

**EFFECT OF LEARNING STYLES AND GENDER ON STUDENTS' ACHIEVEMENT IN  
SECONDARY SCHOOL AGRICULTURE SUBJECT IN ELDORET EAST SUB-COUNTY,  
KENYA**

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Requirements for the Award of the Degree of Master of Science in Agricultural  
Education of Egerton University**

**EGERTON UNIVERSITY**

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## DECLARATION AND RECOMMENDATION

### Declaration

I hereby declare that this study is my original work and has not been presented for any award of a degree or diploma in this or any other university.

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### Recommendation

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## **DEDICATION**

To my parents James and Jane, Noah and Dorcas, my husband Bethuel and children, Sydney, Cyril and Joylene whose wishes I have fulfilled.

## **ACKNOWLEDGEMENTS**

First and foremost I wish to thank Jesus Christ, my Lord and Savior, for having a good plan for my life (Jeremiah 29:11-13), giving me the ability to learn and to see other's needs and seek to meet them, and for being faithful to complete the work He began in me (Philippians 1:6). I would like to appreciate the opportunity accorded me by Egerton University and especially the Faculty of Education and Community Studies through which I have been imparted the education that has made me who I am today. I wish to thank my Supervisors Dr. Agnes Nkurumwa and the late Dr. Mary Lopokoiyit for their assistance and encouragement throughout the research process. Without their involvement, this research would not be what it is, and I would not have grown as I have as both a person and a researcher. I also wish to express heartfelt appreciation for my family who lovingly supported me with their prayers, listening ears, and encouragement through the challenges and each step along the way. My parents deserve many thanks as they started me on the journey of educational exploration and developed in me a love for it.

## ABSTRACT

Despite the importance of agriculture in Kenya's economy, academic achievement of secondary school agriculture students has not been satisfactory. The students' mean scores in the subject from the year 2007 to 2013 were less than 50 percent of the expected score nationally. The mean scores in Agriculture in Eldoret East Sub County ranged between 5.11 and 5.62 out of the possible 12.00. This poor performance has been partially attributed to students' learning styles; their interest in the material under study, motivation and the learning environment. However, few empirical studies have been done to determine the link between learning styles and learners' achievement in secondary school agriculture. The purpose of this study was to determine the effects of learning styles on Agriculture students' achievement in secondary school in Eldoret East Sub County. The target population was all secondary agriculture students and the accessible population was 1200 from three agriculture students in the Sub County co-educational schools. Krejcie and Morgan formula was used to estimate the sample size, which was 291. Purposive sampling was used to select 10 co-educational secondary schools from which 291 respondents were systematically selected into the sample by use of random numbers. Descriptive survey study design was adopted for the study. The Kolb's Learning Style Inventory (KLSI) and an Agriculture assessment test (AAT) were used to collect the data. The reliability of KLSI was 0.745 and that of AAT was 0.71. KLSI was used to profile the learning styles of agriculture students as one of the four learning groups: Converging, Diverging, Assimilating and Accommodating. Statistical Package for Social Sciences computer package version 21 was used in the analysis of the data obtained using frequencies, percentages, means and standard deviations, Analysis of Variance (ANOVA) and Chi-square test. The hypotheses were tested at a 0.05 level of significance. The findings indicated that there was a statistically significant relationship between learning styles and academic achievement at  $\alpha = 0.038$ . The study also revealed that there was a statistically significant difference between gender and achievement based on learning style at  $\alpha = 0.029$  and  $0.012$  for learning styles and gender respectively. This study recommends that Agriculture teachers should identify the learning style of their students and use teaching strategies that complement them. The use of multiple teaching methods will greatly enhance the process of teaching and

learning and make it effective and rewarding.

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## LIST OF ABBREVIATIONS AND ACRONYMS

|                 |  |
|-----------------|--|
| <b>AAT</b>      | Agriculture Assessment Test                                |
| <b>AC</b>       | Abstract Conceptualization                                 |
| <b>AE</b>       | Active Experimentation                                     |
| <b>ANOVA</b>    | Analysis of Variance                                       |
| <b>CDE</b>      | County Director of Education.                              |
| <b>CE</b>       | Concrete Experience  |
| <b>DEO</b>      | District Education Officer                                 |
| <b>DC</b>       | District Commissioner                                      |
| <b>GOK</b>      | Government of Kenya  |
| <b>KCSE</b>     | Kenya Certificate of Secondary Education                   |
| <b>KICD</b>     | Kenya Institute of Curriculum Development                  |
| <b>InnovATE</b> | Innovation for Agricultural Training and Education         |
| <b>LSI</b>      | Learning Style Inventory                                   |
| <b>NACOSTI</b>  | National Commission for Science Technology and Innovation. |
| <b>SAE</b>      | Supervised Agricultural Experiences                        |
| <b>SPSS</b>     | Statistical Package of Social Sciences                     |
| <b>USAID</b>    | United States Agency for International Development         |

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background Information

Academic achievement has, for the past decades, been the center of interest in educational research. Several factors have been identified in explaining academic achievement including gender, (Ray, 2010), intelligence (Deary, Strand, Smith, & Fernandez, 2007) learning styles among others. A specific attention has been given to secondary agriculture due to the importance of agriculture in the economy of Kenya. Agriculture is the mainstay of the Kenyan economy. It accounts for approximately 27 percent of Kenya's Gross Domestic Product (GDP) and the main source of livelihoods for about 80 percent of the population in rural areas (Ministry of Agriculture [MoA], 2014). Agriculture has also greatly factored as a source of income for small scale farmers and contributed to the country's economy as a foreign exchange earner (Gor, Agong, Acheng, Akuno, & Andika, 2012). The importance of agriculture to the economy may account for its inclusion in school curriculum as a subject for every child of school age to acquire the appropriate skills that will enable him cope with life challenges.

Agriculture became officially established in schools curriculum at several phases in the slow development of colonial education, (Sheffield, Moris, & Hermans, 1976). With the introduction of the eight years in primary, four years in secondary and four years in the university (8-4-4) system of education in Kenya in 1985, all the schools started offering agriculture (Republic of Kenya, 1984; Ngugi, Isinka, Temu, & Kitanyi, 2002). The subject is taught so that the youth can appreciate the role agriculture plays in the economy of the country.

In primary school curriculum, agriculture is integrated into the science curriculum (Kenya Institute of Curriculum Development [KICD], formally Kenya Institute of Education (KIE, 2006).

Agriculture is a source of food, employment, foreign exchange, raw materials to the industry, revenue and provision of market for industrial goods. The general objectives of secondary school agriculture according to Kenya Institute of Education (KIE, 2005), are; to develop an understanding of agriculture and its

importance to the family and nation; promote interest in agriculture as industry; create awareness of opportunities existing in agriculture and related sectors, demonstrate that farming is a dignified and profitable occupation; enhance skills needed in carrying out agricultural practices; provide a background for further studies in agriculture; develop occupational outlook in agriculture; enable schools to take an active part in national development through agricultural activities; create awareness of the role of agriculture in industrial and technological development; enhance understanding of the role of technology and industrialization in agricultural development; promote agricultural activities which enhance environmental conservation and promote consciousness of health promoting activities in agricultural production (KIE, 2006). These objectives have both the educational and social economic dimensions. Achievement of these objectives can assist the country towards realization of Vision 2030 (Republic of Kenya, 2007). Despite the importance of agriculture in Kenya's economy, academic achievement of secondary school students in agriculture is generally poor. According to Kenya National Examinations Council (2013), the students' mean scores in the subject were less than 50 per cent for the years 2007-2012. Students had consistently performed poorly, as less than 30 percent of registered candidates obtained good and very good marks, (KNEC, 2014).

The secondary school agriculture syllabus has five main specified areas; Crop production, Agricultural economics, Livestock production, Farm power Machinery and Structures, and Farm Tools and Equipment. Chief Examiner's report on students' areas of deficiency in the Kenya certificate of Secondary Examinations showed that students least understood Agricultural economics concepts as shown by the low scores of candidates who attempted questions in the area of agricultural economics. Most students avoid agricultural economics questions or haphazardly attempt them (KNEC Report 2013). In spite of the importance of agriculture, available data indicate that students' performance in agriculture has been low. Table 1 shows the results of the Kenya Certificate of Secondary Education in Eldoret East Sub County.

## **Table 1**

### ***Eldoret East Sub County Performance in Agriculture KCSE 2013***

| Grade             | A | A- | B+ | B | B- | C+ | C  | C- | D+ | D  | D- | E | X | Y | U |
|-------------------|---|----|----|---|----|----|----|----|----|----|----|---|---|---|---|
| No. of candidates | 2 | 2  | 57 | 7 | 9  | 11 | 13 | 13 | 12 | 21 | 8  | 1 | 2 | 3 | 1 |
|                   | 3 | 9  |    | 1 | 2  | 1  | 7  | 6  | 8  | 2  | 1  | 4 |   |   |   |

***Source: Eldoret East Sub County Quality and Standards Assurance Inspection Report, (2013)***

Table 1 reveals that secondary schools in Eldoret East Sub County performed poorly in agriculture at the Kenya Certificate of Secondary Education, (KCSE) Examination. The poor performance is attributed to factors such as poor teaching and learning methods, lack of agricultural resources, high teacher workload which limits provision of individual attention to the agriculture students, late completion of agriculture syllabus, motivation and the learning environment (Kenya National Examination Council [KNEC], 2014).

Students' learning styles make an important component in the learning environment. Learning Style refers to ways learners concentrate, process, internalize, and remember new and difficult academic information and skills (Shaughnessy, 1998). There are numerous learning style models and instruments used in assessing students' learning styles. Kolb (1986) experiential learning model is one that is established and widely used by researchers (Claxton & Murell, 1987). This model identifies four learning styles: converging, diverging, assimilating, and accommodating. Every student learns and responds to information uniquely (Chang, 2010). The learners' learning style is one factor researchers acclaim influence students' educational performance. Matthews (1996) noted that learning style had a significant effect on the perceived academic achievement.

Aligning learning styles of students with teaching styles of instructors could lead to an improvement in academic achievement (Zeeb, 2004). Information obtained from assessing learning styles could help teachers modify their teaching styles to accommodate varying learning preferences, which may result in improving students' achievement in secondary agriculture. According to Zapalska and Dabb (2002), an understanding of the way students learn improves the selection of teaching strategies best suited to student learning. For students, this matching of instructional strategies to their individual learning styles has consistently evidenced positive results in empirical studies (Minotti, 2005).

Male and female students learn differently from each other (Cavanaugh, 2002). Males are more nonconforming and peer motivated than female. Males tend to learn less by listening. Females, more than males, tend to be auditory, authority-oriented, quieter while learning, and are more conforming than males (Pizzo, 2000). Social preferences of males and females are also different during the process of learning. Male students prefer learning tasks connected with competitions in hierarchical groups, while female students learn by collaboration in small groups in which mutual liking is important (Dorval, 2000). Studies conducted by Leet-Pellegrini (2000) and Fox (1999) suggest that males feel more comfortable in a lecturing role, which is a demonstration of expertise and status, but females feel more comfortable in a listening role, which show a desire to collaborate and bond.

Dunn and Dunn (2009) asserted that valid and reliable instruments are available for assessing the learning styles of students of all ages; additionally, they claimed educators can effectively utilize results gathered from such assessments to develop instructional lessons that are responsive to student needs. Meeting the needs of students is essential if educators are to make substantial progress toward the goal of developing lifelong learners. As indicated in table 2, the number of candidates that sat for KCSE agriculture in the year 2013 were 1,097 with only 383 scoring a mean grade of C+ (plus) and above.

According to a Kenya National Examination Council report, KNEC, (2014), students have seemed to memorize facts without fully understanding the concepts in agriculture and as such, students often are not sure when or how to use what they know. The results of such learning are evident in the number of questions answered correctly in the Kenya Certificate of Secondary Education, (KCSE) agriculture. Thus the purpose of this study was to examine the effects of students' learning styles on their achievement. The learning style and its effect on learners' achievement in secondary school agriculture in Eldoret East Sub County remain unclear. This study sought to fill this gap.

## 1.2 Statement of the Problem

The performance in secondary school Agriculture in the Kenya Certificate of Secondary Education (KCSE) in Eldoret East Sub County has not been satisfactory, especially between the years 2007 and 2013. Out of the possible mean target of



12.00 points, most secondary schools in the sub county have posted mean scores ranging between 5.11 and 5.53. Low academic performance has been attributed partly to low understanding of students' learning styles and failure to take their learning styles into account to enhance learning.

Learning styles of students have a wide range of possible applications in education from classifying the learning preferences of students to detecting potential learning problems at an early stage in order to choose the appropriate teaching methods. By determining the learning styles of students enrolled in secondary agriculture, insight may be offered to agriculture teachers as to how to help the students succeed academically. If there are differences in learning styles between the student groups, do these differences impact the students' academic performance? If so, simple modifications in teaching methodologies could be offered to provide an environment that would be more beneficial to all students.

Past research has predominantly focused on identifying individuals' learning style preferences and patterns. However, little information on the effects of learning style on students' achievement in secondary school Agriculture in Eldoret East Sub County is available. This study was an attempt to fill the gap.

### 1.3 Purpose of the Study

The purpose of the study was to determine the effect of learning styles on students' achievement in secondary school Agriculture, in Eldoret East Sub County, Kenya.

### 1.4 Objectives of the Study

The following objectives guided this study:

- i. To determine the learning styles used by secondary school agriculture students in Eldoret East Sub County.
- ii. To determine the relationship between learning style and academic achievement of secondary school agriculture students.
- iii. To determine gender differences in achievement in secondary school agriculture based on learning styles.
- iv. To compare the effect of learning styles on achievement in specified secondary school agriculture topics (Crop production, Livestock

production, Agricultural economics, Farm tools and Machinery)

## **1.5 Research Question and Hypotheses**

The objective one was translated into a research question. Therefore this study had one research question and three hypotheses are follows:

### **1.5.1 Research Question**

Is there a significant difference in learning styles preferences among secondary agriculture students and between boys and girls in Eldoret east Sub County?

### **1.5.2 Hypotheses**

The following null hypotheses were tested in the study:

**HO<sub>1</sub>** There is no statistically significant relationship between learning style preferences and students' achievement in Secondary School agriculture.

**HO<sub>2</sub>**. There is no statistically significant gender difference in achievement in secondary school agriculture based on learning style.

**HO<sub>3</sub>** There is no statistically significant effect of learning styles on achievement in selected secondary school agriculture topics.

### **1.6 Significance of the Study**

The findings of this study were aimed at providing information to teachers and educational psychologists/researchers to enhance their understanding of the various learning styles favored by the learners. In addition, the researcher hoped to gather crucial and enough information to help instructors recognize the important relationship between learning style preferences gender and academic achievement. Through the findings of this study, teachers may help the learners discover their learning preference, and develop successful and life-long learners. Further, students may benefit from the knowledge about their own learning style and take control or direct their own learning through modifying their habits and materials for optimum learning.

