schools by population and District in the eight Senior High Schools selected for the study. It is observed from the



distribution that the eight schools considered in the study have a wider range in terms of target population difference. In this case the range of teachers is 3 while that of the students is 18.

Table 3. 2: Distribution of Respondents by School and sex sampled from the Target Population

Urban Schools Selected	Male	Female	Headmaster/	Male	Female
	(Teachers)		Headmistress	(Students)	
Tamale SHS	3	1	1	16	9
Ghana SHS	2	0	1	11	5
Kalpohin SHS	1	1	1	12	8
Vitting SHS	1	0	1	9	6
Rural Schools Selected					
Savelugu SHS	1	1	1	10	4
Tolon Kumbungu SHS	1	0	1	8	5
Nalerigu SHS	1	0	1	10	5
Pong Tamale SHS	1	1	1	9	6
TOTAL	11	4	8	91	62

Source: Field Data, 2016

The characteristics of respondents in terms of schools and sex was uniformed across the eight Senior High Schools selected for the study. It is observed from Table 3.2 that whereas more males than females were teachers of Agricultural Science subject across the eight selected schools, more male than female students read Agricultural Science in all the eight selected schools. More so, out of the eight schools selected, four males were headmasters, and four females were headmistresses. Male headmasters were found at Tamale SHS,



Wulensi SHS, Kalpohin SHS, and Nalerigu SHS, while female headmistresses were heading schools such as Ghana SHS, Pong Tamale SHS, Vitting SHS and Tolon Kumbungu SHS.

3.1.4 Sample Size Determination

In calculating the sample size, the study adopted the Bartlett, Kotrlik and Higgins' (2001) sample size determination table based on the margin of error of 0.03 for continuous and 0.05 for categorical data with consideration of appropriate study population and alpha level as a reference for deriving the sample size. The approach adopted simplified lengthy calculation exemplified in Cochran's (1977) model of sample determination which may be used if margin of error shown in the sample size determination table is appropriate for the study, and that sample size would need to be calculated if the error rates are not appropriate. Therefore, using margin of error of 7.54%, the study specifically focused on Bartlett et al. (2001) to determine the sample size to be used in the study which was 176. Thus, after determining the sample size to be used, stratified and purposive sampling techniques were then employed to select the study's respondents.

Mathematically, the sample size was determined using the formula given as;

$$n = \frac{N}{1+N(d)^2}$$



Where n is the sample size to be selected from study's target population; N is population size of the study area where the target population was identified, while d is the error margin. The study considered 7.54% error margin appropriate due to the size of the population in the Northern Region which was estimated to be 2,479,461 in the Ghana's 2010 population and census reports.

$$N = 2,479,461$$

$$d = 0.0825$$

$$n = \frac{2479461}{[1+2479461 (0.0754)^2]}$$

$$n = 176$$

3.1.5 Sampling Procedures

Stratified and purposive sampling techniques were applied to generate the sample size. Simple random sampling was first used to select teachers and students who form the target population in the eight schools. On the other hand, all the headmasters/mistresses who head the eight selected schools were purposively selected to be part of the study's sample size. The working population in each of the schools therefore formed the sampling frame. In total one hundred and seventy-six (176) respondents were sampled from the target population of Two hundred and thirty-two (232) for the study. The stratified sampling approach, which is probabilistic, was adopted with the aim of ensuring that at least each of the respondents would have the equal chance of being selected.



On the other hand, the purposive (non-probability) approach was employed to select only the headmasters/headmistresses because the number of the headmasters/ headmistresses sampled from the eight schools was not large.

The sample size represented approximately 76 percent of the target population. The reason why the study considered 76 percent of the target population is justifiable. Thus although a fraction (about 24%) of the target population formed part of the Agricultural Science teachers and students of the eight selected schools, some teachers were National Service personnel, while some students were newcomers who might not provide the information needed for the study. Therefore such categories of teachers and students were not included in the study's sample.

Thus the selection of study's respondents was done based on proportions of only permanent Agricultural Science teachers, headmasters/mistresses, as well as continuing students who study Agricultural Science. This according to Fraenkel and Wallen (2000), rest on the premise that a sample should be sufficiently representative of the population in situations where the population is too large. More so, the sample should be as large as the researcher can reasonably obtain information with the resources of time and energy at his/her disposal (Fraenkel & Wallen, 2000).

3.2.1 Sources of Data

Data were collected from both primary and secondary sources. The data obtained from the primary sources were gathered using questionnaires which were



used as the main tool to gather data from Agricultural Science teachers and students in the eight selected schools to provide the needed information that was relevant to the study. Due to time constraint, questionnaires were also used to gather data from eight school heads who were considered as key informants. Two separate questionnaires were designed and issued to the teachers and students to ascertain whether the responses which were given by Agricultural Science teachers and students were going to differ from what was provided by the school heads. Secondary data were gathered from the records keeping books of the sampled respondents (Agricultural Science teachers and the school heads).

3.2.2 Data collection Instruments

Questionnaire was the main instrument used to gather data from the study's respondents. The headmasters/headmistresses who were considered as key informants of the study were also given questionnaires to answer them independently. The questionnaire was considered the most appropriate tool for the key informants because they were not ready for any interview arrangement due to their busy schedules. In spite of their busy schedules, the Heads of the selected schools were not left out because their inputs were significant as far as this study is concerned. This was so because the researcher needed an in-depth information from the key informants who happened to be part of the major stakeholders of the selected schools. Additionally, since the study was carried out in the literate environment, questionnaires were used as the main instruments to elicit information from other respondents such as Agricultural Science teachers and



students. Questions that were asked on the questionnaires were based on the specific objectives of the study.

The questionnaires were divided into four sections to address the four specific objectives the study sought to achieve. Section one focused on the background characteristics of respondents. Questions that were asked in section two examined the knowledge of Agricultural Science teachers in teaching Agricultural Science in Urban and Rural SHSs. In section three, questions that related to differences in resources and facilities available as well as teaching methods employed by teachers in Urban and Rural SHSs for teaching Agricultural Science were posed. Section four explored how to assess performance in Agricultural Science lessons in the Urban and Rural SHSs, as well as challenges teachers and students face in teaching and learning of Agricultural Science.

3.2.3 Pre-test of field Instrument

Wyatt (2000: 226) stressed the need for researchers to test survey questionnaires and interview schedules before the actual survey begins, so he writes, “*After designing the tests, we have to test the test.*” In order to identify questions that were ambiguous to the respondents and those that were wrongly answered from the questionnaires, a pre-test was conducted by the researcher to avoid possible inconsistencies in the data results. Due to time and financial constraints, twenty (20) respondents made up of three Agricultural Science teachers, one school head and sixteen Agricultural Science students were selected from Yendi SHS in the Yendi Municipality to take part in the pre-testing. The



respondents were grouped into two. The three (3) Agricultural Science teachers and the head of the school were assigned Group One, while the sixteen (16) Agricultural Science students were assigned Group Two.

Using questionnaires, the study probed Group One to solicit their views on how they understood the research questions. On the other hand, respondents in Group Two were also given a set of questionnaires with specific questions to provide the answers independently. During the testing period, the respondents were given the opportunity to ask the researcher any question they had in mind if they wanted to do so. The whole exercise took place within the maximum of one week. After all the respondents had completed their sessions, the major problems identified were addressed, and all the field questionnaires were reviewed by the researcher to meet the objectives of the study.

One key issue that came up from the pre-test was that half of the respondents were unable to provide the rightful answers to questions that sought to solicit their views on teaching of Agricultural Science in selected urban and rural Senior High Schools in the Northern Region of Ghana. Such questions were therefore modified to the respondents' level of understanding. However, it was observed from the pre-test's results that there were consistencies with regard to all the responses provided by respondents who were given questionnaires to answer. The pre-test was done in the Yendi SHS because it is one of the urban schools in the Northern Region which run Agricultural Science as elective subject. Besides, Yendi SHS is found in another district which is close to the main study area.



3.2.4 Ethical Considerations

The study's methodology was subjected to rigorous ethical considerations. The researcher ensured that the methodological approach of the study did not violate research ethics. Respondents who participated in the study were briefed on the objectives of the study and their consent sought. Under no circumstances was any respondent coerced to participate in the study. Strict confidentiality of the information the respondents provided was assured them. In addition, all protocols, with respect to community entry, were observed.

3.2.5 Data processing and Analysis

The data was obtained in the form of responses from respondents, and were coded and processed, using Statistical Package for Social Science (SPSS) software version 21. The coding helped the researcher to remove items, which were not completed. The coding also enabled numbers to be assigned to the various responses to the items of the questionnaires, which was based on the objectives of the study. Descriptive statistics, specifically, frequencies, percentages, mean, and standard deviation as well as chi-square analysis were used in analyses the responses gathered from the respondents. The statistical significance was tested at 0.05 level of significance or 95% confidence interval for the chi-square analysis. In addition, descriptive approach was employed to engage in comparative analysis of the teaching of Agricultural Science in the urban and rural Senior High Schools in the Northern Region of Ghana.



The data were analysed using mainly tables that showed the frequencies, percentages and descriptive statistics values. The chi-square results were also presented to show the association among some variables captured in the data results. Where necessary, cross tabulations were used to compare how paired variables related.



CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Introduction

The purpose of the study was to evaluate the teaching of Agricultural Science in some selected urban and rural Senior High Schools (SHSs) in the Northern Region of Ghana. This chapter therefore focused on the presentation of results and discussion of the data collected from the field. The presentation was based on the objectives of the study and the research questions posed. The chapter is therefore divided into two sections (Section A and B). The first section focuses on the presentation and discussion of bio-data of the respondents. The second section also used frequencies and percentages to address the first three specific objectives which are: to identify the methods used by Agricultural Science teachers; to assess the performance of Agricultural Science students in urban and rural SHSs; and to examine the challenges of teaching and learning of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana. To address the fourth and fifth specific objectives, chi-square analysis was employed as part of the second section of the analysis and discussion.



SECTION A: PRESENTATION AND DISCUSSION OF RESPONDENTS' BIO-DATA

Table 4. 1: Bio-data of Respondents

<i>Sex Respondents (Students)</i>	Frequency	Percent		
Male	91	59.5		
Female	62	40.5		
Total	153	100.0		
<i>Sex of Agricultural Science Teachers</i>				
Male	11	73.3		
Female	4	26.7		
Total	15	100.0		
<i>Sex of Headmasters/Headmistresses</i>				
Male	4	50.0		
Female	4	50.0		
Total	8	100.0		
<i>Average age of all the Respondents</i>				
<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Dev.</i>	
<i>Number of Observations (N=172)</i>	15	59	19.9	6.5
<i>Educational Level of all the Respondents</i>				
Secondary education	149	87.6		
Higher National Diploma (HND)	4	2.4		
First Degree	12	7.1		
Masters' Degree	5	2.9		
Total	170	100.0		
<i>Employment status of all the Respondents</i>				
Student-Unemployed	152	86.9		
Working Full time-Employed	22	12.6		
On contract	1	0.6		
Total	175	100.0		

Source: Field Data, 2017

Table 4.1 shows that 153 responses were gathered with regards to the sex of Agricultural Science students who participate in the study. Out of the 153 student sampled from the various Senior High Schools, 91, representing 59.5 percent were male, while 62, representing 40.5 percent were female. This finding is in



line with the study of Shiyan and Inyang-Abia (2011) which revealed that the male students' attitude towards the Agricultural Science subject was significantly higher than that of the females. On the other hand, 15 teachers were sampled to participate in the study. Out of the 15, it was gathered that the larger majority (73.3%) were male, while the remaining 26.7 percent were female. This finding is contrary to Aneke (2015) who identified more (71%) female Agricultural Science teachers than male (29%) Agricultural Science teachers in his study's target population from the study area. As shown in Table 4.1, the ages of all the respondents (students, teachers and headmasters/headmistresses) sampled for this study has a minimum of 15 years and maximum of 59 years with mean of approximately 20 years and standard deviation of 6.5 years (N=172; Mean = 19.9; SD= 6.48).

With regards to respondents' educational background, the results show that the larger majority (87.6%), being students, had secondary education, followed by first degree (7.1%), Masters' degree (2.9), and HND (2.4%) respectively. Furthermore, employment status of the respondents was taken into consideration in the data analysis. As exhibited in Table 4.1, out of 175 responses gathered from the respondent, the larger majority (86.9%) were unemployed (students), while 12.6 percent and 0.6 percent of the respondents were full time employed and employed but on contract respectively.



SECTION B: *Discussions of teaching methods used in rural and urban SHSs, teaching challenges, and suggested measures to improve teaching of Agricultural Science*

In order to address the main research questions the study sought to answer, this section discusses the results of the responses which were gathered from the study's respondents. The discussion however begins with the assessment of the subjects taught by Agricultural Science teachers, followed by teacher/students ratio for Agricultural Science course. This was done to ascertain whether or not the teachers teach only Agricultural Science as their area of specialization, and to also determine the average class size of Agricultural Science course.

4.1 Subject taught by Teacher

Sixteen (16) responses, regarding the number of subjects/courses taught by Agricultural Science teachers were gathered from eight (8) Senior High Schools in the Northern Region of Ghana. Out of the sixteen responses, ten, representing 62.5 percent said they teach Agricultural Science and other subjects, while only six, representing 37.5 percent of the respondents were found to be those who teach only Agricultural Science course. The implication of this finding is that majority of Agricultural Science teachers in the Northern Region may not be able to effectively engage in teaching of Agricultural Science. This means the probability that the teachers' concentration on the teaching of Agricultural Science may be conflicting with the other subjects/courses they teach is high.



This finding is contrary to Olaitan, Asogwa and Umeh (2009) who described teacher of Agricultural as someone who has undergone a teacher preparatory programme in the area of Agricultural and is charged with the responsibility of managing the learning behaviour of the Agricultural Science students only. Results of the additional subjects taught by Agricultural Science teachers are presented in Table 4.2.

Table 4.2: Additional Subject (s) taught by Teacher

<i>Additional subject taught</i>	Frequency	Percent
Mathematics	3	30.0
Integrated Science	5	50.0
Elective Science	2	20.0
Total	10	100.0

Source: Field Data, 2017

Aneke (2015) maintains that the subject teacher is supposed to give close supervision to the learners to know their weak points and help them out. As shown in Table 4.2, out of ten respondents, five, constituting 50 percent of the teachers teach Integrated Science in addition to Agricultural Science as the main course they have been assigned to teach. On the other hand, whereas three teachers, representing 30 percent teach mathematics in addition to Agricultural Science, two teachers, constituting 20 percent of the teachers teach other elective Sciences in addition to Agricultural Science. These findings indicate that most of Agricultural Science teachers in both rural and urban Senior High Schools in the Northern Region spend another extra lesson hours in teaching other subjects apart from Agricultural Science.



This finding concurs with the study of Darko, Offei-Ansah, Yuan and Junping (2015) which concludes that for an effective and efficient delivery of Agricultural Science lessons, the background of the teacher is necessary, and that teacher should be professionally trained in his/her area of expertise in order to be able to handle Agricultural Science well.

4.1.1 Teacher/students ratio for Agricultural Science course

The data results further showed that on the average, the Agricultural Science teacher/student ratio in the Northern Region Senior High Schools is 1/43 (i.e.1: 43). This average ratio could have been relatively manageable to ensure effective teaching and learning of Agricultural Science, but the mean used to determine teacher/student ratio was found to contain outliers. This means that there was a very wide variations in the distributions of number of Agricultural Science teachers and students that were sampled from both urban and rural Senior High School in the Northern Region. This finding is not far from what Ministry of Education (2015) reported that in terms of regional distribution of student/teacher ratio in Senior High Schools, the Northern Region exhibits the highest student/teacher ratio (26). The various teaching methods used in teaching Agricultural Science students in both urban and rural Senior High Schools (SHSs) are presented in Tables 4.3 and 4.4.



Table 4. 3: Teaching Methods used in Urban SHS

<i>Teaching methods used in urban SHS</i>	Frequency	Percent
Involves more practicals	48	39.3
Involves field work	28	23.0
Classroom based	17	13.9
Involves trips	4	3.3
Motivating	25	20.5
Total	122	100.0

Source: Field Data, 2017

Table 4.3 highlights how the study's respondents (both Agricultural Science teachers and students) described teaching methods used in urban SHSs. Ofoegbu (2015) opines that in most cases, Agricultural Science teachers are generally fond of using conventional methods, particularly the lecture method, in teaching Agriculture in secondary schools. It is observed from the data results that out of 122 responses gathered, 48 constituting 39.3 percent maintained that the teaching method used in the urban SHSs involves more laboratory practicals, while 28 representing 23.0 percent claimed that it involves field work. On the other hand, whereas 17 constituting 13.9 percent of the respondents asserted that the methods used in the urban Senior High Schools are classroom based, 4 representing 3.3 percent were of the view that urban teachers use educational trips as part of their teaching methods. These findings suggest that teachers in the urban senior secondary school engage in more practicals in Agricultural Science lesson perhaps due to the availability of laboratory facilities.



This is consistent with the study of Robinson (2008) who observed that urban schools are usually staffed with enough well-trained teachers who understand their job and do it effectively. The finding of the study conducted by OECD (2013) also maintains that urban schools are usually larger, and have a more socio-economically advantaged student body.

Table 4. 4: Teaching Methods used in Rural SHS

<i>Respondents Description in rural SHS</i>	Frequency	Percent
Few practicals	36	30.0
More field work	39	32.5
Classroom based	28	23.3
Less use of teaching materials	5	4.2
Not motivating	12	10.0
Total	120	100.0

Source: Field Data, 2017

Daluba (2013) suggests teaching method for Science courses should include interactive and demonstrative method instead of lecture method. With regards to the methods used by Agricultural Science teachers in the rural Senior High Schools however, the results show that the teaching method which dominates in the rural SHSs, according to the respondents is more field work (32.5%), followed by few practicals (23.3%) percent. Also, 28 of the respondents, constituting 23.3 percent claim that the method of teaching in the rural SHS is classroom based, with less use of teaching materials constituting 4.2 percent.