### **1.7 Scope of the Study**

This study focused on students' learning style and gender as a factor affecting their academic achievement in secondary school agriculture. The focus was on learning style components as identified by Kolb (1985) as Converging, Assimilating Diverging, and Accommodating. The choice of the sub county is because most secondary schools in the sub county have posted poor results in agriculture subject in the past five years at Kenya Certificate of Secondary Education, (KCSE) examinations. The study was conducted in Eldoret East Sub-county, and any generalizations will apply only to that sub-county.

## **1.8 Assumptions of the Study**

The study was based on the assumptions that

- i. The students completed the Kolb Learning Style Inventory accurately.
- ii. Teacher awareness of the existence of different learning styles could help with the learning process.

## **1.9 Limitation of the Study**

According to Best and Kahn (1998) limitations are conditions beyond the control of the researcher that may place restrictions on the conclusion of the study and their application to other situations. The study was carried out in Eldoret East Sub-County which is one of the sub counties in Uasin-Gishu County Kenya. For a more conclusive result, all the counties in Kenya would have been studied. This was however not possible due to time and financial constraints. This was overcome by generalizing the findings of the study to Eldoret East Sub County.

## 1.10 Definition of Terms

**Academic achievement-** is defined as measurable behavior in a standardized series of tests. In this study it means learners performance as indicated by the score obtained in the Agriculture results/test used to diagnose individual student strengths and weaknesses as related to the instruction of the Kenya National Examination Council, and to gauge the quality of education (KNEC, 2012).

**Accommodating learning style-** is a type of learning style where the dominant learning abilities are concrete experience (CE) and active experimentation (AE). They grasp the experience through concrete experience and transform it through active experimentation. They have the ability to learn from “hands on” experiences. In this study, accommodating learning style refers to learning by individuals who prefer to work with others to get assignments done, to set goals, to do field work and to test out different approaches to completing a project, (Kolb, 1985)

**Assimilating learning style-** is a type of learning style where the dominant learning abilities are abstract conceptualization and reflective observation (RO). They grasp the experience through abstract conceptualization’ and transform it through reflective observation. They are best at understanding a wide range of information and putting it into concise logical form. In this study assimilating learning styles refers to learning by learners who prefer reading, lectures, and having time to think through ideas, (Kolb 1985)

**Converging learning Style** – is a type of learning where the dominant learning abilities are abstract conceptualization (AC) and active experimentation (AE). They grasp experience through abstract conceptualization and transform it through active experimentation. They are best at solving problems, and dealing with technical tasks. In this study diverging learning refers to learning by individuals who prefer experiments, simulations, laboratory assignments and practical applications, (Kolb 1985)

**Diverging learning** – is a type of learning where the dominant learning abilities are concrete

experience (CE) and Reflective Observation (RO). They grasp experience through concrete experience and transform it through reflective observation. They are best at viewing concrete situations from many different points of view. In this study diverging learning refers to learning by individuals who prefer to work in groups, learn with an open mind and receive personalized feedback (Kolb, 1985)

**Experiential Learning-** Encountered in/derived from experience, learning through practice and firsthand experience. In this study it means learning which involve personal experience of the learning task (Leske & Zilbert, 1989). The indicators of experiential learning will be concrete experience, reflective observation, abstract conceptualization and active experimentation.

**Learning Style Inventory (LSI)** - is an instrument designed to help respondents determine their learning styles. It is a framework for examining one's approach to learning situations, and an instrument for determining one's learning style (Kolb, 1984).

**Learning Style-** refers to individual's unique approach to learning. According to (Keefe, 2001), learning style refers to characteristic cognitive, affective, and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment. In this study, Kolb's four learning-style types (accommodator, diverger, converger, and assimilator) will be identified and analyzed. There is no right or wrong learning style. Thus, in this study, an identified learning style is a preferred learning style; in other words, the mode students prefer when acquiring knowledge.

**Standardized achievement test:** Refers to any form of test that requires all test takers to answer the same questions in the same way and that is scored in a standard or consistent manner which makes it possible to compare the relative performance of individual. According to (Ary, Jacobs, Razavieh, & Sorensen, 2006), standardized tests are any tests with specific content, prescribed directions for administering and scoring, norms, and reliability and validity information derived from administration to representative samples

**Sub County secondary schools-** these are secondary schools in Kenya which select

majority of their form one intake from the primary schools in the Sub County in which they are located. Normally they are expected to admit 85 per cent of their students from the sub county.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter reviews and summarizes literature related to this study on effects of learning styles and gender on students' achievement in secondary school agriculture. The review has been divided into thematic headings which include related studies on learning styles and academic achievement, learning styles, learning styles and achievement, Gender learning

#### **2.2 Students Learning Styles**

Learning is one of the most important individual processes that occur in every part of human life, as in organizations, education and training programs. It is recognized by educational leaders nowadays that the process of learning is critically important and the way individuals learn is the key to educational improvement (Griggs, 2000).

It can be assumed that learning takes place when someone knows something which s/he did not know before or is able to do something which she/he was not able to do before (Honey, 1999). Generally most people think that attending some formal courses or classes and receiving a certificate at the end is the only and best way of learning. These are the external factors of learning process, but they cannot work alone. There are also internal factors in learning process such as individual differences. These factors are considered as the learning styles of the individuals. An individual's preferred way for receiving information in any learning environment is the learning style of that individual.

All human beings are mentally, psychologically, and physiologically different from each other, therefore, the learning processes of each individual differ. This means the knowledge that is obtained from the same information; transfer process differs from individual to individual. Smith and Kolb (1996) said that while we all learn, we do not all learn alike. As a result of our unique set of experiences, we each develop preferred styles of learning. These learning styles are simply the way we prefer to absorb and incorporate new information. Our learning style affects the way we solve problems, make decisions, and develop and change our attitudes and



behavior. It also largely determines the career in which we will find the most comfortably fit; and perhaps most important for the trainer or teacher, it determines what kind of learning experience each type of learner will find effective, comfortable, and growth promoting”.

The key for an effective learning in this case is to understand the range of learners' styles and to design the instructions in a way that they respond to the learning needs of all individuals (Hsu, 1999). However learning can be defined as an internal process that is different for every individual and learning style can be described as the way individuals acquire new information. Hsu, (1999) describe learning styles as a biological and developmental set of personal characteristics, which is defined by the way individual process information. Kafee, (2001) described the learning style as cognitive, affective and psychomotor characteristics that are relatively stable indicators of how learners perceive, interact with, and respond to the learning environment. Each learner has her/his preferred ways of perception, organization and retention that are distinctive and consistent (Chou and Wang, 2000: Hsu, 1999).

Studies on learning processes are formalized to understand these individual differences. The starting point is that different people have different ways of learning which seem natural and preferable for them. This means that some types of learning experience suit them better than others. By a suitable, preferred learning type, the individual can learn lots of things, if not; all of the experience can turn to be a waste of time. The extension of the individual differences in cognitive style and learning preferences can be considered through the Experiential Learning Theory of Kolb (Honey, 1999; Hsu, 1999; & Kolb, 1985).

The study of learning styles has received significant attention in recent years, and in a time when academic achievement is under scrutiny, it is vital that educators know and utilize the best possible methods for helping students learn successfully. The educational world is opening up to the importance of understanding the various ways students learn and recognizing the vital role this plays in attaining widespread academic success (Collinson, 2000). According to Evans and Waring, (2006), teachers benefit from developing an understanding of how their students learn as well as the effect this has on their teaching. Thus, educators must develop a true understanding of learning differences and strive to

provide instruction that is intentionally diverse to suit the learning styles of the learners, (Guild, 2001)

### **2.3 Why Learning Styles are Important?**

How can we improve the performance of our students if we do not know how they learn? How can we pretend any longer that we are serious about creating a learning society if we have no satisfactory responses to the questions: what model of learning do we operate with and how do we use to improve our practice and that of our students? (Hattie & Yates, 2013)

There is a strong intuitive appeal in the idea that instructors should pay closer attention to students' learning styles- by diagnosing them, by encouraging learners to reflect on them and by designing teaching and learning interventions around them. When this is done, learners will become more motivated to learn by knowing their strengths and weaknesses as learners. In turn, instructors can respond to individuals' strengths and weaknesses, and then retention and achievement rates in formal programs are likely to rise and learning to learn skills provide a foundation for lifelong learning. If we accept that we are all different in similar ways and that it's possible to identify and measure these differences reasonably accurately, then the potential benefits for teachers and learners are phenomenal. A greater knowledge of a range of learning styles will help the instructors to be more aware of their preferred teaching style (Coffield, Moseley, Hall, & Ecclestone, 2004). This might include the way they communicate and the kinds of methods and techniques used to explain things. It might also include the way they plan lessons and the kinds of tasks and activities devised for learners; recognize their students learning style preference, particularly those that are different from their own and also understand better the difficulties and barriers that young people experience in their learning (Harris, Mishra, & Koehler, 2009). Potentially, the most attractive claim is that teachers will be able to match their teaching to their students learning styles by explaining and presenting things in different ways using alternative teaching aids and techniques and tailoring the activities that they provide to suit their students learning styles (Pritchard, 2013). Greater awareness of their own dominant learning styles can help teachers to provide learning activities that are more inclusive of the other styles and which reach all students (Pritchard, 2013) and (Vita, 2001).

Although the value of learning styles theory has been questioned in recent

years, this has been due largely to the lack of scientific research to support the various models, particularly in relation to gains in learning and achievement. Nevertheless, there is a common acceptance that people do learn in different ways and that greater awareness of learning preferences and styles helps teachers to be more flexible in their teaching and to use a wider range of classroom methodologies. This is consistent to a research by Cheminais (2002), Reid (2005) and Burnett (2005) which identifies learning style as an important idea for inclusive learning and teaching in the classroom.

According to Hawk and Shaw (2007), knowledge of the overall learning style profile of classes allows us to make adjustments to our learning approaches as the profile changes from course to course and across semesters. Utilization of information regarding the learning style profile of a cohort of students to tailor pedagogy to enhance student achievement is consistent with the Dunn and Dunn learning styles methodology (Dunn 2000). Given the impracticality of designing a teaching strategy that matches each student's learning style, Dunn (2000) suggests an alternative method that allows instructors to capitalize on students learning style preferences. The method involves the use of an instrument to identify individual and group patterns among students learning style preferences and develop teaching style strategies to respond to those patterns (Dunn, 2000).

## **2.4 Learning Style Models**

A wide variety of learning style models is available. However, a review of the significant models include learning modalities, multiple intelligences, the Dunn and Dunn learning styles model, the Myers-Briggs Type and Kolb's learning style model.

### **2.4.1 Some learning modalities**

Learning modalities can also be referred to as perceptual styles and include up to seven different pathways through which learners receive, store, and give information (Reiff,1992). This includes print, interactive, olfactory, visual, auditory, tactile, and kinesthetic. The foundation of perceptual learning style theory, which includes all seven modalities, is the idea that a person's five senses act as the source of the majority of what is learned, (Davis, 2007). The senses play a vital role in the storage of information in the sensory or immediate memory where it retains

and combines this information with that which is newly gathered. Information from sensory or immediate memory then transfers into short-term, and eventually long-term, memory Sprenger, (2003).

### 2.4.2 Multiple intelligences

According to Denig (2004), Howard Gardner developed the theory of multiple intelligences in opposition to the idea that a single construct could accurately determine a person's intelligence. The theory advanced by Gardner was founded upon the idea that individuals, in fact, display a wide variety of culturally valuable intelligences that could not be measured or indicated by the standard IQ test but could be utilized to develop essential products and solutions (Gardner, 1999). As such, Gardner argued that there are at least eight intelligences including linguistic, logical mathematical, spatial, kinesthetic, musical, interpersonal, intrapersonal, and naturalistic. A variety of these intelligences characterize most people, but at varying levels of development (Jacobs-Connell, 2000). The typical test of a person's intelligence quotient (IQ) was limited in that it only measured the mathematical and linguistic domains. In addition, the analytic style of the IQ test served to discriminate against examinees with a global approach to learning.

### 2.4.3 Honey and Mumford's learning style theory

Kolb's work formed the basis of Honey and Mumford's theory in the field of learning style and management and the development of their learning styles questionnaire. Honey and Mumford's description and measurement of learning style are grounded in Kolb's experiential learning model, with styles closely corresponding to those defined by Kolb. The four learning styles measured propounded by Honey and Mumford are: activist (Kolb's experimentation); reflector (Kolb's reflective observation); theorist (Kolb's abstract conceptualization; and pragmatism (Kolb's concrete experience). In other words, there is arguably a strong similarity between the Honey and Mumford styles/stages and the corresponding Kolb learning styles: Activist = Accommodating; Reflector = Diverging; Theorist = Assimilating; and Pragmatist = Converging.

**'Having an Experience' (stage 1)**, and Activists (style 1): 'here and now', gregarious, seek challenge and immediate experience, open-minded, bored with implementation. Activists involve themselves fully and without bias in new experiences. They enjoy the here and now, and are happy to be dominated by immediate experiences. They are open-minded, not skeptical, and this tends to

make them enthusiastic about anything new. Their philosophy is: "I'll try anything once". They tend to act first and consider the consequences afterwards. Their days are filled with activity. They tackle problems by brainstorming. As soon as the excitement from one activity has died down they are busy looking for the next. They tend to thrive on the challenge of new experiences but are bored with implementation and longer term consolidation. They are gregarious people constantly involving themselves with others but, in doing so, they seek to center all activities around themselves (Hartley, 1998).

**'Reviewing the Experience' (stage 2)** and Reflectors (style 2): 'stand back', gather data, ponder and analyze, delay reaching conclusions, listen before speaking, thoughtful.

Reflectors like to stand back to ponder experiences and observe them from many different perspectives. They collect data, both first hand and from others, and prefer to think about it thoroughly before coming to a conclusion. The thorough collection and analysis of data about experiences and events is what counts so they tend to postpone reaching definitive conclusions for as long as possible. Their philosophy is to be cautious. They are thoughtful people who like to consider all possible angles and implications before making a move. They prefer to take a back seat in meetings and discussions. They enjoy observing other people in action. They listen to others and get the drift of the discussion before making their own points. They tend to adopt a low profile and have a slightly distant, tolerant unruffled air about them. When they act it is part of a wide picture which includes the past as well as the present and others' observations as well as their own (Hartley, 1998).