This implies that field work and classroom based method of teaching are pervasive in the rural Senior High Schools in the Northern Region, as compared to the method used in the urban SHSs where more practical teaching methods are employed. This disparities may be as a results of what Halai (2008) has observed that there is a significant shortage of Science teachers in schools in most developing countries, and that the situation is much worse in rural communities.

The finding further supports the study of Aneke (2015) which shows that teachers adopt demonstration, farm field experience, individual teaching method, etc. as instructional methods for enhancing skills acquisition in most rural community secondary schools. In order to assess the further description of the various method employed by teachers in teaching of Agricultural Science in urban and rural SHSs, another critical question was posed to the respondents to rate the teaching methods they use as ‘excellent’, ‘very good’, ‘good’ and fair. Table 4.5 presents the data results gathered from both teachers and students sampled for the study.



Table 4. 5: Rating of Agricultural Science teaching methods used in the Urban Senior High Schools

Rating	Excellent		V. good		Good		Fair		Poor		Total	
<i>Teaching methods in urban SHS</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>
Laboratory Teaching Method	54	34.0	41	25.8	42	26.4	22	13.8	0	.0	159*	100.0
Field Investigation Method	44	28.0	42	26.8	35	22.3	36	22.9	0	.0	157*	100.0
Giving assignment	69	44.8	41	26.6	34	22.1	10	6.5	0	.0	154*	100.0
Problem Solving Method	49	32.2	43	28.3	36	23.7	24	15.8	0	.0	152*	100.0
Discussion Method	89	57.8	33	21.4	29	18.8	3	1.9	0	.0	154*	100.0
Brainstorming Method	39	26.0	38	25.3	46	30.7	27	18.0	0	.0	150*	100.0
Illustration and examples	82	53.6	41	26.8	19	12.4	11	7.2	0	.0	153*	100.0

*No responses exist

Source: Field Data, 2017 [*f* = frequency; (%) = percentage]

The results show that out of 159 responses, fifty-four, constituting 34.0 percent of the respondents in the urban Senior High Schools rated laboratory teaching method as “excellent”, while twenty-two, representing 13.8 percent rated it as “fair”. With respect to field investigation method, forty-four, representing 28.0 percent of the respondents rated it as “excellent”, while thirty-five, representing 22.3 percent of the respondents rated it as “good” and thirty-two constituting 22.9 percent rated it “fair” respectively. None of the respondents rated any of the teaching methods as “poor.



The results further show that the method of illustration and example constituted eighty-two (53.6%) as well as discussion eighty-nine (57.8%) were rated “excellent” by the majority of the respondents than all the other methods used by teachers in teaching of Agricultural Science in the urban SHS in the Northern Region. These findings suggest that in the respondents’ view, the adoption of examples and illustration and method of discussion in teaching of Agricultural Science would ensure effective and efficient teaching and learning of Agricultural Science in the Northern Region urban Senior High Schools. Theoretically, this finding supports Merrill’s (1983) Component Display Theory which specifies that instruction is more effective to the extent that it contains all necessary primary and secondary forms. Thus, a complete lesson would consist of objective followed by some combination of rules, examples, recall, practice, feedback, helps and mnemonics appropriate to the subject matter and learning task. The findings also confirm the link exhibited in the conceptual framework, which highlights the various teaching methods teachers in both rural and urban Senior High Schools can adopt to enhance their teaching. These observations supports Genç’s (2016) call that teachers are expected and assumed to develop a philosophy of teaching by transferring course learning, mostly theoretical in nature, to authentic teaching contexts with real students and conditions.

Assessment of the respondents’ rating of teaching of Agricultural Science in rural Senior High Schools is exhibited in Table 4.6. This comparison was made to comparatively examine what pertains in both rural and urban SHSs in relation to teaching of Agricultural Science.



Table 4. 6: Rating of Agricultural Science teaching methods used in the rural Senior High Schools

<i>Rating of Teaching methods used in rural SHS</i>	Excellent		V. good		Good		Fair		Poor		Total	
	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>
Laboratory practicals	23	17.4	26	19.7	26	19.7	57	43.2	0	.0	132*	100.0
Field Investigation	35	28.0	38	30.4	28	22.4	24	19.2	0	.0	125*	100.0
Activity Method	49	38.6	34	26.8	28	22.0	16	12.6	0	.0	127*	100.0
Problem Solving	26	21.0	47	37.9	33	26.6	18	14.5	0	.0	124*	100.0
Discussion	45	36.6	37	30.1	28	22.8	13	10.6	0	.0	123*	100.0
Brainstorming	30	25.0	30	25.0	41	34.2	19	15.8	0	.0	120*	100.0

*No responses exist

Source: Field Data, 2017 [*f* = frequency; *(%)* = percentage]

With regards to laboratory practical teaching method, 132 responses were gathered from both Agricultural Science teachers and students in the selected rural Senior High Schools. Out of the 132 respondents, fifty-seven (43.2%) of them rated the use of Science laboratory practicals in teaching as ‘fair’, while only twenty-three (17.4%) of them rated it as ‘excellent’. As observed in the urban SHSs, none of the respondents rated laboratory practicals teaching method as “poor”. This finding is far from Perry (2015) who observed in his study that in Ghana, countless teachers have on no occasion conducted far more than rudimentary repetition of theory work which is a requirement for examinations, instead of practical hand on method of teaching. This is in contrast with what pertains to urban SHSs where most of the respondents considered the use of Science laboratory in teaching as ‘excellent’.



Field investigation, as part of teaching methods, was rated by thirty-eight (30.4%) of the respondents as ‘very good’ and ‘excellent’ thirty-five (28.0%) respectively. Coincidentally, 28.0 percent of the respondents in the urban Senior High Schools also rated field investigation method as ‘excellent’. This implies that the urban Senior High Schools in the Northern Region do not only engage in more laboratory teaching method adopted by the teachers, but also, through the effort of the teachers, their field investigation matches what pertains to the rural Senior High Schools where there is availability of land. This is in line with Akdeniz et al. (2016) observation that the most important factor that affects learning is the current supply of knowledge produced by teachers, and this stock of knowledge should be revealed, and teaching should be planned accordingly through effective teaching methods. All in all, it is clear, as shown in Table 4.6, that the teaching methods employed in the rural SHSs that were rated very high by the respondents were found to be assignment (38.6%) rated as ‘excellent’, discussions (36.6%) rated as ‘excellent’ and problem solving (37.9%) rated as ‘very good’. This is an indication that teaching of Agricultural Science in the rural Senior High Schools in the Northern Region involves less Science laboratory practicals, but more of assignment, discussions and problem solving approach are widely used. Contrary to the study of Ogwo and Oranu (2006), who found that skill acquisition is enhanced when concepts are demonstrated and that it is better used for subjects which are practical oriented like Agricultural Science, the methods identified in these findings are likely to miss the goal of skill acquisition enhancement.



In order to achieve other aspect of objective one which is, “to examine how practical methods promote teaching of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana”, the following research question was posed: how do teaching methods employed by teachers promote teaching of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana?

4.1.2 Respondent agreement/disagreement on how teaching methods employed by teachers help promote teaching of Agricultural Science

One hundred and seventy (170) responses were gathered to ascertain the study’ respondents’ agreement or disagreement of whether or not teaching methods employed by teachers contribute to the teaching of Agricultural Science in both rural and urban Senior High Schools. This was done with the purpose of assessing how important the roles of teachers are in ensuring effective teaching. Babalola (2017) has cited that most Science teachers in Africa only give high regard to practical work if it helps students pass examinations irrespective of its contribution towards developing practical skills or otherwise.

It was observed from the study’s data results that out of 170 respondents, one hundred and thirty-nine (139) representing 81.8 percent agreed that indeed teaching methods employed by teachers contribute immensely to the teaching of Agricultural Science in both rural and urban Senior High Schools, while thirty-one, constituting 18.2 percent of the respondents maintained that teaching methods employed by teachers do not contribute to the teaching of Agricultural Science in both rural and urban Senior High Schools.



This is in line with Olaitan and Mama (2001) who write that if teachers do not effectively teach and take the students to the school farm to demonstrate skills and practice it, the students cannot acquire skills that will make them competent to be self-employed or compete with other in the labour market. Those who do not consider teachers contribution to teaching of Agricultural Science were of the view that it is rather government initiative and the schools management's commitment that would ensure effective teaching of Agricultural Science in both rural and urban Senior High Schools. Those who believed that teachers contribute to teaching of Agricultural Science in both rural and urban Senior High Schools were asked to rate the teachers' contributions in different areas, and the results are presented in Table 4.7.