**'Concluding from the Experience' (stage 3)** and Theorists (style 3): think things through in logical steps assimilate disparate facts into coherent theories, rationally objective, reject subjectivity and flippancy. Theorists adapt and integrate observations into complex but logically sound theories. They think problems through in a vertical, step-by-step logical way. They assimilate disparate facts into coherent theories. They tend to be perfectionists who won't rest easy until things are tidy and fit into a rational scheme. They like to analyze and synthesize. They are keen on basic assumptions, principles, theories/models and systems thinking (Gregorc, 1979). Their philosophy praises rationality and logic. "If it's logical it's good." Questions they frequently ask are: "Does it make sense?" "How does this fit

with that?" "What are the basic assumptions?" They tend to be detached, analytical and dedicated to rational objectivity rather than anything subjective or ambiguous. Their approach to problems is consistently logical. This is their 'mental set' and they rigidly reject anything that doesn't fit with it. They prefer to maximize certainty and feel uncomfortable with subjective judgments, lateral thinking and anything flippant.

**'Planning the next steps' (stage 4)** and Pragmatists (style 4): seek and try out new ideas, practical, down-to-earth, enjoy problem solving and decision-making quickly, bored with long discussions. d. 'Planning the next steps' (stage 4) and Pragmatists (style 4): seek and try out new ideas, practical, down-to-earth, enjoy problem solving and decision-making quickly, bored with long discussions. Pragmatists are keen on trying out ideas, theories and techniques to see if they work in practice. They positively search out new ideas and take the first opportunity to experiment with applications. They are the sort of people who return from courses brimming with new ideas that they want to try out in practice. They like to get on with things and act quickly and confidently on ideas that attract them. They tend to be impatient with ruminating and open-ended discussions. They are essentially practical, down to earth people who like making practical decisions and solving problems. They respond to problems and opportunities 'as a challenge'. Their philosophy is "There is always a better way" and "If it works, it's good".

Based on this model, Honey and Mumford developed a Learning Style Questionnaire (LSQ) which has been used to determine learning styles in the education field up to date. Although developed for use with management trainees, the LSQ has been used in a range of settings including education. However, concerns regarding the psychometric qualities of the LSQ have been raised. A failure to support the existence of either the bipolar dimensions or learning styles proposed by Honey and Mumford found the LSQ to have only modest levels of internal consistency (ranging from 0.52 to 0.73) for the four styles subscales has been reported (Duff & Duffy, 2002).

#### **2.4.4 Dunn and Dunn learning styles model**

The Dunn and Dunn learning styles model (Denig, 2004) has its foundation to the concept that intelligence is not definitively linked to talent or inborn capabilities



(Denig, 2004; Lovelace, 2005). Instead, perception, comprehension adaptability, the acquisition of knowledge through experiences, and analytical problem solving and decision-making skills are acceptable and valid demonstrations of intelligence (Denig, 2004).

As such, the learning styles model considers 20 elements that affect student learning and encompass the learner's environment, emotionality, sociological preferences, physiological characteristics, and psychological processing inclinations. Each of these broad categories is then broken down into the following specific elements: sound, light, temperature, seating design (environment); motivation, task persistence, responsibility/conformity, structure (emotionality); learning alone, in pairs, in a small group of peers, as part of a team, with an adult, with variety or routines (sociological preferences); perceptual strengths, time of day, need for intake, mobility while learning (physiological characteristics); and global/analytic, impulsive/reflective (psychological processing inclinations) (Dunn & Burke, 2006).

The Dunn and Dunn learning styles model proposes that students should be taught how to utilize their primary learning style to study and learn new material (Denig, 2004). In addition, students should be encouraged to employ their secondary style as a means of effective reinforcement of initial learning. According to the International Learning Styles Network (2008), all individuals have unique tendencies in their approach to the various aspects of learning.

#### **2.4.5 Vermunt's learning style model**

The concept of learning style has also been described by Vermunt in the Learning-Centered Process-Based Approach/Information Processing Style in terms of: processing strategies, including an awareness of the aims and objectives of the learning exercise used to determine what is learnt; regulation strategies, which serve to monitor learning; mental models of learning, encompassing the learner's perceptions of the learning process; and learning orientations, described as personal aims, interventions and expectations based on past experience of learning (Vermunt, 1992). Based on these strategies and orientations, Vermunt derives four learning styles: undirected where there is difficulty in assimilating learning material, coping with the volume of material; reproduction, where little or no effort is made to

understand but instead information is reproduced to complete the task or achieve the minimum required standard; application directed, which is characterized by the application of learning material to concrete situations in order to gain understanding and lastly, meaning directed learning, which involves attempts to gain a deeper understandings of learning material and to draw on existing and related knowledge to achieve critical understanding.

Based on this theory, the Vermunt's Learning Style (LSI) was developed as a diagnostic tool for use in a higher education context. The degree to which each of the four styles is favored is assessed using Vermunt's LSI, Vermunt (1994). The LSI comprises of 20 subscales and 120 items relating to study strategies, motives and mental models. Individuals respond to statements along a five-point scale according to the degree to which the statement is descriptive of their behavior or the extent to which they agree with the statement.

#### **2.4.6 The Myers-Briggs type indicator**

The Myers-Briggs Type Indicator (MBTI), classify students as extraverts or introverts, sensors or intuitors, thinkers or feelers, and judgers or perceivers. Individual student's preferences in each of these categories can then be combined to form any of 16 different learning style types (Felder, 1996). While the MBTI is actually a personality assessment, the information that is gathered has often been related to how people think, learn, and make decisions. In reality, all people exhibit characteristics of each of the four categories, but individuals display their uniqueness in the extent to which they employ these characteristics and the individual's effectiveness in doing so (Reiff, 1992). McPherson (1999) supported the relevance of this connection by his assertion that the teacher's knowledge of student personality types can bolster the development of meaningful class activities.

#### **2.4.7 Gregorc's learning style theory**

Anthony Gregorc's Mind Styles model is purported to be based on how the mind works and also proposes four learning styles. Gregorc proposes that we perceive the world in both concrete and abstract ways and subsequently order

those perceptions in either a sequential or random fashion. The combination of these perceptual qualities and ordering abilities generates four combinations: Concrete Sequential; Abstract Random; Abstract Sequential; Concrete Random. Although both of the perceptual qualities and both of the ordering abilities are present in each individual, some will be more dominant. It is this combination that determines our preferred —Mind Style|| and provides the foundation for our specific learning strengths, or learning styles. It is notable that there are a number of "loose similarities" between each of the preceding models, insofar as they each construct a matrix predicated on two intersecting continua (one concerned with the way we perceive, the other with how we process those perceptions). The model is based on the existence of perceptions- our evaluation of the world by means of an approach that makes sense to us. These perceptions in turn are the foundation of our specific learning strengths, or learning styles (Gregorc, A.F and Butler, K.A, 1984).

In this model, there are two perceptual qualities: (a) concrete and (b) abstract; and two ordering abilities: (a) random and (b) sequential. Concrete perceptions involve registering information through the five senses, while abstract perceptions involve the understanding of ideas, qualities, and concepts which cannot be seen. In regard to the two ordering abilities, sequential involves the organization of information in a linear, logical way and random involves the organization of information in chunks and in no specific order. Both of the perceptual qualities and both of the ordering abilities are present in each individual, but some qualities and ordering abilities are more dominant within certain individuals (Gregorc, 1984).

#### **2.4.8 David Kolb's experiential learning model**

David A. Kolb's model is based on the Experiential Learning Theory (Kolb 1984). In the theory of experiential learning, Smith and Kolb claims that:

*Experiential learning offers a fundamentally different view of how we all learn - one considerably broader than that commonly associated with traditional teaching activities, or even with the classroom. This theory is essentially that we learn as a direct result of our immediate, here-and-now experience, and that learning happens in all human settings – from school to shop floor, from research laboratory to management boardroom, in personal relationships and in the aisles of the local grocery store, (1999).*

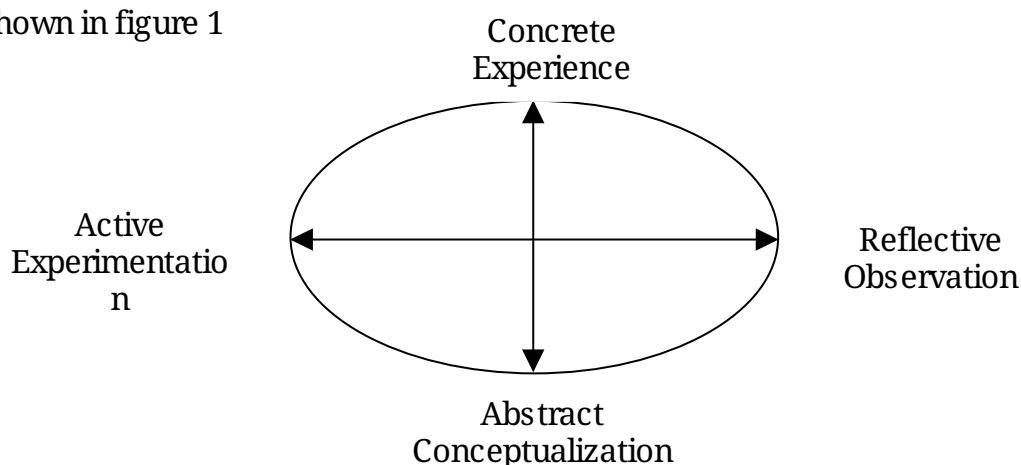
In ELT model, there are four stationary points of the learning process (Hsu, 1999; Smith and Kolb, 1996). Individuals learn through experience, and as they learn they move through this four-stage cycle. The stages are:

**Concrete Experience (CE).** (Learning from feeling). According to Kolb, (2000) Concrete Experience (CE) (“Feeling”) is the ability to be involved in new experiences without bias or Restraint. Individuals tend to rely more on their feelings rather than on a systematic approach to problems and situations.

**Reflective Observation (RO).** (“watching”) is the ability to maintain multiple perspectives in observation and meditation. In this stage of the learning cycle, people understand ideas and situations from different points of view. In a learning situation individuals would rely on patience, objectivity, and careful judgment but would not necessarily take any action. People would rely on their own thoughts and feelings in forming opinions.

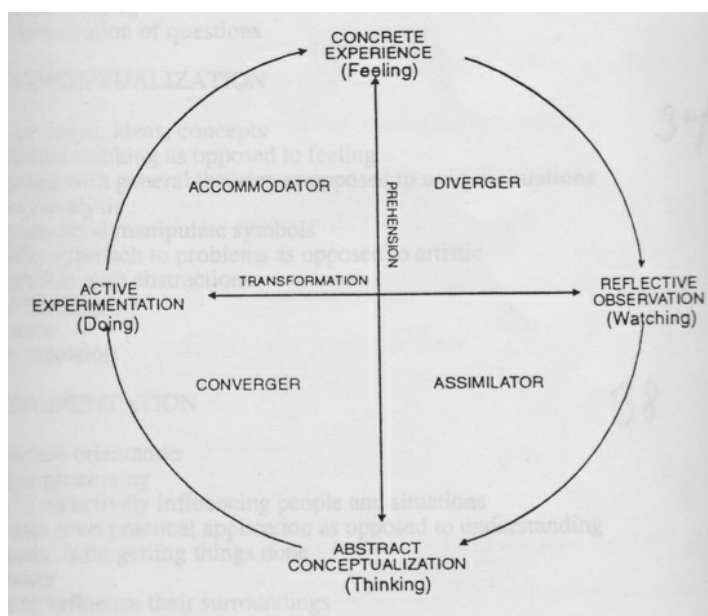
**Abstract Conceptualization (AC).** (“thinking”) is the ability to theorize logically, integrating observation into concepts. In this stage, learning involves using logic and ideas, rather than feelings, to understand problems or situations. Typically, people would rely on systematic planning and develop theories and ideas to solve problems. (Kolb 2000).

**Active Experimentation (AE)** (“doing”) is the ability to act by making decisions and problem solving (Kolb 2000). In this stage learning takes an active form. Individuals would take a practical approach and be concerned with what really works, as opposed to simply watching. Kolb also claims that experience is acquired by either concrete experience or abstract conceptualization and that this experience is transformed through reflective observation or active experimentation (Gusentine & Keim, 1996). The four stationary points of the learning process is as shown in figure 1



**Figure 1: The experiential learning model (Smith and Kolb, 1996)**

Individuals who rely on CE perceive through their senses, immerse themselves in concrete reality, and rely heavily on their intuition, rather than step back and think through the elements of the situation analytically, where others who rely on Abstract Conceptualization (AC) are thinking about, analyzing, or systematically planning, rather than using intuition or sensation as a guide, since AC is learning by thinking (Smith and Kolb, 1996). This was stated as the Concrete-Abstract dimension in which the new information perceived (Smith and Kolb, 1996). As the second essential element of learning, Smith and Kolb (1996) stated that there was the Active-Reflective dimension in which the absorbed information and experience processed. Individuals rely on Active Experimentation (AE) are the doers, while the ones who rely on Reflective Observation (RO) are the watchers. AE is learning by doing and RO is learning by reflecting (Smith & Kolb, 1996). The learning style preferences resulting from the two bipolar scales of the Learning Cycle were described by Kolb (1984) as Accommodating (AE/CE), Divergent (CE/RO), Assimilating (RO/AC) and Convergent (AC/AE). These four different learning styles were labeled according to the individuals' preferred information perceiving and processing modes (Hsu, 1999) as in Figure 2.



***Figure 2:*** The four learning styles through the learning cycle adopted from Kolb's Learning Style Inventory

**Divergers.** Individuals with diverging learning style as shown in figure 2 have concrete experience and reflective observation being their dominant dimensions. These learners approach concrete situations with different perspective and they organize relationships between events in a meaningful way. They make observations first before taking any action. They take into account their own feelings and thoughts while configuring learning issues, and are quite successful at brainstorming activities and creativity. They have strength in imagination, perception, identifying problems and evaluating them from different perspectives. However, they have hard times while choosing an option, or making decisions; at times, they are inadequate in taking advantage of learning opportunities (Smith & Kolb, 1996).

**Assimilators.** Abstract conceptualization and reflective observation are the dominant dimensions for individual learners with assimilating learning style. They are more interested in abstract concepts and ideas. Their problem-solving skills are high. However, they are insufficient in practical work and learning behaviors concerning practical values and ideas. These individuals also choose to receive the information from experts and see teachers as the most important source of information. They also tend to learn by listening and observing making them better with the traditional learning approaches, (Smith & Kolb, 1996).

**Convergers.** Individuals with converging learning style use abstract conceptualization and active experimentation as their dominant learning styles. These individuals have higher skills in problem solving, logical analysis and deductive reasoning. They are often interested in technical issues and are not attracted to social and interpersonal activities. They are quite good at exam questions with single answers, and they are more interested in the practical parts of ideas. They prefer to reach the correct information by trial and error and by applying what they learn, and they often require feedback from the teacher (Smith & Kolb, 1996).

**Accommodators,** for individuals with accommodating learning style, learning through concrete experience and active experimentation are their dominant dimension. Leadership abilities of these individuals are higher and while they are learning they make use of interpersonal relationships and personal information of

individuals rather than technical analysis. Their curiosity and research motivation are higher. Since they are sociable, they can easily communicate with other individuals. They are open-minded about learning and their capacity to adapt to change is high. If the theory put forth or a plan is incompatible with the facts, they usually abandon the plan (Smith & Kolb, 1999).

Although it was proposed that every individual have a constant learning style, this does not mean that there would not be any change or shift in the learning style preferences of individuals. Through time and development, there may be some shifts in the learning styles of individuals. As Willcoxson and Prosser (1996) proposed, the influence of long-term and short-term situational factors upon learning modes implies not only professional or academic demands that may permanently or temporarily affect and alter learning style preferences but also any individual will respond to the demands of different learning contents by utilizing different learning strategies.

In addition to Kolb's research, there are other researchers who also describe the same characteristics of the four learning styles, (Reiff 1992, DiBartola, Miller & Turley, 2001). Reiff (1992), explain Kolb's four learning modes as stages in the similar way. Kolb's ELT will be used in this study in that, teachers have identified Supervised Agricultural Experiences programs as the primary experiential learning tool in agricultural education (Benson, 1981; Cheek, 1994). However, Kolb (1984) asserted that all learning is experiential. Thus, experiential learning plays an integral role in the entire agricultural education classrooms, not just the SAE component. Croom (2008) noted that, for agricultural education to be successful to a significant degree, there must be a commitment by all stakeholders to deliver all components of experiential learning collectively therefore enriching the learning process. There is evidence to support the idea that experiential learning produces results that are better than traditional educational models (Clayton, 2004). Experiential learning can be goal-oriented and standard-based. Though experiential learning may be more time and effort intensive, it produces richer, more enduring learning (Cheek, 1994).

Agricultural education is uniquely poised to help students through an effective model of instruction that is experiential by nature. Though experiential learning process may take more time and effort, the result constitutes more enduring and relevant learning. Experiential learning builds meta-cognitive skills



(Kolb & Kolb, 2009). As such, provide students with the opportunity to understand how they learn and the process involved in making meaning of various experiences. Agricultural educators who engage students to learn by experience through authentic pedagogy will most likely see the fruits of higher intellectual achievements, not only in classrooms and schools, but more importantly, in their roles as adults as contributing citizens of society (Knobloch, 2003).

## **2.5 The Concept of Academic Achievement**

Academic achievement is defined as successful completion, through effort, of the acquisition of academic content and skills. Achievement is defined as measurable behavior in a standardized series of tests (Simpson & Weiner, 1989). The tests are usually constructed and standardized to measure proficiency in school subjects. The most highly valued method of determining whether a successful completion has taken place for a learner is quantitative in nature. In other words, numbers (in the context of grading and testing) are used to indicate whether a student has been successful or unsuccessful in mastering academic content and skills (Simpson & Weiner, 1989). A student who scores 90 per cent (where 90 per cent equals an A) is deemed to have achieved, where as a student who has 18 per cent is deemed not to have achieved. A student who takes a standardized test in writing and scores at a 99th percentile is regarded as an achiever, while a student who scores at a 13th percentile is seen as a non-achiever.

In most cases, according to Bruce and Neville (1979), "accomplishment" is sometimes used in place of "achievement". According to them educational achievement is measured by standardized achievement test developed for school subjects. What this means is that academic achievement is measured in relation to what is attained at the end of a course, since it is the accomplishment of medium or long term objective of education. What is important is that the test should be a standardized test to meet national or state norm. For a test to be standardized, it must be valid for over a period of time. Academic achievement discourse prefer that all students in a school take the same coursework and engage in that coursework in the same way- through traditional methods such as note-taking, raising hands for questions, and reading the same textbooks.

The bottom line in academic achievement discourse is based on grades and

test scores. According to Steve (2000), academic achievement is distinguished from academic performance in that academic achievement is long-term while academic performance is measurable at any point in time. Steve (2000) further stated that satisfactory academic achievement award is given to recipient who maintains satisfactory academic performance and progress towards, the attainment of high school certificate. This is to suggest that academic achievement is cumulative and progressive: it means that academic achievement cannot be attained within a short period or at a slot. What this indicates is that academic performance culminates and influences academic achievement.

## **2.6 Implications of Learning Styles on Learning and Teaching**

With the shift from an instructional to a learning paradigm, there is growing acceptance that understanding the way students learn is the key to educational improvement. To achieve a desired learning outcome, one should provide teaching interventions that are compatible with the students' learning styles. When teaching takes place in or out of the classroom, students are expected to learn. Because teaching is intended to result in learning, secondary agriculture teachers can benefit from understanding and applying certain principles of learning when designing and implementing their teaching activities Mutua, (2015). Previous studies have reported that students' learning performance could be improved if proper learning style dimensions could be taken into consideration when developing any learning or instructional process (Graf, Liu, & Kins huk, 2010).

The basis of learning research must be the individual learner because that is the learning unit. However, most teaching efforts today are made at the classroom level with a relatively large group of students. Thus, while the teaching approaches are at the class (macro) level, learning takes place at the individual student (micro) level, influenced by their individual learning style preferences (Mutua,2015). Proponents of learning style assessment contend that optimal instruction requires diagnosing individuals learning style and tailoring instruction accordingly. The students in a classroom are diverse, in terms of ethnicity and gender. This diversity can affect classroom settings in many ways, including the diversity of learning styles (Mutua, 2015). Any good teacher strives and passionately stays committed to his/her discipline/profession and are anxious to convey its significance and

knowledge base to their students.

Despite the good intentions, one may be so concerned with covering the subject matter that he/she loses track of how much of that material really gets conveyed through their taken-for-granted teaching modes (Stenberg, 1997). If teachers are not inclined to much self-reflection about their teaching methods and practices, they are likely to continue teaching their students the way they learn best, assuming that this way will work for all students (Irvine & York, 1995). But given the increasing diversity of the student body, as well as the higher expectations for teaching performance among high school administrators, it is likely that many teachers feel the urgency in rethinking their teaching methods.

The contention is that, by making an effort to consider students learning styles, teachers may be able to reap equal satisfaction from reinvigorating their teaching practices hence high academic achievement (Irvine & York, 1995). Realistically, no teacher can expect to develop different ways of teaching for each individual student in their class, but they can provide variety of learning experiences such as that at one point or another each learning style is addressed.

## **2.7 Students' Learning styles and Achievement**

Research has shown that the relationship between learning style and academic achievements is linear (Chamorro, 2008). According to Ormestein, (1992), good performance is the ultimate goal of every learner. Research has established that learners with high performance-orientation to acquire knowledge are extrinsically motivated in terms of learning behaviors due to the reward which will come as a result of high performance, while learners who embrace superficial learning styles focus on the minimum effort necessary to ensure success (Marshall, 1999). Educators therefore should encourage learners to take a deep learning approach as opposed to memorizing information, rote learning and learning facts without a meaningful context. Knowledge about students' learning style can benefit students and teachers. For students it will help them understand their own strengths and weaknesses and consequently learn more effectively and take responsibility for their own learning (Honey & Mumford, 1992). For teachers it may help them consider appropriate teaching strategies that enhance students learning strength. Their awareness of students learning styles would help them in making

informed choices in course material and learning process.

Effective learning requires matching materials to learner's abilities and learning styles (Honey & Mumford, 1992). If these do not match, frustrations set in making learning more difficult. When the learning style of students in a class and the teaching style of their teacher are mismatched the students may become uncomfortable and inattentive in class. This possesses further challenges for educators in assisting students in learning and succeeding academically (Felder & Spurling, 2005). A student's style of learning, if accommodated, can result in improved attitudes toward learning and an increase in thinking skills, academic achievement, and creativity (Irvine & York, 1995). Some past research on learning styles attempted to categorize learners by ability has produced some convincing results. For example, Kolb (1984) identified four learning styles (i.e. accommodation, assimilation, converging, and diverging) and four learning modes (i.e. concrete experience, reflective observation, abstract conceptualization, and active experimentation) (Kolb D. A., 1984). Dunn and Dunn (1978) developed a comprehensive model dealing with environmental, emotional, sociological, physical, and psychological learning style elements and concluded that these elements could provide information directly related to teaching strategies and academic achievement.

Most researchers in the field of learning styles agree that enabling learners to reflect on how they learn best helps to develop their meta-cognition: fostering meta-cognition is perhaps the most important advantage that can be claimed for applying learning style theory to teaching and learning which in turn develop effective learners who can handle challenges in a learning context and excel in examinations. Learning style consideration in learning is therefore an approach that is directed at meta-learning, similar to setting goals, choosing appropriate strategies and monitoring progress which are more effective ways of improving learning outcomes and achievement than those which simply aim to engage learners at the level of presenting information or understanding and use (Hattie, Biggs, & Purdie, 1996).

## **2.8 Studies Related to Learning Styles and Academic Achievement**

A significant number of studies have been carried out to establish whether

learning style preference has any relationship with academic achievement. Much of these past studies have sought to establish the relationship between the two variables. Some of these studies have also sought to understand the relationship by gender, and most of them have found significant relationships between the two variables and by gender. A study conducted by Gappi, (2013), explored on the student's preferred learning styles and their academic achievement Results showed that there was no significant effect of gender, age and academic program on the learning style preferences of the students ( $r = -0.056$ ). Based on the result, there was no significant statistical correlation between the academic achievement and the learning style preferences of the students.

A different study conducted by Vaishnav and Chirayu (2013) on the analysis of learning styles prevalent among secondary school students also tried to find out the relationship and effect of different learning styles on academic achievements of students. It was conducted on three learning styles-visual, auditory and kinesthetic (VAK). A sample of 200 students of class 9th, 10th and 11th standard of Maharashtra state was randomly selected for the study. After selecting the sample the Howard Gardner's VAK learning style brain box and VAK Learning Style Inventory by Victoria Chislett and Alan Chapman was used to identify the preferred learning style of students. The correlation between academic achievement and learning style was determined using Pearson's product moment co-efficient of correlation method and also to identify the effect of learning style on academic achievement ANNOVA F test was used. Findings of the study revealed that, kinesthetic learning style was more prevalent than visual and auditory learning styles among secondary school students. There exist positive high correlation between kinesthetic learning style and academic achievement ( $r=0.658$ ). The other two learning styles have positive relationship but not strong one:  $r=0.287$  for auditory learning style and  $r=0.129$  for visual learning style. The main effects of the three variables - visual, auditory and kinesthetic are significant on academic achievement (Vaishnav & Chirayu, 2013).

A study conducted by Gokalp, (2013) evaluated the learning styles of education faculty students and determined the effect of their success and relationship between their learning styles and academic success. The population of the study comprised of the students from the Faculty of Education at May

University, and the sample included 140 students, among whom 68 were art and 72 pre-school teacher department students. Depending on the results obtained from pre-test, it was aimed to improve students' knowledge and skills in studying (Gokalp, 2013). There was a significant difference between the scores of pre-tests and post-tests. The significant relationship between the scores of post-test and the student success revealed that they learned how to study effectively. The study found out that statistically significant differences existed between the results of the first and final applications of the subtests on learning styles and academic success; those sub-tests covered the items as learning, planned study, effective reading, listening, writing, note taking, using the library, getting pre-prepared for and taking exams, class participation and motivation.

A closely related study that investigated the impact of learning styles on the academic achievement of secondary school students in Iran JilardiDamavandi, Mahyuddin, Elias, Daud, and Shabani,( 2011) has also contributed to the learning styles discourse. The Kolb Learning Style Inventory (1999) was administered in eight public schools in Tehran. The mean of test scores in five subjects, namely English, science, mathematics, history and geography, was calculated for each student and used as a measure of academic achievement. A total of 285 Grade 10 students were randomly selected as sample of the study. The results of the analyses of variance showed that there is a statistically significant difference in the academic achievement of the Iranian students that correspond to the four learning styles; in particular, the mean scores for the converging and assimilating groups are significantly higher than for the diverging and accommodating groups.

A study conducted by Ismail Erton in 2010 among five faculties at Bilkent University First Year Students has contributed to the field of learning styles in education (Erton, 2010). The study was conducted among 102 freshman students between the age of 18 and 23 who responded to the Jeffrey Barsch's Learning Style Inventory and their test scores were used to calculate the statistical coefficient between the two variables. The study showed that there is a weak positive statistical relationship between the learning styles of the students and their achievement in foreign language (English 101 course) with a correlation coefficient of 0.306.

Although these studies were conducted based on different learning style

models, that is, cognitive learning styles, sensory learning styles, and personality styles, the results show a positive relationship between learning styles and academic achievement regardless of the model used. The present study will help in understanding the relationship between learning styles and academic achievement in Kenyan context, and specifically in secondary agriculture in Eldoret East Sub County.

## **2.9 Instruments for Measuring Learning Styles**

Style Inventories that have been found in the literature currently available in the field include the following:

### **2.9.1 The Grasha-Riechmann student learning style scales (GRSLSS)**

The Grasha-Riechmann Scale is a 90-item self-report inventory which measures the preferences of both high school and college students (Grasha, 1999). It consists of six categories: Avoidant (takes little responsibility for learning) Participative (accepts responsibility for self-learning and relates well to peers) Competitive (suspicious of peers), Collaborative (enjoys working harmoniously with peers) Dependent (becomes frustrated when facing new challenges not directly addressed in the classroom) and Independent (prefers to work alone and requires little direction). However, the researchers emphasized that this instrument seems ideal for assessing student learning preferences in a college-level distance learning setting (Diaz & Carnal, 1999). Studies on the instrument's validity are limited and lack in strictness and care for detail. Grasha himself has grown dissatisfied with it (Grasha, 1999). The instrument's focus on college students makes it of limited use in secondary education.

### **2.9.2 Dunn and Dunn learning style scales**

It was developed by Dunn and Dunn (1999). The instrument has two parts: the Learning Style Inventory (LSI) designed for children of grades 3-12 containing 104 items, and the Productivity Environmental Preference Survey (PEPS), an adult version of the LSI containing 100 items. The Dunns' Learning Style Model is complex and encompasses 5 strands of 21 elements that affect each individual's learning. Although the Dunns' LSI has "impressive reliability and construct validity" (DeBello, 1990), one criticism of the Dunns' approach is that the two-part

instrument contains more than 200 items, which will require approximately one hour to administer, (Dun & Dunn 1999).

### **2.9.3 The learning styles questionnaire (LSQ) developed by Honey and Mumford**

This is a questionnaire that was developed by Honey and Mumford (1992). The questionnaire consists of 80 items with true/ false answers to determine learning styles (Swales & Senior, 1999). Taking from Kolb's original concept of a learning cycle of different learning styles, Honey and Mumford (1992) identify four types of learners: Activists: who enjoy new experiences, make intuitive decisions, and dislike structure. Theorists: focus on ideas, systematic planning, and mistrust intuition. Pragmatists: favor practical approaches, group work, debate, and risk-taking. And Reflectors who observe and describe, try to predict outcomes, and try to understand meaning. However the LSQ does not clearly reflect the four-stage Learning Cycle relied upon for a theoretical foundation and there is no support for using this instrument as a measurement of learning style in education (Swales & Senior, 1999).