Table 4.7: Rating of how the methods employed by teachers promote teaching of Agricultural Science in Senior High Schools

<i>Rating Teachers' contributions</i>	Excellent		V. good		Good		Fair		Poor		Total	
	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>	<i>f</i>	<i>(%)</i>
Students Performance in Examination	66	38.2	74	42.8	25	14.5	8	4.6	0	.0	173*	100.0
Imparting Practical skills to Students	38	22.1	63	36.6	49	28.5	22	12.8	0	.0	172*	100.0
Motivating Students to show interest in Agricultural Science	89	51.1	27	15.5	41	23.6	17	9.8	0	.0	174*	100.0
The use of practical methods of teaching	43	24.9	49	28.3	45	26.0	36	20.8	0	.0	173*	100.0

*No responses exist

Source: Field Data, 2017 [*f* = frequency; (%) = percentage]



Akdeniz et al. (2016) maintain that traditional learning comprises teaching activities and explanations in class under the leadership of the teacher. Table 4.7 therefore shows respondents' rating of how the practical methods employed by teachers contribute to students' performance in examination, imparting practical skills to students, motivating students to show interest in Agricultural Science, and the use of practical method of teaching. In terms of students' performance in examination, seventy-four, representing 42.8 percent of the respondents rated it as 'very good', followed by sixty-six (38.2%) who rated it as 'excellent', with only eight (4.6%) respondents who rated it as 'fair'. With respect to the use of practical methods of teaching, sixty-three (28.3%) of the respondents rated it as 'very good', and forty-five (26.0%) rated it as 'good' respectively. The findings also show that out of 174 respondents, eighty-nine (51.1%) of them rated teachers' motivation for students to show interest in Agricultural Science as 'excellent'. However, in terms of impartation of practical skills to the students, only 22.1 percent of the respondents rated it as 'excellent'. The findings of this study reaffirm that of Fakomogbon (2012), Igu, Ogba, and Igwe (2014), and Adebule and Ayoola (2016), who reported in their studies that students taught with appropriate teaching method and instructional materials by teachers performed better than those taught without the requisite teaching methods and instructional materials. These findings also indicate that Agricultural Science teachers in the Northern Region Senior High Schools use practical method of teaching and also motivate their students to show interest in the Agricultural Science course, but their ability to impart practical skills to the student is not



encouraging. This supports the research findings that students, particularly disadvantaged students, learn more and have fewer disciplinary problems when they feel that their teachers are devoted to their academic success (Gamoran, 1993) and when they have good working relations with their teachers (Crosnoe, Johnson & Elder, 2004).

To achieve the third objective of the study which is, to assess the performance of Agricultural Science students in urban and rural Senior High Schools in the Northern Region of Ghana, the research question, “how different is the performance of Agricultural Science students in urban from rural Senior High Schools in the Northern Region of Ghana?” was posed.

4.1.3 Respondents’ agreement/disagreement of equal academic performance of Agricultural students in Urban and Rural SHSs

As already indicated, the purpose of the study was to evaluate the teaching of Agricultural Science in some selected urban and rural Senior High Schools in the Northern Region. In order to assess whether the respondents (both students and teachers) agree or disagree that academic performances of Agricultural students in urban and rural SHSs are equal, a question to that effect was posed to solicit their views. One hundred and seventy-three (173) respondents expressed their view on the matter under discussion. Out of the 173 responses that were gathered, one hundred and fifty-eight (91.3%) were of the view that there is a wider difference between the performances of urban Senior High Schools Agricultural students and their counterparts in the rural SHSs, while only fifteen (8.7%) claimed that there is no difference between urban Agricultural Science



students and that of the rural Agricultural Science students in terms of academic performances. This finding supports OECD's (2013) position that differences in students' socio-economic background explain only part of the performance gap between students who attend urban schools and those who attend schools in non-urban areas. The majority of the study's respondents who believed that there is a wider difference between the academic performances of urban Senior High Schools' Agricultural students and their counterparts in the rural SHSs were asked to give reasons why they disagreed, and the results of their responses are displayed in Table 4.8.

Table 4. 8: Respondents Reason for their agreement/disagreement

<i>Respondents' Reason for their agreement</i>	Frequency	Percent
Inadequate Agricultural Science teachers in rural schools	31	18.0
Lack of laboratory practicals in rural schools	34	19.8
Less use of practical tools	27	15.7
Classroom based in urban schools	9	5.2
Lack of educational trips in rural schools	2	1.2
Adequate Agricultural Science teachers and better tools in urban schools	69	40.1
Total	172*	100.0

*No responses exist

Source: Field Data, 2017

Table 4.8 presents the various reasons provided by the respondents to explain why they disagreed that there is equal academic performances between Agricultural Science students in urban and rural Senior High Schools in the Northern Region.



According to the data results, 40.1 percent of the respondents maintain that students in the urban schools perform better than those in the rural schools due to the availability of adequate Agricultural Science teachers and better tools used in the urban Senior High Schools. Lack of laboratory practicals in the rural Senior High Schools, according to 19.8 percent of the study's respondents, accounts for disparities in academic performances between students in the urban Senior High Schools and those in the rural communities in the Northern Region. This supports Babalola's (2017) observation that there were large differences in access to social amenities between urban schools and schools in the rural areas, despite the fact that majority of the African country's population are rural dwellers. Other factors that create academic performance disparity between students in the urban Senior High Schools and those in the rural communities were cited by the respondents as inadequate Agricultural teachers in the rural schools (18%), lack of educational trips in the rural schools (1.2%), and classroom based teaching method in the urban Senior High Schools (5.2%). These findings are consistent with Amuah's (2009) observation that common challenges bedeviling the agricultural practical lessons in developing country include: inadequate facilities, low professional and efficiency levels of teachers, poor attitudes of teachers, poor funding, poor attitude of school administrators and parents towards agricultural education, and political lapses. The findings clearly show that the main reason why there is academic performance disparity between students in the urban Senior High Schools and those in the rural communities is the fact that whereas there is adequate Agricultural Science teachers in the urban Senior High School,



Agricultural teachers in the rural SHSs are woefully inadequate. These findings are not far from the studies of Darling-Hammond (2000) and Rivkin, Hanushek and Kain (2005), who found that in terms of educational quality in rural and remote areas, teachers tend to be inadequate, less well-resourced and supported, and less qualified than their urban peers. More so, performance disparity identified in this finding supports Robinson (2008), who argues that rural teachers tend to be recipients of lower quality in-service training provision than their urban peers, and this can affect students' academic performance.

Further assessment was made by the researcher to determine the number of students who pass their West African Senior Secondary Certificate Examination (WASSCE) and further to the tertiary institutions. The teachers and students who were selected from both urban and rural Senior High Schools for the study provided the estimate of Agricultural Science students who successfully write and pass WASSCE and gain admission into tertiary institutions. This step of focusing on teachers and students to assess academic performance was informed by the study of Taylor, Pressley and Pearson (2002), who found that academic activities and high student performance are valued by both students and teachers. The results of teachers and students qualitative estimation of Agricultural Science students who pass WASSCE and further to tertiary institutions are shown in Table 4.9.



Table 4. 9: Proportion of Agricultural Science students who pass WASSCE and further to Tertiary institutions

<i>Number of students passed</i>	Frequency	Percent
All the candidates	12	6.9
Half of the candidates	37	21.4
More than Half of the candidates	91	52.6
Less than Half of the candidates	33	19.1
Total	173*	100.0

*No responses exist

Source: Field Data, 2017

It is observed from Table 4.9 that out of 173 respondents sampled, ninety-one, representing 52.6 percent estimated that more than half of Agricultural Science candidate successfully pass their WASSCE and gain admission into tertiary institutions, while a little higher than 21 percent claimed that exactly half of the Agricultural Science students pass their final exams and enter into tertiary institutions. On the other hand, whereas a little higher than 19 percent of the respondents estimated that less than half of Agricultural Science students pass their exams and gain admission into tertiary institutions, twelve, constituting 6.9 percent of them claimed that all the Agricultural Science students in their respective schools successfully pass their exams and enter into tertiary institutions.



These findings suggest that although teaching of Agricultural Science in the Northern Region Senior High Schools has been described by most of the respondents as ineffective, the outcome of the examination results of majority of Agricultural Science students is encouraging. The reason for these findings may be explained by the results from OECD's (2010) assessment of students' performance, which show that even though the learning environment in schools and classrooms is partially shaped by the resources, policies and practices of the systems and schools, disciplined classrooms themselves tend to go hand in hand with higher performance.

4.1.4 Chi-square analysis based on teaching methods used in rural and urban SHSs and students' performance

Chi-square analysis was employed to test whether there is significance difference in teaching methods used in rural and urban SHSs in the Northern Region of Ghana. The chi-square analysis was also adopted to test whether there is significant association between teaching methods used in rural and urban SHSs and the proportion of Agricultural Science students who pass WASSCE and further to tertiary institutions. The data results (see Appendix I, Table c) reveal highly significant difference in teaching methods used in urban SHSs and the teaching methods used rural SHSs ($\chi^2=67.49$; $df =16$; $p\text{-value}=0.000$). The null hypothesis that there is no significance difference in teaching methods used in urban SHSs and the teaching methods used rural SHSs is therefore rejected.



The finding of this study is inconsistent with findings of Owoeye's (2011) study which sought to assess school facilities and academic achievement of rural and urban Senior Secondary School students in Agricultural Science, and found no significant difference between rural and urban secondary schools in terms of teaching methods, availability of library facilities, textbooks and laboratory facilities which affect students' performance. This finding indicates that although methods used in teaching Agricultural Science in SHSs in Ghana are supposed to be equal across board, as prescribed in the General Agricultural Science syllabus (Ministry of Education, 2010), there is a very wide difference in terms of teaching methods used in rural and urban SHSs in the Northern Region of Ghana. This is confirmed from the cross tabulation (see Appendix III) which shows that whereas teaching methods used in the rural SHSs were observed by 75 percent of the respondents as methods which involved less use of teaching material, only 8.8 percent of the urban SHSs had teaching methods which involved less use of teaching materials. In addition, majority (60.0%) of the respondents observed that the method used in rural SHSs involved few practicals, while 26.5 percent of the teaching methods used in urban SHSs involved more practicals.