### **2.9.4 Solomon and Felder's index of learning styles (ILS)**

This questionnaire has 44 questions and focuses on four bi-polar preferences for learning scales Felder and Silverman, (1988). Active-Reflective (Active learners learn by trying things and working with others and Reflective learners think things through and work alone). Sensing-Intuitive (Sensing learners are oriented toward facts and procedures while Intuitive learners are more conceptual, innovative and focus on theories and meanings) .Visual-Verbal (visual learners prefer visual representations of material such as pictures, diagrams and charts while verbal learners prefer written or spoken explanations) However Bacon (2004) in his study pointed out that most of the subscales contained in the ILS had poor reliability since the reliabilities may vary from school to school.

### **2.10 Kolb's Learning Style Inventory**

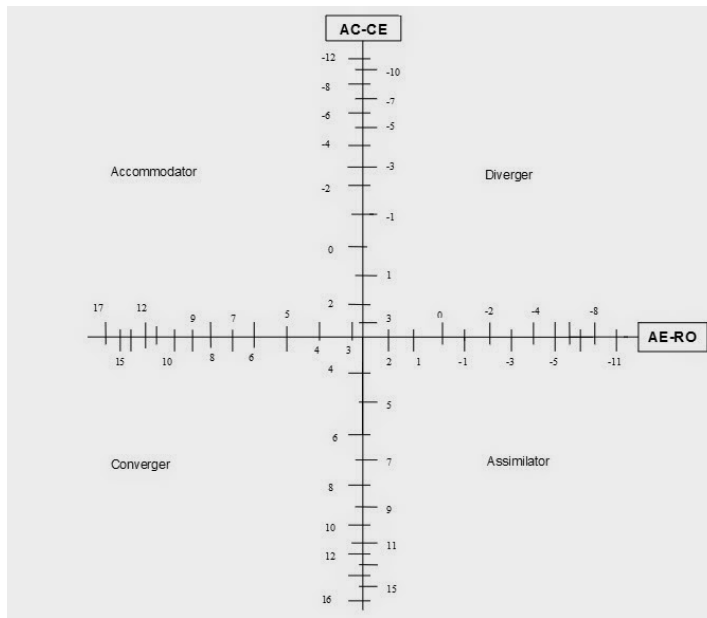
The Learning Style Inventory (Kolb, 1985) is a 12- item self-reporting instrument in which individuals' attempt to describe their learning styles. KLSI is a 12-item self-description questionnaire where each item asks the respondent to rank



in order four words that best describes the respondent's preferred learning style (Kolb, 1985; 1999). The 12 items consist of short statements concerning learning situations and each of the items asks respondents to rank four sentence endings that correspond to the four learning modes- Concrete Experience (whose characteristic word is feeling), Reflective Observation (watching), Abstract Conceptualization (thinking), and Active Experimentation (doing) (Gencel, 2007).

The Learning Style Inventory (LSI) provides a framework for examining one's approach to learning situations. The respondent is asked to use a rating scale from one through four as follows: four (4) best characterizes his or her learning style, three (3) to the word which is next best at characterizing the respondents' learning style, two (2) to the next most characteristic word, and one (1) to the word which is least characteristic for him or her as a learner. The scores of the four basic learning styles are derived by summing the rank numbers assigned to the words that correspond to each of the learning modes. The learning mode receiving the highest score is considered to be the preferred learning style of the respondent (Kolb, 1999).

The inventory measures the respondent's relative emphasis on the four modes of learning- Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). The raw scores for each of the four learning modes range from 12 to 48. Higher scores indicate greater emphasis on a particular learning mode. The inventory also measures an individual's relative emphasis across two dimensions, CE versus AC and AE versus RO. These two dimensions bisect on a learning style grid to form four quadrants reflecting four learning styles: accommodator, diverger, assimilator, and converger. In order to find the dominant learning style of an individual, the scores from four learning modes are combined and subtracted (Gencel, 2007). The combination score (AC-CE) reflects the extent to which the respondent emphasizes abstractness over concreteness. The score (AE-RO) indicates the extent to which the respondent emphasizes action over reflection. The score of AC-CE and AE-RO are then plotted on the learning style grid to determine the learner's dominant learning style if accommodating, diverging, converging or assimilating.



**Figure 3: Learning style grid (based on Kolb, 1984)**

Kolb's learning style inventory is considered appropriate for the study because it gives the most valid and reliable coverage of students learning style and approaches to learning, Hawk and Shah, (2007). It also measures an individual's relative strength and weaknesses as a learner. Although learning styles are thought to be a permanent part of human behavior (Curry, 1983; Kolb, 1984), they are considered by some to be flexible structures rather than unchangeable personality traits (Fielding, 1994).

### 2.11 Theoretical Framework

The theory guiding this study is Kolb's theory of experiential learning (Kolb 1984) and the functional curriculum theory by Obanya, (2004). According to Obanya, functional content education simply says that the situation in which the learner is learning, should determine the way education is carried out, including what is taught and how it is to be taught and learned Obanya, (2004) posits that the purpose of education is to acquire skills of adapting to that environment and acting to influence it thereby contributing to its development. According to Obanya, the learner's environment should determine the way education is carried out, including what is taught and how it is taught and learned. Experiential learning theory (ELT) builds on this idea, grounded in the theory that all learning begins with an

experience, which is then processed into knowledge. This theory of learning is congruent with the secondary agriculture syllabus which focuses on hands-on application, where student experience is given an essential role in the learning process. The agriculture syllabus in secondary school is designed to give students experiences that simulate tasks that are performed in the school farm which act as an agriculture laboratory. This model is relevant to this study in that the study of agriculture is based on experiential learning as an integral element, (Roberts, 2012). The experiential learning model, when placed on the agricultural education model, illustrates the total learning experience of agricultural education, where the learner in the three cycle model sees, say something and the SAE portion allows students to take what they have seen in the classroom and apply it in real life agriculture experiences.

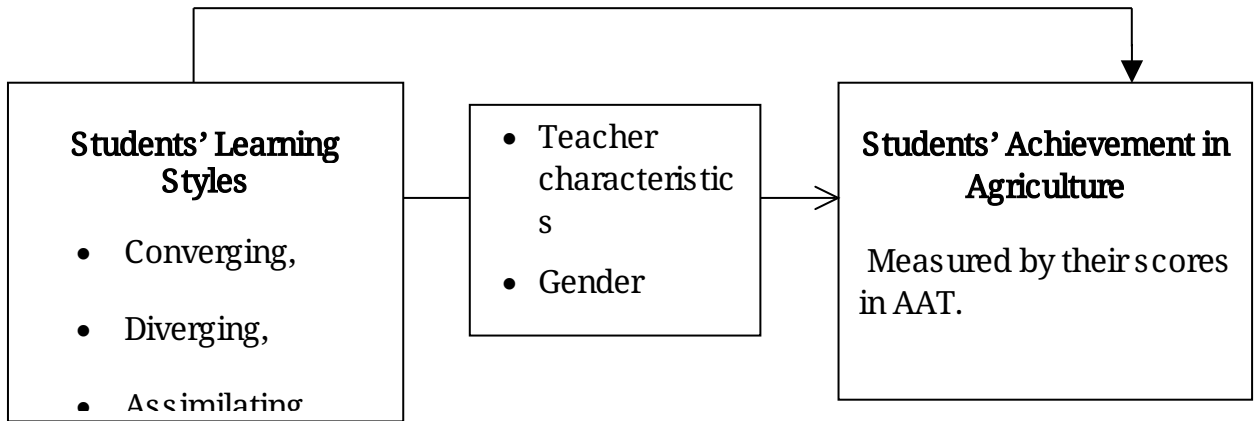
The experiential learning cycle provides a good framework to complement the existing agricultural education model. In general, agricultural education teachers are naturally covering a lot of the learning emphasis on the different modes of the learning cycle. Kolb (1984) asserted that all learning is experiential. Thus, experiential learning plays an integral role in the entire agricultural education model. The bottom line of secondary school agriculture was to equip learners with agricultural skills they could use for self-reliance.

## **2.12 Conceptual Framework**

A conceptual framework refers to how a researcher conceptualizes the relationships between variables in the study by presenting them graphically or diagrammatically, Mugenda and Mugenda, (2003). The conceptual framework is found significant for it assist the researcher to quickly perceive the relationship established between variables.

This study aimed at establishing the effects of students' learning styles on their achievement in secondary school agriculture. Thus students' learning style was the independent variable and it was conceptualized that it would influence the learners' achievement in agriculture which was the dependent variable. The achievement however, could be influenced by intervening factors some of which are teacher characteristics, gender, and learners' age. The teacher characteristics' were controlled by involving trained teachers who have taught secondary School

Agriculture for at least one year. This is because the teacher training and experience determines how effectively a teacher uses the approach. The age of the students was controlled by involving Form Three students who have comparable age. Gender of the students was studied to determine the effects on students' achievement in Agriculture.



**Independent Variables**

**Intervening Variable**

**Dependent Variables**

**Figure 4:** Conceptual framework showing interaction between factors affecting students' achievement

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Introduction

This chapter outlines the research procedure used in the study. It covers research design, location of the study, population of the study, sampling procedure and sample size, instrumentation, data collection, data analysis and a summary of the analytical procedures. This chapter also explains too the procedure used to administer Kolb's learning style inventory questionnaire, and the Agriculture Assessment Test.

#### 3.2. Research Design

This study adopted a cross-sectional survey research design. Cross-section is an approach where information on a population is gathered at a single point in time which was the case for this study. According to Mugenda and Mugenda (2012), a survey is an attempt to collect data from members of a population in order to determine the current status of that population with respect to one or more variables. Survey research is considered as the best method in collecting original data for purposes of describing a population which is too large to be observed directly (Kombo & Tromp, 2006).

This research design was therefore suitable in studying students' learning styles. Survey design was chosen because it was appropriate for educational fact-finding as it yields a great deal of information which is accurate, and helps the researcher to establish the pertinent facts that the research intended to establish without necessarily manipulating the variables of the study (Koul, 1998). Survey research design also enables a researcher to describe the nature of the existing conditions (Cohen & Manion, 2000).

#### 3.3 Location of the Study

The study was carried out in Eldoret East Sub county of Uasin Gishu County, Kenya. Eldoret East is one of the three sub counties of Uasin Gishu County. It

borders Eldoret North, Eldoret South, Keiyo South, Keiyo North and Eldama Ravine sub counties (See the Appendix D). It is approximately 1.891 square kilometers. It has a population estimate of 622,705. It has a secondary school enrolment rate of 18 percent and ranked 38th in the nation, (Economic Survey Report, 2014). The main socio-economic activity is farming where large and small scale farming of maize and wheat is the main activity (Economic Survey Report, 2014).

### 3.4 Target Population

A target population, according to Mugenda and Mugenda (2012) is that population to which the researcher wants to generalize the results of a study. The target population for this study consisted of 4800 secondary school agriculture students in the 47 secondary schools in Eldoret East Sub County. The accessible population was 1,200 form three agriculture students in Eldoret East Sub County (Eldoret East Sub County Education Report, 2015)

### 3.5 Sampling Procedure and Sample Size

Forty seven secondary schools register students in Kenya Certificate of Secondary Education, (KCSE) in agriculture in the Sub-County, with a total number of twelve hundred form three agriculture students Using the formula developed by Krejcie and Morgan (1970), a sample size of 291 respondents consisting of 148 boys and 143 girls were randomly selected from the twelve hundred form three agriculture students. The researcher selected form three students on the assumption that they were able to report their cognitive process of mind which was necessary to answer the Kolb learning style inventory. The Form 4 students were candidates and therefore they required ample time to prepare for examinations without any external or internal interference. Krejcie and Morgan (1970) recommend that for a population of 1200 units, a sample size of 291 units may be used as illustrated as follows:

$$S = \frac{x^2 NP(1-P)}{d^2 (N-1) + x^2 P(1-P)}, \text{ in which}$$

S=required sample size

N= the given population

P=population proportion assumed to be .50

$\chi^2$  =the degree of accuracy set at .05d=table value of chi square which is

3.841 for the .95 confidence level

$$S = \frac{\chi^2 NP(1 - P)}{d^2(N - 1) + \chi^2 P(1 - P)}$$

$$\frac{3.841 \times 1200 \times 0.5(1 - 0.5)}{0.052 \times (1200 - 1) + 3.841 \times 0.5(1 - 0.5)}$$

$$\frac{1,152.3}{2.9975 + 0.96025} = 291$$

In this study therefore, 291 respondents were distributed as: 148 boys and 143 girls. The distribution was based on the proportion of boys and girls making up the total population. According to Zikmund and William, (2003), proportional stratified sample is one in which the number of sampling units from each stratum is in proportion to the population size of that stratum. Various sampling procedures were used during the study. First the researcher used the stratified random sampling to select Co-educational public secondary schools in the sub-county. This was followed by purposive sampling of ten public co-educational secondary schools that have more than 30 agriculture students as shown in Table 2

**Table 2:*****Secondary Schools and Number of participants in the Study***

| <b>Name of School</b>         | <b>Number of Students participating in Study</b> |
|-------------------------------|--|
| Cheburbur Secondary School    | 40   |
| Kimoning Secondary School     | 35   |
| Tembelion Secondary School    | 38   |
| Kapsoya Secondary School      | 22   |
| Central Secondary School      | 18   |
| Kimumu Secondary School       | 20   |
| Mageresa Secondary School     | 21   |
| Ngelel Tarit Secondary School | 30   |
| Chepkongony Secondary School  | 32   |
| Ainabkoi Secondary School     | 36   |
| <b>Total</b>                  | <b>291</b>                                       |

Purposive sampling was used in that it allowed the researcher to use cases that had the same required characteristics (Dunn & Griggs, 2000). Cohen (2007) also suggests that if general conclusions about the population as a whole are to be reached, the sample size needs to be at least 30. Purposive sampling was also used to specifically select agriculture students who were in form three because at form three the students had the ability to think about the cognitive process of mind and to report these introspections, which were necessary to answer learning style inventory, which normally actualizes at adolescence stage, (Kolb, 1985). Co-educational secondary schools were used in this study. This was because coeducation requires teachers to consciously adopt a gender balanced pedagogy which realizes the individual needs of each student based on their assessed skills instead of gender characterizations. This stimulates both male and female students to contribute positively to classroom discussion (Dunlop, Macdonald, 2004 & Foster, 1992). Systematic random sampling technique which involved the use of random numbers was used to select students from each school to be included in the sample. In all the ten schools selected, agriculture was offered as an optional



subject.

### **3.6 Instrumentation**

The required data was collected using both the Kolb Learning Style Inventory and an Agriculture Assessment Test.

#### **Kolb's Learning Style Inventory**

Kolb's Learning Style Inventory (Kolb, 1999), which contains 12 items with four statements each, was used to evaluate the students' learning preference (See Appendix A). Individuals were asked to rank the endings for each sentence ranging from "4" for the sentence that best describes the way that the learner learns to "1" for the sentence that least describes the way that the learner would learn. The four endings correspond to the four learning modes of Active Experimentation (AE), Concrete Experience (CE), Reflective Observation (RO), and Abstract Conceptualization (AC), (Kolb, 2005). The Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC) and Active Experimentation (AE) scores for each participant was determined. By subtracting each student's CE scores from AC scores and RO scores from AE scores the learning style of each participant was classified either as 'accommodating', 'diverging', 'assimilating' or 'converging' (Kolb, 2005). The LSI has been found to possess adequate validity and reliability (Barmeyer, 2004). The Kolb LSI was chosen because the inventory is relatively simple to administer and score and it has demonstrated a high degree of reliability (Willcoxson & Prosser, 1996).

#### **Agriculture Achievement Test (AAT)**

In the Secondary school agriculture syllabus; there are five major sections that are offered to the students in the secondary agriculture curriculum. These are Crop Production, Livestock Production, Tools and Equipment, Agricultural Economics and Farm power Machinery and Structures. An agriculture assessment test (AAT) adopted from KNEC past examination papers and modified was used to measure the students' achievement. 10 Structured questions with a maximum score of 20 marks in each of the five sections were provided. The performance scores of the students in these five areas were analyzed with respect to their learning styles. The official grading system of secondary school uses letter grades with pluses and minuses for performance scores. Passing grades range from 'A' to

'E\_'. The highest grade is 'A' while the lowest is 'E' and each grade has a quality-point equivalence (A =12, A- =11,B+ =10 B=9,B- =8,C+=7,C=6,C- =5,D+ =4, D=3, D- =2 and E=1. The student's academic achievement was determined by computing the totals in the five areas examined in the AAT.

### **3.6.1 Validity**

Validity establishes whether the technique, instrument, or process used measures the intended concept. A research instrument is valid if its content is relevant and appropriate to research objectives (Eshiwani, 2004). To ascertain content validity of the instruments the researcher consulted experts and experienced personnel in agriculture education from the Department of Agricultural Education and Extension, Egerton University, to make criticism and comments on the format of the instruments.

The researcher with the help of the experts and peers ensured that the instruments sufficiently covered the research objectives by providing ten items in every section of the AAT that carried equal marks. This ensured that the items were adequate enough to reflect the research hypotheses. This was done with the assistance of the supervisors from the Department of Agricultural Education and Extension, Egerton University. In this there was agreement that an instrument reflected accurately what it purported to measure (Mbwesa, 2006).

### **3.6.2 Reliability**

According to Fraenkel and Wallen (2000), reliability is a measure of the degree to which a research instrument will yield consistent results after repeated trials. Reliability indicates the stability and the consistency of the chosen instruments to tap the variables (Sekaran, 2003). Piloting was done to test the reliability of the instruments. Cronbach alpha correlation coefficient was used to estimate reliability. The acceptable reliability for KLSI was 0.75 and that for AAT was 0.71. The Kolb learning Style Inventory was issued to form three secondary school agriculture students in a co-educational secondary school in the neighboring Wareng sub county. Thereafter, the data was analyzed in order to derive the reliability. The reliability coefficients ranged from 0.59, 0.71, 0.74, 0.80, 0.81, to 0.82 respectively as shown in Table 3. The findings of this study were

consistent with the results reported by Kolb (1985) using a larger sample size (N=268).

**Table 3:*****Reliability of Kolb's Learning Style Inventory***

| Learning Mode                   | Number of items | Cronbach's Alpha | Cronbach's Alpha Kolb's Study |
|---------------------------------|-----------------|------------------|-------------------------------|
| Concrete Experience (CE)        | 12              | 0.81             | 0.83                          |
| Reflective Observation (RO)     | 12              | 0.71             | 0.73                          |
| Abstract Conceptualization (AC) | 12              | 0.82             | 0.83                          |
| Active Experimentation (AE)     | 12              | 0.74             | 0.78                          |
| Abstract-Concrete (AC-CE)       | 12              | 0.80             | 0.88                          |
| Active-Reflective (AE-RO)       | 12              | 0.59             | 0.81                          |

The lower reliability scores in RO, AE and AE-RO scales can be explained by the fewer number of learners with accommodating and diverging styles in the respondents. The Cronbach's coefficient alpha of 0.75 was obtained in the Kolb Learning Style inventory and 0.71 in the Agriculture Assessment Test implying that the research instruments were reliable and therefore the researcher adopted them. According to Fraenkel and Wallen (2000), a Cronbach's Alpha coefficient of at least 0.7 is acceptable for research purposes and is considered suitable to make possible group inferences that are accurate enough. Koul (1998) also asserted that a Cronbach co-efficient of 0.70 and above should be taken as respectable and reliable for consistency levels.

**3.7 Data Collection Procedure**

According to Kothari (2004), data collection procedure comprises of the steps and actions necessary for conducting research effectively and the desired sequencing of these steps. Following the approval of the research proposal, the researcher obtained a clearance letter from the Board of Post Graduate Studies (BPGS) of Egerton University. This facilitated the acquisition of a research permit from the National Commission for Science, Technology and Innovation (NACOSTI).

Upon obtaining the permit, the researcher visited the Uasin Gishu County Commissioner (CC) and Uasin Gishu County Director of Education, (CDE) respectively, to inform them about the intended research exercise in the County. A visit was also made to the Sub-County Education office to notify them about the intended study in the sub county.

The Sub county education office was a valuable resource in providing information about the number of schools that register students for Agriculture at KCSE in Eldoret East Sub County, the number of coeducational secondary schools that enroll their students in Agriculture at KCSE and the number of Form Three agriculture students in Eldoret East Sub County. Permission was sought from the principals and the agriculture teachers from the selected schools. The Kolb Learning Style inventory was administered for 20 minutes after which the agriculture achievement test (AAT) was administered .The instruments were administered by the researcher with the help of Agriculture teachers in the selected schools.

### **3.8 Data Analysis**

Data analysis refers to examining what has been collected in a survey or experiment, and making deductions and inferences (Kombo & Tromp, 2006). It also refers to a variety of activities and processes that a researcher administers to a database in order to draw conclusions and make certain decisions regarding the data collected from the field. Data analysis involves summarizing large quantities of raw data, categorizing, rearranging and ordering data (Mbwesa, 2006).

The Statistical Package for Social Sciences (SPSS) was used to process all the responses from the Kolb Learning Style Instrument (KLSI). The KLSI was coded and fed into the SPSS program to generate frequency tables and percentages. All data was analyzed at significance level of  $\alpha=0.05$ . The research question was analyzed using percentages, means and frequencies to present the number of students with the different learning style preferences and the level of academic achievement. Chi-square was used to analyze hypothesis one to establish the effects of learning styles on the academic achievement of the agriculture students. In hypothesis two, two ways ANOVA was carried out to determine the effects of gender difference in achievement in secondary school agriculture based on

learning style and one way ANOVA was used to analyze hypothesis three to determine the effects of different learning styles in specified secondary school agriculture topics on students' achievement. The summary is presented in Table 4.

**Table 4:**  
***Summary of Data Analysis***

| <b>Hypothesis</b>  | <b>Independent variable</b>   | <b>Dependent variable</b>                                     | <b>Statistical test</b> |
|--|---|---|-------------------------|
| <b>HO<sub>1</sub>:</b> There is no statistically significant relationship between learning style preferences and students' achievement in Secondary School agriculture | Students' learning style measured by Kolb's learning style inventory  | Students' achievement measured by Agriculture Assessment Test | Chi-Square              |
| <b>HO<sub>2</sub>:</b> There is no statistically significant gender difference in achievement in secondary school agriculture based on learning style                  | Students learning styles by Gender  | Students' achievement measured by Agriculture Assessment Test | Two-Way Anova           |
| <b>HO<sub>3</sub>:</b> There is no statistically significant effect of different learning styles in selected secondary agriculture topics.                             | Students learning styles in various topic areas in secondary agriculture syllabus measured by Kolb's learning style inventory | Students' achievement measured by Agriculture Assessment Test | One-Way Anova           |

**CHAPTER FOUR**  
**RESULTS AND DISCUSSIONS**

**4.1 Introduction**

This chapter presents the findings of the study beginning with the demographic characteristics of the sampled student population followed by presentation of the study findings based on the objectives: learning style preferences, academic achievement levels and the relationship between the two, all including a gender perspective.

**4.1.1. Demographic characteristics of the respondents**

Two hundred and ninety one students from ten public coeducational secondary schools in Eldoret East Sub County participated in the study. The demographic characteristics investigated in this study were age and gender. The findings are presented in Table 5.

**Table 5:**

*Demographic Characteristics of the Respondents*

| Differentiation | Groups         | Frequency | percentage |
|-----------------|----------------|-----------|------------|
| <b>Gender</b>   | Boy            | 148       | 51.        |
|                 | Girl           | 143       | 49.        |
| <b>Age</b>      | 15             | 13        | 4          |
|                 | 16             | 116       | 40         |
|                 | 17and<br>above | 162       | 56         |

From the information in Table 5, the findings indicated that 49 percent of the students who participated in this study were female while 51 percent were male; which meant that more boys chose agriculture than girls. That could have been due to commonly observed gender norms that push females into gender-stereotyped fields and away from math and science fields. Over half (56 percent) of the students were 17 and above years old. This was attributed to proof of age for admission to basic education institutions where by one is admitted on attainment of the school going age of four years.



#### 4.1.2 Level of Academic Achievement

Student achievement was measured using a 50-item short answer structured test (Appendix B), which was prepared to measure all the three domains of learning; the psychomotor, Cognitive and affective domains in the five main areas in secondary school agriculture syllabus. Each item carrying 2 points with a possible score ranged from 0-100. The students' achievement in the Agriculture assessment test in the specified secondary agriculture topics was as shown in Table 6.

**Table 6:**

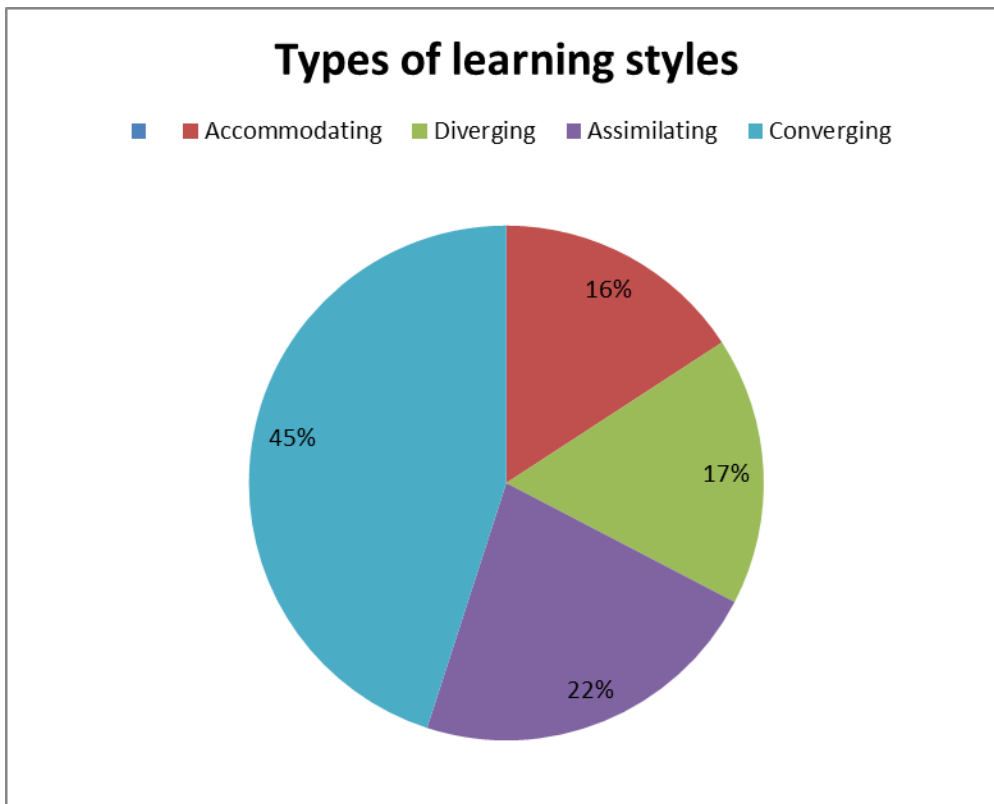
***Level of achievement of Secondary School Agriculture Students in AAT by Frequencies and percentages***

| Level of achievement | Score range | Frequency  | Percent      |
|----------------------|-------------|------------|--------------|
| Low                  | 01-39       | 121        | 41.6         |
| Average              | 40-59       | 85         | 29.2         |
| High                 | 60 -74      | 58         | 19.9         |
| Very High            | 75-100      | 27         | 9.3          |
| <b>Total</b>         |             | <b>291</b> | <b>100.0</b> |

Majority of the students, 41.6 percent (121) were low performers whereas 29.2 percent (85) were average performers. The study also revealed that 19.9 percent (58) of the students were high performers and only 9.3 percent (27) were very high in the test administered. This implies that majority (70.8 percent) of the respondents who scored between 01 and 59 percent in the Agriculture Assessment Test were average and low performers.

#### 4.2 Findings about the Learning Styles of the Respondents

The respondents were asked to complete the Kolb learning style inventory. The four learning styles that were tested in KLSI include accommodating, assimilating, converging and diverging. From the study, 46 (15.8 percent) were accommodators, 49 (16.8 percent) were divergers, 65 (22.4 percent) were assimilators and 131 (45 percent) were convergers. This is illustrated in Figure 5.



**Figure 5: Categories of agriculture students according to learning styles**

The Accommodating learning style was the least represented among the agriculture students, at 15.8 percent. The accommodators use active experimentation and concrete experience. These individuals have a clear preference for hands-on learning. The accommodator has been described as having a tendency for prompt action and a noted ability for adapting to diverse situations in any learning context (Kolb & Kolb, 2005). Majority of the respondents, 45 percent had the Converging learning style. Convergencers use abstract conceptualization to drive active experimentation. Action is based on abstract understanding of the task and projected strategies for successful completion of the task. The divergers accounted for 17 percent of the respondents. Divergers are individuals who experience information concretely and process what they take in reflectively. Divergers are often described as creative learners because of their propensity to consider multiple potential strategies for learning and problem solving. The assimilators were 22 percent. Assimilators are individuals who perceive experience abstractly and process what they take in reflectively. In this study it was found that secondary agriculture students have preference for all the

four learning styles. This study also agrees with the findings by Adel and Louis (2003), who investigated the preferred learning styles of 274 accounting and Marketing students in the Clayton State University. Their findings were that all the four learning styles existed among their respondents. However, preference of the majority was Converging Learning style. In this regard, the basic principle is that, in order for students to benefit maximally, instructions should match their learning styles. Therefore, flexibility is crucial for students as well as for teachers.