The data results further show that there is significant association between teaching methods used in the urban SHSs and Agricultural Science students who pass WASSCE and further to tertiary institutions ($\chi^2=22.72$; $df=12$; $p\text{-value}<0.05$). This finding implies that teaching methods used by Agricultural Science teachers in the urban SHSs have significant influence on Agricultural Science students' ability to pass WASSCE and gain admission into tertiary



institution. These findings supports prior studies (Yusif, Ishak & Abu-Hassan, 2011; Addae-Mensah, 2000) which found that one of the major predictors of one's success in Ghanaian secondary schools is quality of the Senior Secondary School one attends. The cross-tabulation (see Appendix III, Table A) showed that the majority (70.0%) of urban SHSs believed that all the Agricultural Science students would pass their WASSCE and further to tertiary institutions if the teaching method used by teachers involved more practicals. This is consistent with Daluba's (2013) study finding which showed that a more interactive teaching method such as the practical method has a significant effect on students' achievement compared to the conventional lecture method. On the other hand, 67.9 percent of the respondents claimed more than half of the Agricultural Science students would pass their WASSCE and further to tertiary institutions if the teaching method used by teachers involved field work. This finding supports Darko, Offei-Ansah, Shouqi and Jun-ping's (2015) study which revealed that difficulty in planning field trips was one of the challenges to effective teaching and learning of Agricultural Science in the Senior High Schools.

With regards to the association between teaching methods used in the rural SHSs and Agricultural Science students who pass WASSCE and further to tertiary institutions, the results show insignificant association between the two variables ($\chi^2=9.25$; $df=12$; $p\text{-value}>0.05$). This finding is different from the study of Motlhabane (2013) which found that the role and viability of effective practical teaching methods have significant relationship with the performance of disadvantaged rural schools in the South Africa. Comparatively, the cross-



tabulations (see Appendix III, Table B) showed that whereas the larger majority (70.0%) of urban SHSs believed that all the Agricultural Science students would pass WASSCE and further to tertiary institutions if the teaching method used by teachers involved more practicals, only 12.5 percent of the rural SHSs believed that all the Agricultural Science students would pass WASSCE and further to tertiary institutions due to the teaching method used by teachers which involved few practicals. On the other hand, whereas 67.9 percent of the urban SHSs respondents claimed more than half of the Agricultural Science students would pass their WASSCE and further to tertiary institutions if the teaching method used by teachers involved field work, 33.9 percent of rural SHSs had the same belief. This is a clear indication that the proportion of Agricultural Science students in the urban SHSs who pass WASSCE and further to tertiary institutions far outweighs those in the rural SHSs due to vast variation in the teaching methods used by teachers in teaching Agricultural Science SHSs in the Northern Region.

Respondents sampled from both rural and urban SHSs were asked to rank the various challenges they face in teaching and learning of Agricultural Science. It was observed that both rural and urban SHSs had some common challenges which are peculiar to teaching and learning of Agricultural Science. Thus both Agricultural Science teachers and students were asked to rank (from first to fifth) their challenges in terms of how critical they are. The results of how the respondents ranked the challenges they face in teaching and learning of Agricultural Science are exhibited in Table 4.10.



Table 4. 10: Ranking of common challenges in teaching of Agricultural Science in rural and urban Senior High Schools

RANKING	First		Second		Third		Fourth		Fifth		Total	
	<i>f</i>	(%)	<i>f</i>	(%)	<i>f</i>	(%)	<i>f</i>	(%)	<i>f</i>	(%)	<i>f</i>	(%)
Lack of good Science laboratory	83	47.7	50	28.7	19	10.9	14	8.0	8	4.6	174*	100.0
Inadequate Agricultural Science teachers	36	20.8	42	24.3	35	20.2	31	17.9	29	16.8	173*	100.0
Wrong perception about Agricultural Science course	38	21.8	26	14.9	36	20.7	35	20.1	39	22.4	174*	100.0
Lack of government support for Agricultural course	62	35.8	32	18.5	37	21.4	33	19.1	9	5.2	173*	100.0
Voluminous nature of Agricultural Science syllabus	28	16.2	21	12.1	24	13.9	31	17.9	69	39.9	173*	100.0

*No responses exist

Source: Field Data, 2017 [*f* = frequency; (%) = percentage]

Darko, Offei-Ansah, Yuan and Jun-ping (2015) observed that lack of required resources in the Senior High Schools could have a great toll on the students' overall performance in Agricultural Science in Ghana. Table 4.10 therefore presents respondents' ranking of common challenges in teaching of Agricultural Science that have been identified in both rural and urban Senior High Schools in the Northern Region of Ghana.



It is observed from Table 4.10 that eighty-three of respondents representing 47.7 percent ranked lack of good Science laboratory as their number one challenge (first), while eight, constituting 4.6 percent ranked it as their fifth challenge. This is consistent with Babalola's (2017) observation that the Open Science Laboratory (OSL) approach can support secondary educators, however, access to well-equipped laboratories is a challenge in African Secondary Schools. Kidane and Worth (2013) also found that the teaching and learning of Agricultural Science was greatly impeded in South Africa by lack of fields for practical experience, laboratories, and libraries to facilitate learning.

With respect to inadequate Agricultural Science teachers, forty-two of the respondents constituting 24.3 percent ranked it as their second challenge, while thirty-six, representing 20.8 percent ranked it as their first challenge. In addition, thirty-nine of the respondents constituting 24.2 percent, considered it as their fifth challenge, with thirty-eight (21.8%) rated it as being their first challenge. This means that wrong perception about Agricultural Science course in Senior High Schools in the Northern Region is a bit minimal. In ranking the challenge of lack of government support for Agricultural Science course, sixty-two (35.8%) of the respondents ranked it as their topmost challenge, while nine of the respondents representing 5.2 percent ranked it as their fifth challenge. This implies that government support for teaching of Agricultural Science in the Northern Region Senior High Schools is not encouraging. These findings are consistent with Njoroge & Orodho (2014) who found in their studies that Senior High School students have a positive attitude and interest towards the study of Agricultural



Science subject, though the teaching and learning of the subject are constrained by inadequate instructional resources such as tools, demonstration lands and other agricultural equipment provided by the government.

Lastly, the highest number of the respondents (sixty-nine), constituting 39.9 percent ranked voluminous nature of Agricultural Science syllabus as their fifth challenge, while only twenty-one, representing 12.2 percent ranked it as their second challenge. This shows that both teachers and students of Agricultural Science do not consider the course's syllabus as voluminous. Although Shiyam and Inyang-Abia (2011) found that the level of availability of Agricultural Science facilities in the school has significant influence on students' attitudes towards the subject, this study finds that utmost challenge of the respondents (both teachers and students) which needs urgent attention is the lack of Science laboratory and inadequate government support. The findings support O'Connor, Greene and Anderson (2006) who argue that rural Senior High Schools in Ghana share many of the same challenges as schools in most rural settings in other part of Africa, with lack of funding and resources, aging facilities and difficulty in finding and retaining quality teachers being a commonplace. The finding is contrary to Darko, Offei-Ansah, Yuan and Jun-ping's (2015) research findings from their study which indicate that the major challenges facing the teaching and learning of Agricultural Science in Ghana include frequent use of lecture method in teaching, large class size and poor remuneration of teachers.

In order to address the challenged identified, the respondents were asked to recommend measures that can be put in place to improve upon the existing



state of teaching of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana. Table 4.11 presents the results of the respondents' suggestions regarding the solutions to the challenges identified.

Table 4. 11: Suggestions to improve upon the existing state of Teaching of Agricultural Science in SHS

<i>Respondents' suggestions</i>	Frequency	Percent
Government should improve working conditions	35	20.80
Provision of Agricultural laboratory with tools	109	64.90
Field work should be encouraged	11	6.50
Introduction of computer-based teaching	1	.60
Provision of scholarships to Agricultural students	4	2.40
Organize extra classes for Agricultural students	8	4.80
Total	168*	100.0

*No responses exist

Source: Field Data, 2017

In assessing the suggestions on how to improve teaching of Agricultural Science in Senior High Schools in the Northern Region, one hundred and sixty-eight (168) responses were gathered from the study's respondents as indicated in Table 4.11. Out of the 168 responses, one hundred and nine, constituting 64.9 percent suggested that provision of Agricultural Science laboratory with tools should be made to ensure effective teaching and learning of Agricultural Science course.



Another suggestion that was made by thirty-five (20.8%) of the respondents was that government should improve working conditions of Agricultural Science teachers to motivate them to put in their best in teaching of Agricultural Science. Only one respondent, representing .60 percent, suggested that introduction of computer-based teaching is the only way that would ensure effective teaching and learning of Agricultural Science course. These findings suggest that the two critical measures that must be put in place by the government to enhance teaching of Agricultural Science are the provision of Agricultural Science laboratories and improvement of working conditions of Agricultural Science teachers by the government. These suggestions are consistent with OECD's (2009) argument that public policy can improve conditions for effective teaching if it addresses such factors as school climate, teaching beliefs, co-operation among teachers, teacher job satisfaction, and professional development and teaching techniques. Ensuring these will enable Agricultural Science teachers play their role as identified by Aneke (2015), that the teacher is required to involve the students actively in the farm, and laboratory activities, take them on field trips, give the students projects and individual portions in the farm for private practice.

4.1.5 Summary

This chapter was set to analyse and discuss the result of the data used in the study. Using frequencies and percentages, the analyses were done descriptively to address the various research questions posed to assess the



teaching of Agricultural Science in some selected urban and rural Senior High Schools in the Northern Region of Ghana. Chi-square analysis was also employed to examine the association among some key variables used in the study. The results of the study's data were mainly presented in tables. The findings of this study, supported by several empirical literature, revealed that what pertains in the urban and rural Senior High Schools in terms of methods used in teaching of Agricultural Science are entirely different. Additionally, since there were disproportionate distribution of teacher/student ratio, and unequal availability of Science laboratories in the urban and rural Senior High Schools, disparities in terms of students' academic performance were also observed in the discussions.



CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The chapter focuses on the summary of the study, the conclusions drawn from the findings and recommendations made for policy implication. The final section of the chapter looks at the areas for further research, highlighting the alternative approach that could be used by other researchers to investigate the current problem. The summary, conclusion and recommendation are based on the study's objective in assessing the teaching of Agricultural Science in some selected urban and rural Senior High Schools in the Northern Region of Ghana.

5.1 Summary of the Study

The study was set to assess the teaching of Agricultural Science in some selected urban and rural Senior High Schools in the Northern Region of Ghana. The specific objectives were: to identify the method used in teaching of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana; to examine the contributions of Agricultural Science teachers to teaching of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana; to assess the performance of Agricultural Science students in urban and rural Senior High Schools in the Northern Region of Ghana; to examine the challenges of teaching and learning of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana; to examine association between teaching methods used in teaching Agricultural



Science students in the urban and rural SHSs in the Northern Region; and to examine the association between teaching methods used in rural and urban SHSs and the proportion of Agricultural Science students who pass WASSCE and further to tertiary institutions.

Both theoretical and empirical underpinnings reviewed within the scope of the study's objectives showed that irrespective of where or when the teaching of Agricultural Science is done, teachers are required to adopt practical methods involving field work to provide the necessary skills for their students. In this regard, the study employed descriptive research approach where the discussion was done comparatively. Using both stratified and purposive sampling methods, a total of 176 respondents were sampled to participate in the study. Questionnaires were the main research instruments used to gather the needed data from the study's respondents. The analysis of data was done using the Statistical Package for Social Sciences (SPSS) software version 21. Using frequencies and percentages, the study's data were presented in tables and the analyses were done descriptively. Chi-square analysis was also employed to test two different hypotheses relating to teaching methods and Agricultural Science students' performance in rural and urban SHSs in the Northern Region of Ghana.

5.1.1 Key Findings

The study's data were analysed based on the research objectives and research questions. The study's analysis revealed a number of findings which have both theoretical and empirical bases as discussed in the literature review



chapter of this study. The assessment teaching of Agricultural Science in some selected urban and rural Senior High Schools in the Northern Region of Ghana revealed several findings upon which valid conclusion and recommendations can be made. Thus based on the study's objectives, the following key findings were found in the study:

1. The Agricultural Science teacher/student ratio in the Northern Region Senior High Schools is 1/43 (i.e.1: 43). This average ratio could have been relatively manageable to ensure effective teaching and learning of Agricultural Science, but the average ratio was affected by outliers caused by disproportionate distribution of teachers in urban and rural Senior High Schools in the Northern Region.
2. Majority of Agricultural Science teachers were found to be teaching Agricultural Science and other subjects due to inadequate qualified teachers. This is likely to negatively affect effective teaching and learning of Agricultural Science in the Northern Region of Ghana.
3. Urban Senior High Schools engage in more laboratory practicals in Agricultural Science lesson due to the availability of Science laboratory facilities they have. On the other hand, due to lack of Science laboratories, teaching of Agricultural Science in the rural Senior High Schools involves less laboratory practicals, but more assignment, discussions and problem solving approaches are widely used by teachers. This is confirmed by the chi-square results which showed statistically significant difference between



teaching methods used in urban and rural SHSs in the Northern Region of Ghana.

4. Field work and classroom based method of teaching were found to be pervasive in the rural Senior High Schools in the Northern Region, as compared to the method used in the urban SHSs where more laboratory practical teaching methods are employed.
5. The use of examples and illustration as well as method of discussion in teaching ensure effective and efficient teaching and learning of Agricultural Science in the Northern Region urban Senior High Schools.
6. There was an agreement by the larger majority of the study's respondents that indeed the role of teachers in employing the appropriate teaching methods promotes teaching of Agricultural Science in both rural and urban Senior High Schools than the contribution of other stakeholders of SHSs in the Northern Region, in terms of the promotion of Agricultural Science courses.
7. Generally, Agricultural Science teachers in the Northern Region Senior High Schools motivate their students to show interest in the Agricultural Science course, but their ability to impart practical skills to the student was found not to be encouraging.
8. The majority of the study's respondents were of the view that there is a wider difference between the academic performances of urban Senior High Schools Agricultural students and their counterparts in the rural Senior High Schools. Thus the performance of Agricultural Science students in the urban Senior



High Schools was found to be extremely higher than those in the rural schools.

9. The main reason why the respondents find academic performance disparity between students in the urban Senior High Schools and those in the rural communities is the fact that there are adequate Agricultural Science teachers in the urban Senior High School, while Agricultural teachers in the rural SHSs are woefully inadequate. Evidence from the chi-square analysis confirms this by showing that whereas there is significant association between teaching methods used in urban SHSs and students' academic performance in WASSCE, there is insignificant association between teaching methods used in rural SHSs and students' academic performance in WASSCE.
10. Generally, the study's findings show that although teaching of Agricultural Science in the Northern Region Senior High Schools has been described by most of the respondents as ineffective, the outcome of the examination results of majority of Agricultural Science students was found to be encouraging.
11. The utmost challenge of the respondents (both teachers and students) which needs urgent attention is the lack of Science laboratory and inadequate government support for Agricultural Science course.

5.1.2 Conclusions

Based on the key findings from the study, the following conclusions could be drawn:



Overall, prior studies postulate that Agricultural Science is geared towards the development of manual skills as well as knowledge and attitude required to manage Agricultural resources and this requires that the teacher plans, executes and evaluates his teaching using various methods which emphasize skill acquisition. More so, the teacher is required to involve the students actively in the farm, and laboratory activities, take them on field trips, give the students projects and individual portions in the farm for private practice.

The principal objective, as indicated in the preceding chapters, was to assess the teaching of Agricultural Science in some selected urban and rural Senior High Schools in the Northern Region of Ghana. Based on the findings of the study the following conclusions were made:

On the basis of the first objective, the study concludes that majority of Agricultural Science teachers teach Agricultural Science and other subjects, while only few of them were found to be those who teach only Agricultural Science course. The implication of this finding is that majority of Agricultural Science teachers in the Northern Region may not be able to effectively engage in teaching of Agricultural Science. This is so because the probability that the teachers' concentration on the teaching of Agricultural Science may be conflicting with the other subjects/courses they teach is high. The possibility that teachers who do not qualify to handle a course like Agricultural Science at the SHSs level is also high. Professional development on the part of Agricultural Science teachers is therefore critical to ensure teaching and learning of Agricultural Science in all SHSs in the Northern Region, and for that matter, Ghana as a whole.



Conclusion can also be drawn that teachers in the urban SHSs engage in more practicals in Agricultural Science lessons due to the availability of laboratory facilities, while field work and classroom based method of teaching are pervasive in the rural Senior High Schools in the Northern Region. This observation is a step in the right direction to give direction to the government, management of Senior High Schools in the Northern Region, as well as all other stakeholders of the schools to put in place pragmatic measures regarding teaching and learning of Agricultural Science in rural and urban schools in the region. Specifically, provision of the necessary academic facilities by the government and effective monitoring by regional and district education directors to ensure that Agricultural Science teachers use standard teaching methods are crucial. This study has therefore served to reinforce the understanding to emphasise the level of disparities and challenges in the teaching and learning of Agricultural Science in the Northern Region of Ghana.

The study further concludes that adoption of examples and illustration and method of discussion in teaching of Agricultural Science would ensure effective and efficient teaching and learning of Agricultural Science in the Northern Region urban Senior High Schools. The contribution of these findings to the already existing knowledge is that the use of examples and illustration and method of discussion in teaching of Agricultural Science would have the tendency to broaden the analytical scope in assessing the teaching of Agricultural Science in some selected urban and rural Senior High Schools in the Northern Region of Ghana.