#### 4.2.1 Learning style preference by students' gender

Further analysis was done to establish the differences in learning styles of students who participated in this study based on gender. The findings were as presented in Table 7.

**Table 7**

***Cross Tabulation of Gender and Learning Styles***

| Gender |                         | Learning Styles |          |             |           | Total |
|--------|-------------------------|-----------------|----------|-------------|-----------|-------|
|        |                         | Accommodator    | Diverger | Assimilator | Converger |       |
| Male   | Frequency               | 24              | 25       | 29          | 70        | 148   |
|        | % within Gender         | 16.2%           | 16.9%    | 19.6%       | 47.3%     | 100%  |
|        | % within learning style | 52.2%           | 51.0%    | 44.6%       | 53.4%     | 50.9% |
|        | % of Total              | 8.2%            | 8.6%     | 10.0%       | 24.1%     | 50.9% |
| Female | Frequency               | 22              | 24       | 36          | 61        | 143   |
|        | % within gender         | 15.4%           | 16.7%    | 25.2%       | 42.7%     | 100%  |
|        | % within learning style | 47.8%           | 49.0%    | 55.4%       | 46.6%     | 49.1% |
|        | % of Total              | 7.6%            | 8.2%     | 12.4%       | 21.0%     | 49.1% |

As shown in Table 7, there were more male accommodators (8.2 percent),

divergers (8.6 %), and convergers (24.1%) than female (7.6 %, 8.2% and 21% respectively). There were more female students (12.4 %) who were assimilators than male (10%) students. This implies that female and male students perceived learning styles differently. This compares well with Cezair, (2003) findings that female students extremely preferred assimilating learning style whereas male students were in favor of converging learning style. Teachers in coeducational schools can be encouraged to teach their students accordingly. As stated by Sternberg (1997), teachers must take into account that they teach according to a specific styles. However, they should design a way of teaching which takes into account the diversity of learning styles. This must be done to enrich and at the same time favor all the students in that a compatible learning style with the teaching style of a course instructor enables the students to retain the information much longer, apply it more efficiently and effectively and have more positive post-course attitudes toward the subject than their counterparts who experience learning/teaching styles mismatches (Felder, 1993).

#### **4.3 Findings about the Relationship between Learning Styles and Academic Achievement**

The study also sought to determine the relationship between learning style preference and academic achievement of secondary school agriculture students. In Table 8 the agriculture assessment test mean scores of students with different learning style types are presented.

**Table 8:**

***Learning Styles and Academic Achievement of Agriculture Students***

| Learning Style |                         | Performance  |              |              |             | Total         |
|----------------|-------------------------|--------------|--------------|--------------|-------------|---------------|
|                |                         | Low          | Average      | good         | very good   |               |
| Accommodator   | Count                   | 18           | 6            | 17           | 5           | 46            |
|                | % within learning style | 39.1%        | 13.0%        | 37.0%        | 10.9%       | 100.0%        |
|                | % within performance    | 14.9%        | 7.1%         | 29.3%        | 18.5%       | 15.8%         |
|                | % of Total              | <b>6.2%</b>  | <b>2.1%</b>  | <b>5.8%</b>  | <b>1.7%</b> | <b>15.8%</b>  |
| Diverger       | Count                   | 25           | 12           | 9            | 3           | 49            |
|                | % within learning style | 51.0%        | 24.5%        | 18.4%        | 6.1%        | 100.0%        |
|                | % within performance    | 20.7%        | 14.1%        | 15.5%        | 11.1%       | 16.8%         |
|                | % of Total              | <b>8.6%</b>  | <b>4.1%</b>  | <b>3.1%</b>  | <b>1.0%</b> | <b>16.8%</b>  |
| Assimilator    | Count                   | 28           | 20           | 9            | 8           | 65            |
|                | % within learning style | 43.1%        | 30.8%        | 13.8%        | 12.3%       | 100.0%        |
|                | % within performance    | 23.1%        | 23.5%        | 15.5%        | 29.6%       | 22.3%         |
|                | % of Total              | <b>9.6%</b>  | <b>6.9%</b>  | <b>3.1%</b>  | <b>2.7%</b> | <b>22.3%</b>  |
| Converger      | Count                   | 50           | 47           | 23           | 11          | 131           |
|                | % within learning style | 38.2%        | 35.9%        | 17.6%        | 8.4%        | 100.0%        |
|                | % within performance    | 41.3%        | 55.3%        | 39.7%        | 40.7%       | 45.0%         |
|                | % of Total              | <b>17.2%</b> | <b>16.2%</b> | <b>7.9%</b>  | <b>3.8%</b> | <b>45.0%</b>  |
| Total          | Count                   | 121          | 85           | 58           | 27          | 291           |
|                | % within learning style | 41.6%        | 29.2%        | 19.9%        | 9.3%        | 100.0%        |
|                | % within performance    | 100.0%       | 100.0%       | 100.0%       | 100.0%      | 100.0%        |
|                | % of Total              | <b>41.6%</b> | <b>29.2%</b> | <b>19.9%</b> | <b>9.3%</b> | <b>100.0%</b> |

Findings in Table 9 indicate that majority (51.0 percent) of the low achievers adopted diverging learning style, while 43.1 percent of the low achievers adopted assimilating learning style. Further, 39.1 percent of the low achievers were using accommodating learning style and 38.2 percent of the low achievers adopted converging learning style. It should be noted that most of the low achievers used

diverging learning style. Research shows that in formal learning situations, people with the Diverging style prefer to work in groups, listening with an open mind and receiving personalized feedback (Kolb, 1985). Majority of the agriculture students who were good and very good (47.9 percent) were accommodators while 26 percent of the good and very good were convergers. Assimilators and divergers were 26.1percent and 24.5 percent respectively in the good and very good achievers. It should be noted that most of the high achievers used accommodating learning style.

Accommodators have the ability to learn from “hands on” experience and perform well in situations where they must adapt to new circumstances. They enjoy carrying out plans and involving themselves in new and challenging experiences (Kolb, 1985). Educators should be encouraged to identify their students learning styles, and their learning needs, and use appropriate teaching and learning strategies for meaningful learning across all the learning styles. The results of this study agree with those of Greb (1999) that male and female students learn differently from each other.

#### **4.4 Findings about Learning Styles and Achievement in Agriculture Based on Gender**

The study sought to determine the differences in the effect of learning styles on achievement in secondary school agriculture based on gender. The results as presented in Table 9 show the means and standard deviation of boys and girls according to the Agriculture Achievement Test.

**Table 9*****Learning Styles, Gender and Achievement***

| <b>Learning Style</b> | <b>Gender</b> | <b>Mean</b>   | <b>S.D.</b>    | <b>n</b>   |
|-----------------------|---------------|---------------|----------------|------------|
| Accommodator          | Male          | 2.3750        | 1.17260        | 24         |
|                       | Female        | 2.0000        | 0.97590        | 22         |
|                       | <b>Total</b>  | <b>2.1957</b> | <b>1.08770</b> | <b>46</b>  |
| Diverger              | Male          | 1.8400        | 0.98658        | 25         |
|                       | Female        | 1.7500        | 0.94409        | 24         |
|                       | <b>Total</b>  | <b>1.7959</b> | <b>0.95698</b> | <b>49</b>  |
| Assimilator           | Male          | 2.0690        | 1.13172        | 29         |
|                       | Female        | 1.8611        | 0.96074        | 36         |
|                       | <b>Total</b>  | <b>1.9538</b> | <b>1.03729</b> | <b>65</b>  |
| Converger             | Male          | 2.0143        | 1.01429        | 70         |
|                       | Female        | 1.9016        | 0.86996        | 61         |
|                       | <b>Total</b>  | <b>1.9618</b> | <b>0.94791</b> | <b>131</b> |
| Total                 | Male          | 2.0541        | 1.06128        | 148        |
|                       | Female        | 1.8811        | 0.91536        | 143        |
|                       | <b>Total</b>  | <b>1.9691</b> | <b>0.99433</b> | <b>291</b> |

It was noted that in all the four learning styles; accommodating, diverging, assimilating and converging, the male students were dominating in academic achievement. According to Abidin et al. (2011), there are noticeable differences between academic performance of girls and boys in science and mathematics. The National Assessment of Educational Progress (NAEP), data from 1976 to 2015 also indicate that a male advantage in science achievement emerges and grows as learners progress through school. This could be due to their characteristics, skills, aptitude and learning environment. Jones and Wheatley (1989) have argued that gender differences in science achievement may be due to differential socialization experiences at home and at school, gender-role stereotypes, and differences in boys' and girls' participation in science within and outside the school. According to Dweck (1986), girls are more likely than boys to exhibit a 'learned helpless' response pattern, because girls usually lack confidence in their abilities. In terms of

academic achievement, from Table 9 it was noted that male students had the highest mean of 2.05 with a standard deviation of 1.061 while the female students had a mean of 1.88 with a standard deviation of 0.915.

#### **4.5 Findings about Learning Styles and Achievement in Agriculture Topics**

The fourth objective of the study was to compare the effect of learning styles on achievement in specified secondary school agriculture topics. The topics tested in this study were Crop production, Livestock production, Agricultural economics, and, Farm tools and Machinery. The actual scores in each category and respective percentages are presented in Table 10.



**Table 10:**

*Categories Scores and Percentages in selected topics*

| Score | Frequency and Percentages in specified topics |      |                |      |                    |      |               |      |               |      |
|-------|---|------|----------------|------|--------------------|------|---------------|------|---------------|------|
|       | Crop<br>prodn                                 |      | Agric<br>Econs |      | Livestock<br>prodn |      | Farm<br>power |      | Farm<br>tools |      |
|       | F   | %    | F              | %    | F                  | %    | f             | %    | F             | %    |
| 0     | 1   | 0.34 | 1              | 0.34 | 0                  | 0.00 | 0             | 0.00 | 0             | 0.00 |
| 1     | 1   | 0.34 | 5              | 1.71 | 6                  | 2.06 | 5             | 1.71 | 3             | 1.00 |
| 2     | 17  | 5.84 | 61             | 20.9 | 40                 | 20.6 | 43            | 14.7 | 30            | 10.3 |
| 3     | 3   | 1.03 | 8              | 2.74 | 17                 | 5.84 | 7             | 2.40 | 8             | 2.74 |
| 4     | 20  | 6.87 | 49             | 16.8 | 27                 | 9.27 | 42            | 14.4 | 16            | 5.4  |
| 5     | 3   | 1.03 | 1              | 0.34 | 13                 | 4.46 | 2             | 0.68 | 1             | 0.34 |
| 6     | 24  | 8.24 | 30             | 10.3 | 26                 | 8.93 | 28            | 9.52 | 18            | 6.1  |
| 7     | 0   | 0.00 | 1              | 0.34 | 11                 | 3.78 | 5             | 1.71 | 3             | 1.00 |
| 8     | 30  | 10.3 | 37             | 9.27 | 17                 | 5.84 | 35            | 12.0 | 21            | 7.2  |
| 9     | 3   | 1.03 | 0              | 0.00 | 35                 | 12.0 | 2             | 0.68 | 15            | 5.1  |
| 10    | 35  | 12.0 | 24             | 8.24 | 24                 | 8.24 | 20            | 6.87 | 24            | 8.24 |
| 11    | 3   | 1.03 | 1              | 0.34 | 4                  | 1.37 | 3             | 1.03 | 5             | 1.71 |
| 12    | 32  | 10.9 | 31             | 10.9 | 15                 | 5.15 | 29            | 9.96 | 24            | 8.24 |

|              |            |      |            |      |            |      |            |      |            |     |
|--------------|------------|------|------------|------|------------|------|------------|------|------------|-----|
|              |            | 9    |            | 9    |            |      |            |      |            | 4   |
| <b>13</b>    | 3          | 1.03 | 0          | 0.00 | 4          | 1.37 | 6          | 2.06 | 8          | 2.7 |
|              |            |      |            |      |            |      |            |      |            | 4   |
| <b>14</b>    | 18         | 6.18 | 14         | 4.81 | 16         | 5.49 | 24         | 8.24 | 28         | 9.5 |
|              |            |      |            |      |            |      |            |      |            | 2   |
| <b>15</b>    | 14         | 4.81 | 0          | 0.00 | 5          | 1.71 | 1          | 0.34 | 5          | 1.7 |
|              |            |      |            |      |            |      |            |      |            | 1   |
| <b>16</b>    | 24         | 8.24 | 11         | 3.78 | 7          | 2.40 | 11         | 4.81 | 20         | 6.8 |
|              |            |      |            |      |            |      |            |      |            | 7   |
| <b>17</b>    | 0          | 0.00 | 0          | 0.00 | 5          | 1.71 | 3          | 1.03 | 7          | 2.4 |
|              |            |      |            |      |            |      |            |      |            | 0   |
| <b>18</b>    | 25         | 8.95 | 9          | 3.09 | 4          | 1.37 | 11         | 3.78 | 21         | 7.2 |
|              |            |      |            |      |            |      |            |      |            | 1   |
| <b>19</b>    | 4          | 1.37 | 0          | 0.00 | 8          | 2.74 | 3          | 1.03 | 4          | 1.3 |
|              |            |      |            |      |            |      |            |      |            | 7   |
| <b>20</b>    | 31         | 10.6 | 7          | 2.40 | 7          | 2.40 | 8          | 2.74 | 30         | 10. |
|              |            | 5    |            |      |            |      |            |      |            | 3   |
| <b>Total</b> | <b>291</b> |      | <b>291</b> |      | <b>291</b> |      | <b>291</b> |      | <b>291</b> |     |

The frequencies in Table 10 were then put in a class interval of seven as shown in Table 11.