In terms of teachers' contributions, the majority of the study's respondents agreed that indeed teachers contribute immensely to teaching of Agricultural Science in both rural and urban Senior High Schools. In this regard, conclusion can be drawn that Agricultural Science teachers in the Northern Region Senior High Schools use appropriate method of teaching and also motivate their students to show interest in the Agricultural Science course, but their ability to impart practical skills to the student is not encouraging. Although the methods used by most teachers in rural community SHSs in the Northern Region are theory-based with little or no laboratory practicals, the blame cannot squarely be put on teachers, since most SHSs in especially rural communities lack basic laboratory tools and apparatuses used to enhance the teaching of Agricultural Science.

With respect to Agricultural Science students' academic performance, a larger majority of respondents were of the view that there is a wider difference between the performances of urban SHSs Agricultural Science students and their counterparts in the rural SHSs. The conclusion that can therefore be drawn is that the main reason why there is academic performance disparity between students in the urban SHSs and those in the rural communities is the fact that whereas there is adequate Agricultural Science teachers in the urban SHSs, Agricultural Science teachers in the rural SHSs are woefully inadequate. However, inference can be made that the generality of teachers' performance in terms of using appropriate teaching method could also reflect in the students' academic performance. This calls for effective monitoring and supervision by education directors and their team of supervisors in the Northern Region.



All in all, conclusion can be drawn based on the study's findings that although teaching of Agricultural Science in the Northern Region Senior High Schools has been described by most of the respondents as ineffective, the outcome of the examination results of majority of Agricultural Science students, especially in the urban SHSs, is encouraging. On the other hand, it was found that the utmost challenge of the respondents (both teachers and students) which needs urgent attention is the lack of Science laboratory and inadequate government support. The two critical measures that should be put in place to enhance teaching of Agricultural Science are the provision of Agricultural Science laboratories and improvement of working conditions of Agricultural Science teachers by the government.

5.1.3 Recommendations

In the light of the findings and the conclusions of the study, the following recommendations have been made for policy implication:

1. Government of Ghana, through National Association of Teachers (GNAT), National Graduate Teachers Association (NAGRAT) and Ghana Education Service (GES) should have a clear-cut master plan for posting teachers to ensure evenly distribution of teachers across rural and urban Senior High Schools in the Northern Region. This could be done by giving special incentives to especially Agricultural Science teachers who would accept postings to SHSs in the rural communities in the Northern Region.



2. Government, through the Ministry of Education, should make it as part of its educational policies and strictly limit teachers who have been trained as Agricultural Science teachers to only their area of expertise to enable them concentrate on teaching of Agricultural Science. More so, more Agricultural Science teachers should be trained by the government to prevent the tendency of Agricultural Science teachers teaching more than one course/subject in the Northern Region SHSs.
3. Government of Ghana and other stakeholders of second cycle institutions should make it as part of their priorities to ensure a fair distribution of both human and material resources in terms of employing more Agricultural Science teachers, provision of more Science laboratories as well as teaching and learning materials to SHSs in the Northern Region of Ghana. This will go a long way to improve academic performance of students in both rural and urban Senior High Schools. This is crucial because inadequate Agricultural Science teachers, lack of academic facility like science laboratory, and lack of government support were cited by the study's respondents as some of the key challenges they face in teaching and learning of Agricultural Science in the Northern Region of Ghana.
4. Teachers in the rural community Senior High Schools in the Northern Region should be given the needed training by the government, through the Ministry of Education, in the form of refresher courses, to enable them adopt the modern methods of teaching a course like Agricultural Science.



5. The Curriculum Research and Development Division under the Ministry of Education should, as a matter of urgency, revise the 2010 teaching syllabus for General Agriculture Science for SHSs in Ghana by introducing modern teaching methods that will address the current needs of the students. The government of Ghana should also put measures in place to resource all rural SHSs to meet the standard of urban SHSs. This is so because teaching methods used in urban SHSs have significant association with students' academic performance in WASCCE, while the teaching methods used in rural SHSs have insignificant association with students' academic performance in WASCCE.

5.1.4 Suggestion for further Research

The study suggests the use of correlation and logistic regression as alternative approaches which should be employed in future research on the current problem under investigation. Such studies should be conducted on cross regional and district basis to examine the teaching of Agricultural Science in urban and rural Senior High Schools in Ghana. This will enhance the authenticity of the results obtained from the research.

It is further suggested that broad operationalisation should be done in future studies to incorporate more variables that will widen the scope of the studies' results and discussion. This is crucial because this study focused on few variables in the analysis. On the other hand, sample size of future studies should be increased, since this study considered only 176 respondents, and such sample size



might not be representative of the larger population of the region within which the study was carried out.



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APPENDIX I: Questionnaire

UNIVERSITY FOR DEVELOPMENT STUDIES

FACULTY OF EDUCATION

DEPARTMENT OF AGRICULTURE AND CONSUMER SCIENCE

SCHOOL OF GRADUATE STUDIES

TOPIC: EVALUATING THE TEACHING OF AGRICULTURAL SCIENCE IN
SELECTED URBAN AND RURAL SENIOR HIGH SCHOOLS IN THE
NORTHERN REGION OF GHANA.

QUESTIONNAIRE

The purpose of this questionnaire is to collect data for an academic exercise only. Your candid opinions and views on the subject would be very essential and useful for this study. However, you are assured that the information provided would be treated with utmost confidentiality and tactfulness it deserves.

CONSENT OF RESPONDENT'S UNDERTAKEN SIGNED

I understand that, the information collected is going to be used and disclosed, while keeping my identity confidential, between the researcher and the agencies responsible for the safety, effectiveness, and conduct of the research; and that the researcher may use and share my information for scientific purposes related to this and other associated studies.

Respondent's Signature..... Date.....



Please, answer the question by ticking (✓) in the appropriate box or by writing in the space provided.

SECTION A: DEMOGRAPHICS (✓)

	Male	Female
1. Sex		

	Your age in years
2. Please how old are you	I am.....years old.

3. What is your highest Qualification? (✓)

a) WASSCE	
b) Diploma in Basic Education	
c) High National Diploma (HND)	
d) First Degree	
e) Masters' Degree	
f) PhD	

4. Marital Status (✓)

a) Single	
b) Married	
c) Widower/widow	
d) Divorced or separated	

5. What is Your Employment Status? (✓)

a) Working full time	
b) Working part-time	
c) On contract	
d) Others, specify

6. Which subject do you teach in your school? (✓)

a) Agricultural Science only	<input type="checkbox"/>
b) Agricultural Science and other subject (s)	<input type="checkbox"/>



c) Please indicate any additional subject (s) you teach if your answer to (8) is (b).....
.....
.....
.....
.....

7. In all, how many Agricultural Science teachers do you have currently in your school?
.....

10. Please indicate the number of the teachers in terms of sex/gender.

(a) Number of Female Agric teachers.....

(b) Number of Male Agric teachers.....

8. From your school's records, how many Agricultural Science students do you have currently in your school?
.....

9. Please indicate the number of the students in terms of sex/gender.

(a) Number of Female Agric students.....

(b) Number of Male Agric students.....





SECTION B: METHODS USED IN TEACHING OF AGRICULTURAL SCIENCE IN URBAN AND RURAL SENIOR HIGH SCHOOLS IN THE NORTHERN REGION OF GHANA.

10. How would you describe the method used in teaching of agricultural science in urban senior high schools in the Northern Region?

.....

11. How would you describe the method used in teaching of agricultural science in rural senior high schools in the Northern Region?

.....

12. How do you rate the method of teaching used by Agric Science Techers in Urban Senior High Schools? (√)

METHOD	Excellent	Very good	Good	Poor	Fair
Laboratory teaching method					
Field investigation method					
Giving Assignment					
Problem solving					
Discussion					
Brainstorming					
Illustration and use of examples					

13. How do you rate the method of teaching used by Agric Science Techers in Rural Senior High Schools? (√)

METHOD	Excellent	Very good	Good	Poor	Fair
Laboratory teaching method					
Field investigation method					
Giving Assignment					
Problem solving					

Discussion					
Brainstorming					
Illustration and use of examples					

SECTION C: CONTRIBUTIONS OF ADOPTED TEACHING METHODS TO TEACHING OF AGRICULTURAL SCIENCE IN URBAN AND RURAL SENIOR HIGH SCHOOLS IN THE NORTHERN REGION OF GHANA.

14. Do you agree that the teaching methods employed by teachers promote teaching of Agricultural Science in urban and rural Senior High Schools in the Northern Region of Ghana? (a) Yes (b) No

--

15. How do you rate the contribution of practical methods employed by teachers to the teaching of agric science in your school?	(√)				
	Excellent	Very good	Good	Poor	Fair
a. Students performance in examination					
b. Imparting practical skills to students					
c. Motivating students to show interest in Agric Science course					
d. Using practical method of teaching					

SECTION D: ASSESSING THE PERFORMANCE OF AGRICULTURAL SCIENCE STUDENTS IN URBAN AND RURAL SENIOR HIGH SCHOOLS IN THE NORTHERN REGION OF GHANA.

16. Do you agree that the performance of agricultural science students in urban and rural senior high schools in the Northern Region of Ghana are the same?
Yes No

17. Please give reason (s) to your answer
.....
.....



18. Following the trend of your school's performance, what proportion of Agricultural Science students pass WASSCE and further to tertiary institutions?

- a. All the candidates
- b. Half of the candidates
- c. More than half of the candidates
- d. Less than half of the candidates

SECTION E: THE CHALLENGES OF TEACHING AND LEARNING OF AGRICULTURAL SCIENCE IN URBAN AND RURAL SENIOR HIGH SCHOOLS IN THE NORTHERN REGION OF GHANA.

19. What are the common challenge (s) of teaching and learning of agricultural science in your school? [Please rank starting from 1st as the best]

	<i>(1st, 2nd, 3rd, 4th and 5th)</i>
a. Lack of good science laboratory	
b. Inadequate Agric teachers	
c. Wrong perception about Agric course	
d. Lack of government support for Agric course	
e. Voluminous Agric Science syllabus	

20. What measure (s) would you recommend to improve upon the existing state of teaching of agricultural science in your school?

.....
.....

Thank you



APPENDIX II: Chi-square Results Tables

Table (a): Association between Teaching Methods used in Urban SHS and Agric Science students who pass WASSCE and further to Tertiary institutions.

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.718 ^a	12	.030
Likelihood Ratio	21.490	12	.044
Linear-by-Linear Association	.004	1	.948
N of Valid Cases	120		

a. 13 cells (65.0%) have expected count less than 5. The minimum expected count is .33.

Table (b) Association between Teaching Methods used in Rural SHS and Agric Science students who pass WASSCE and further to Tertiary institutions.

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.249 ^a	12	.682
Likelihood Ratio	9.882	12	.626
Linear-by-Linear Association	.067	1	.795
N of Valid Cases	119		

a. 10 cells (50.0%) have expected count less than 5. The minimum expected count is .34.

Table (c) Association between Teaching Methods used in Urban SHS and Teaching Methods used in Rural SHS

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	67.488 ^a	16	.000
Likelihood Ratio	76.665	16	.000
N of Valid Cases	180		

a. 21 cells (58.3%) have expected count less than 5. The minimum expected count is .11.



APPENDIX III: Cross Tabulation Tables

Table A: Teaching Methods in Urban SHS * Agric Science students who pass WASSCE and further to Tertiary institutions Crosstabulation



			Agric Science students who pass WASSCE and further to Tertiary institutions				Total
			All the candidates	Half of the candidates	More than Half of the candidates	Less than Half of the candidates	
Teach Meth Urban	more practicals	Count	7	6	27	6	46
		% within Teaching Methods in Urban SHS	15.2%	13.0%	58.7%	13.0%	100.0%
		% within Agric Science students who pass WASSCE and further to Tertiary institutions	70.0%	26.1%	38.0%	37.5%	38.3%
		% of Total	5.8%	5.0%	22.5%	5.0%	38.3%
		Count	1	6	19	2	28
		% within Teaching Methods in Urban SHS	3.6%	21.4%	67.9%	7.1%	100.0%
	field work	% within Agric Science students who pass WASSCE and further to Tertiary institutions	10.0%	26.1%	26.8%	12.5%	23.3%
		% of Total	0.8%	5.0%	15.8%	1.7%	23.3%
		Count	0	3	7	7	17
	1 based	% within Teaching Methods in Urban SHS	0.0%	17.6%	41.2%	41.2%	100.0%



Source	UNIVERSITY FOR DEVELOPMENT STUDIES	rips	% within Agric Science students who pass WASSCE and further to Tertiary institutions	0.0%	13.0%	9.9%	43.8%	14.2%	
			% of Total	0.0%	2.5%	5.8%	5.8%	14.2%	
			Count	0	2	2	0	4	
			% within Teaching Methods in Urban SHS	0.0%	50.0%	50.0%	0.0%	100.0%	
			% within Agric Science students who pass WASSCE and further to Tertiary institutions	0.0%	8.7%	2.8%	0.0%	3.3%	
			% of Total	0.0%	1.7%	1.7%	0.0%	3.3%	
			Count	2	6	16	1	25	
			% within Teaching Methods in Urban SHS	8.0%	24.0%	64.0%	4.0%	100.0%	
			% within Agric Science students who pass WASSCE and further to Tertiary institutions	20.0%	26.1%	22.5%	6.3%	20.8%	
			% of Total	1.7%	5.0%	13.3%	0.8%	20.8%	
			Source	17					



Table B: Teaching Methods used in Rural SHS * Agric Science students who pass WASSCE and further to Tertiary institutions Crosstabulation

			Agric Science students who pass WASSCE and further to Tertiary institutions				Total	
			All the candidates	Half of the candidates	More than Half of the candidates	Less than Half of the candidates		
Teac SHS	UNIVERSITY FOR DEVELOPMENT STUDIES 	Count	1	8	14	13	36	
		% within Respondents Description of Practical Teaching Methods in Rural SHS	2.8%	22.2%	38.9%	36.1%	100.0%	
		Few practicals						
		% within Number of Agric Science students who pass WASSCE and further to Tertiary institutions	12.5%	30.8%	25.0%	44.8%	30.3%	
		% of Total	0.8%	6.7%	11.8%	10.9%	30.3%	
		Count	5	8	19	7	39	
	ral	UNIVERSITY FOR DEVELOPMENT STUDIES 	% within Respondents Description of Practical Teaching Methods in Rural SHS	12.8%	20.5%	48.7%	17.9%	100.0%
			More field work					
			% within Number of Agric Science students who pass WASSCE and further to Tertiary institutions	62.5%	30.8%	33.9%	24.1%	32.8%
			% of Total	4.2%	6.7%	16.0%	5.9%	32.8%
			Count	2	6	14	5	27
			Classroom based					
		% within Respondents Description of Practical Teaching Methods in Rural SHS	7.4%	22.2%	51.9%	18.5%	100.0%	

UNIVERSITY FOR DEVELOPMENT STUDIES		% within Number of Agric Science students who pass WASSCE and further to Tertiary institutions	25.0%	23.1%	25.0%	17.2%	22.7%
		% of Total	1.7%	5.0%	11.8%	4.2%	22.7%
		Count	0	2	2	1	5
	Less use of teaching materials	% within Respondents Description of Practical Teaching Methods in Rural SHS	0.0%	40.0%	40.0%	20.0%	100.0%
		% within Number of Agric Science students who pass WASSCE and further to Tertiary institutions	0.0%	7.7%	3.6%	3.4%	4.2%
		% of Total	0.0%	1.7%	1.7%	0.8%	4.2%
		Count	0	2	7	3	12
		% within Respondents Description of Practical Teaching Methods in Rural SHS	0.0%	16.7%	58.3%	25.0%	100.0%
		% within Number of Agric Science students who pass WASSCE and further to Tertiary institutions	0.0%	7.7%	12.5%	10.3%	10.1%
	Not motivating	% of Total	0.0%	1.7%	5.9%	2.5%	10.1%

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Table C: Teaching Methods in Urban SHS * Teaching Methods in Rural SHS Crosstabulation

			Teaching Methods in Rural SHS					Total	
			Few practicals	More field work	Classroom based	Less use of teaching materials	Not motivating		
Teach Urban	UNIVERSITY FOR DEVELOPMENT STUDIES	Involves more practicals	Count	9	15	7	3	0	34
		% within Teaching Methods in Urban SHS	26.5%	44.1%	20.6%	8.8%	0.0%	100.0%	
		% within Teaching Methods in Rural SHS	60.0%	40.5%	35.0%	75.0%	0.0%	42.5%	
		% of Total	11.3%	18.8%	8.8%	3.8%	0.0%	42.5%	
		Involves field work	Count	4	12	9	0	0	25
		% within Teaching Methods in Urban SHS	16.0%	48.0%	36.0%	0.0%	0.0%	100.0%	
		% within Teaching Methods in Rural SHS	26.7%	32.4%	45.0%	0.0%	0.0%	31.3%	
		% of Total	5.0%	15.0%	11.3%	0.0%	0.0%	31.3%	
		Classroom based	Count	1	5	1	0	1	8
		% within Teaching Methods in Urban SHS	12.5%	62.5%	12.5%	0.0%	12.5%	100.0%	
		% within Teaching Methods in Rural SHS	6.7%	13.5%	5.0%	0.0%	25.0%	10.0%	
		% of Total	1.3%	6.3%	1.3%	0.0%	1.3%	10.0%	
		Involves trips	Count	0	2	1	0	0	3



UNIVERSITY FOR DEVELOPMENT STUDIES	Motivating	% within Teaching Methods in Urban SHS	0.0%	66.7%	33.3%	0.0%	0.0%	100.0%
		% within Teaching Methods in Rural SHS	0.0%	5.4%	5.0%	0.0%	0.0%	3.8%
		% of Total	0.0%	2.5%	1.3%	0.0%	0.0%	3.8%
		Count	1	3	2	1	3	10
		% within Teaching Methods in Urban SHS	10.0%	30.0%	20.0%	10.0%	30.0%	100.0%
		% within Teaching Methods in Rural SHS	6.7%	8.1%	10.0%	25.0%	75.0%	12.5%
		% of Total	1.3%	3.8%	2.5%	1.3%	3.8%	12.5%

Source

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