**Table 11*****Class intervals and their respective frequencies of agriculture students' achievements***

| Class interval    | Topical areas in the AAT |            |               |            |                    |            |               |            |               |            |
|-------------------|--------------------------|------------|---------------|------------|--------------------|------------|---------------|------------|---------------|------------|
|                   | Crop<br>prodn            | %          | Agric<br>Econ | %          | Livestock<br>prodn | %          | Farm<br>Power | %          | Farm<br>Tools | %          |
| <b>0-6</b>        | 69                       | 23.7       | 15            | 53         | 129                | 44.32      | 127           | 43.64      | 76            | 26.14      |
| <b>7-13</b>       | 106                      | 36.4       | 96            | 33.0       | 110                | 37.88      | 100           | 34.36      | 100           | 34.36      |
| <b>14-20</b>      | 116                      | 39.9       | 40            | 14.0       | 52                 | 17.8       | 64            | 22         | 115           | 39.5       |
| <b>Tota<br/>l</b> | <b>291</b>               | <b>100</b> | <b>291</b>    | <b>100</b> | <b>291</b>         | <b>100</b> | <b>291</b>    | <b>100</b> | <b>291</b>    | <b>100</b> |

The highest percentage of those students who scored between 0 and six was in Agricultural economics with 53 percent followed by livestock production, farm power, farm tools and crop production with 44.32 percent, 43.64, percent 26.14 percent and 33.7 percent respectively. The agriculture students who scored between 14 and 20 had the highest percentage of 39.9 in crop production followed by farm tools, farm power, livestock production and agricultural economics with 29.9 percent, 39.5 percent, 22 percent, 17.8 percent and 14 percent respectively. It was only in crop production that had more students between 14 and 20. The other topics had higher percentages between 0 and 6 with agricultural economics having 53 percent. This agrees with (KNEC, 2014) report that agriculture students had consistently performed poorly, as less than 30 percent of registered candidates obtained good and very good marks, According to Kenya National Examination Council report, (KNEC, 2014), students have seemed to memorize facts without fully understanding the concepts in agriculture and as such, students often are not sure when or how to use what they know. The learning styles and achievement in specified agriculture topics was as shown in Table 11.



**Table 12:**  
*Learning Styles and Achievement in specified topics*

| Topic           | Learning styles | n          | Mean         | S.D          |
|-----------------|-----------------|------------|--------------|--------------|
| Crop Production | Accommodator    | 46         | 12.63        | 5.499        |
|                 | Diverger        | 49         | 10.73        | 6.106        |
|                 | Assimilator     | 65         | 11.92        | 5.526        |
|                 | Converger       | 131        | 11.62        | 5.471        |
|                 | <b>Total</b>    | <b>291</b> | <b>11.70</b> | <b>5.597</b> |
| Agric Economics | Accommodator    | 46         | 8.02         | 5.479        |
|                 | Diverger        | 49         | 7.33         | 5.092        |
|                 | Assimilator     | 65         | 6.57         | 4.707        |
|                 | Converger       | 131        | 7.55         | 4.927        |
|                 | <b>Total</b>    | <b>291</b> | <b>7.37</b>  | <b>4.995</b> |
| Livestock Prod  | Accommodator    | 46         | 9.59         | 6.156        |
|                 | Diverger        | 49         | 7.12         | 5.667        |
|                 | Assimilator     | 65         | 7.98         | 6.084        |
|                 | Converger       | 131        | 7.86         | 5.437        |
|                 | <b>Total</b>    | <b>291</b> | <b>8.04</b>  | <b>5.758</b> |
| Farm Power      | Accommodator    | 46         | 9.48         | 5.984        |
|                 | Diverger        | 49         | 7.59         | 4.774        |
|                 | Assimilator     | 65         | 8.48         | 5.019        |
|                 | Converger       | 131        | 8.58         | 5.212        |
|                 | <b>Total</b>    | <b>291</b> | <b>8.53</b>  | <b>5.231</b> |
| Farm Tools      | Accommodator    | 46         | 12.17        | 6.089        |
|                 | Diverger        | 49         | 10.59        | 5.697        |
|                 | Assimilator     | 65         | 10.86        | 5.932        |
|                 | Converger       | 131        | 11.69        | 5.806        |
|                 | <b>Total</b>    | <b>291</b> | <b>11.40</b> | <b>5.857</b> |

As earlier established, the general performance of the students in Agriculture was below average. The performance of the agriculture students in specific topics reveals that majority of the students performed well in crop production as indicated by a mean of 17 and standard deviation of 5.60. Farm tools achieved a mean score of 11.40 and standard deviation of 5.86. The third best performed topic was farm power that obtained a mean score of 8.53 and standard deviation of 5.23. Livestock

production followed with a mean score of 8.04 and standard deviation of 8.758. The least performed is agricultural economics with a mean value of 7.37 and standard deviation of 5.0.

Further analysis indicated that the accommodators performed better in all the topics tested in Agriculture with mean scores of 12.63, 12.17, 9.59, 9.48 and 8.02 for crop production, farm tools, livestock production, farm power and agricultural economics respectively. Convergents were second in farm tools (11.69) and farm power (8.58) respectively. Assimilators ranked second in crop production (11.92) and livestock production (7.98) respectively. The students who adopted diverging learning style did not perform well in all topics included in the test that was used to generate the scores for this study.

## 4.6 Tests of Hypotheses

### 4.6.1 Test of hypothesis one

HO<sub>1</sub>: There is no statistically significant relationship between learning style preferences and students' achievement in Secondary School agriculture. The Chi-Square test was carried out to investigate whether there was a significant relationship between the learning style preference and the achievement in secondary school agriculture. The results were as presented in Table 13.

**Table 13**

*Chi-Square Results on Learning Style and Students' Achievement*

|                              | Value | Df | Significance |
|------------------------------|-------|----|--------------|
| Chi-Square                   | 17.78 | 9  | 0.038        |
| Likelihood Ratio             | 17.50 | 9  | 0.041        |
| Linear-by-Linear Association | .493  | 1  | 0.048        |

From the information in Table 15, a chi-square value of 17.788, df=9 and p=0.038 was obtained. Since p<0.05, the null hypothesis is rejected. This implies that there was a significant relationship between learning style and students' achievement in Secondary School agriculture. This confirms the results presented

through descriptive statistics. Post-hoc comparisons support that the mean scores for converging and assimilating groups are significantly higher than diverging and accommodating groups. This result was in accordance with those of some other scholars (Malcom, 2009; Kolb, 1984), as they found that accommodators and divergers were slightly less successful students than convergers and assimilators. With reference to this it can be concluded that agriculture students in Eldoret East Sub-County are academically rewarded for being more abstract and less concrete. This is consistent with Piaget's theory that students develop abstract thinking during adolescence, possibly as a result of environmental (educational) demands. Meanwhile, there is another possible explanation, that is, greater learning occurs when the teaching style matches the students' learning styles than when they are mismatched (Felder & Brent, 2005).

Thus, it is possible that teachers in the chosen sample have converging and assimilating teaching style. In other words, the higher academic achievement can be the result of the match between teachers' teaching style and the students' learning styles. It was statistically established that there was a significant relationship between learning style and students' achievement in Secondary School agriculture (chi-square=17.788, df=9 and p=0.038).

#### **4.6.2 Test of hypothesis two**

HO<sub>2</sub>: There is no statistically significant gender difference in achievement in secondary school agriculture based on learning style.

Two-way Analysis of Variance was carried out to investigate whether there was a significant relationship between the learning style preference and the achievement in secondary school agriculture based on gender. The results were as presented in Table 14.

**Table 14*****ANOVA test on Learning Styles, Gender and Achievement***

| Source                    | Df  | F     | Sig.  |
|---------------------------|-----|-------|-------|
| Learning Style            | 3   | 2.244 | 0.029 |
| Gender                    | 1   | 3.382 | 0.012 |
| Learning style and Gender | 3   | 1.233 | 0.047 |
| Total                     | 291 |       |       |

The results in Table 14 indicate an ANOVA value of 2.244(F=2.244), df=3 and p=0.029 for learning style and F=3.382, df=1 and p=0.012 for gender were obtained. Since  $p < 0.05$  for both learning style and gender, there was no statistically significant difference in the students' learning styles and achievement in agriculture based on gender. The null hypothesis was rejected implying that there is a statistically significant difference in the effect of learning styles on achievement in agriculture based on gender. That is, the learning styles adopted by students affects the academic achievement of the students in Agriculture differently in as far as gender of the students is concerned. This implied that males and females were perceived to have direct impact on different learning styles. Researchers have proven that both gender and learning styles have an impact on student's achievement. Sendil (2009) found that there are significant correlation between students' learning styles and gender. Miller (1990) also found that learning styles between males and females have direct impact on achievement.

**4.6.3 Test of hypothesis three**

HO<sub>3</sub>: There is no statistically significant effect of learning styles on achievement in selected secondary school agriculture topics. One way Analysis of Variance was used to investigate whether there was a significant relationship between the learning style preference and the achievement in secondary school agriculture. The results were as presented in table 16



**Table 15:*****ANOVA Test on Learning Styles and Achievement in Specified Topics***

| <b>Topic</b>    |                | <b>df</b> | <b>f</b> | <b>Sig.</b> |
|-----------------|----------------|-----------|----------|-------------|
| Crop production | Between Groups | 3         | .953     | .015        |
|                 | Within Groups  | 287       |          |             |
|                 | Total          | 291       |          |             |
| Agric Economics | Between Groups | 3         | .874     | .050        |
|                 | Within Groups  | 287       |          |             |
|                 | Total          | 291       |          |             |
| Livestock Prod  | Between Groups | 3         | 1.574    | .019        |
|                 | Within Groups  | 287       |          |             |
|                 | Total          | 291       |          |             |
| Farm Power      | Between Groups | 3         | 1.036    | .038        |
|                 | Within Groups  | 287       |          |             |
|                 | Total          | 291       |          |             |
| Farm Tools      | Between Groups | 3         | .871     | .046        |
|                 | Within Groups  | 287       |          |             |
|                 | Total          | 291       |          |             |

The results of One-way ANOVA as indicated in Table 16, showed  $F=0.953$ ,  $df=3$  and  $p=0.015$  for the effect of learning style on students achievement in crop production,  $F=0.874$ ,  $df=3$  and  $p=0.050$  for the effect of learning style on students achievement in agricultural economics,  $F=1.574$ ,  $df=3$  and  $p=0.019$  for the effect of learning style on students achievement in livestock production,  $F=1.036$ ,  $df=3$  and  $p=0.038$  for the effect of learning style on students achievement in farm power and  $F=0.871$ ,  $df=3$  and  $p=0.046$  for the effect of learning style on students achievement in farm tools. In all the findings established, p-values are less than 0.05 ( $p<0.05$ ).

This implies that there is statistically significant effect of learning styles on achievement in specified secondary school agriculture topics (Crop production, Livestock production, Agricultural economics, Farm tools and Machinery). The finding proved that students' achievement vary in specific topic depending on their preferred learning styles. This implied that existing learning styles focus highly on lecturing, handouts/notes and class discussion, hands on activities and observations which fall on the accommodating learning style.

Based on this finding, teachers have less focus in putting concise information in a logical form to meet learning outcomes of student understanding from reflective observation. This agrees with the findings of Blackmore (1996) that divergers learn best in a traditional classroom based delivery that comprises of brainstorming sessions, reflective activities, lectures and rhetorical questions. It is important to identify different learning styles needs across the different topics in the secondary school agriculture syllabus and match the teaching style with the preferred learning styles.

The findings of this study suggested that participants' preferred learning styles have significant influence on students' academic achievements. Hence, the findings compares with that of (Lau & Yuen 2009) that there are relationships between learning and student achievement. The results also indicated that gender would have a significant influence on students' achievement. In this study, the findings indicate that the majority of the agriculture students, regardless of gender, have converging learning styles. They find it effective to solve problems and experiment with new ideas using practical theories rather than deal with social issues and interpersonal issues. However, diverging learning style was least adopted by the agriculture students and had the lowest score in Agriculture assessment test.

This research finding supported Miller *et.al* (1990) proposition that gender has a direct impact on achievement. Majority of the agriculture students, regardless of gender, have converging learning styles. They find it effective to solve problems and experiment with new ideas using practical theories rather than deal with social issues and interpersonal issues. However, diverging learning style was least adopted by the agriculture students and had the lowest score in Agriculture assessment test.



## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter is divided into three sections. The first section provides a summary of the study. The second part expounds on the conclusions. Recommendations and suggestions for further research are detailed in the final section.

#### 5.2 Summary of the Study

The study aimed to establish the extent to which secondary school agriculture students' learning styles affect their achievement. The main objective of this study was to understand the learning styles of agriculture students and come up with recommendations that could help agriculture teachers modify their teaching styles to accommodate varying learning preferences, which may result in improving students' achievement in secondary agriculture.

The study had four objectives from which three hypotheses were derived. The study findings generally indicate that there were four learning styles among the secondary agriculture students; Converging, Diverging, Assimilating and Accommodating. Convergents (those who use abstract conceptualization and active experimentation) were the majority compared to those who preferred assimilating, diverging and accommodating. Specifically, the accommodating learning style was the least preferred.

The hypothesis which stated that there was no statistically significant relationship between learning style preferences and students' achievement in Secondary School agriculture was rejected. The study findings on the relationship between learning styles and academic achievement of the secondary school students showed that there was a positive relationship between the two variables. This result rejects the null hypothesis that was no statistically significant relationship between learning style preferences and students' achievement in Secondary School agriculture and accepts the alternate hypothesis that there is a significant difference between learning style preferences and students'

## achievement in Secondary School agriculture

The second hypothesis stated that there was no statistically significant gender difference in achievement in secondary school agriculture based on learning style. The correlation was strong, among the male and female students and also significant. Male students tended more to converging learning style, while girls preferred assimilating learning styles. The least preferred learning style was converging for girls and accommodating learning styles for boys.

In all the specified topics in agriculture male students had the highest mean score compared to girls. It can be concluded that, gender is indeed significantly related to achievement with respect to learning style preference. As such, it was inferred that gender difference and learning styles do make an impact on the students' overall academic achievement. Such finding highlights the importance of recognizing students varying learning styles. Teachers should be aware of the usefulness of learning styles for effective learning to take place.

The third hypothesis stated that there was no statistically significant effect of different learning styles on achievement in selected secondary agriculture topics. The findings indicated that the accommodators performed better in all the topics tested in Agriculture. Convergents were second in farm tools (11.69) and farm power (8.58) respectively. Assimilators ranked second in crop production (11.92) and livestock production (7.98) respectively.

The students who adopted diverging learning style did not perform well in all topics included in the study. As such it was inferred that learning styles affect achievement in different topic in secondary school agriculture. This result rejects the null hypothesis that was no statistically significant relationship between learning style preferences and students' achievement in specific topics of Secondary School agriculture and accepts the alternate hypothesis that there is a significant difference between learning style preferences and students' achievement in specific topics in Secondary School agriculture. Such finding highlights the importance of recognizing students' varying learning styles. Teachers should be aware of the usefulness of learning styles for effective learning to take place. This agrees well with (Tinklin, Croxford, Ducklin, & Frame, 2001) that educators should consider how teaching and learning styles work together in the classroom.



### **5.3 Conclusions**

Based on the findings of the study, the following conclusions were drawn:

- i. Secondary agriculture students possess all the four learning styles; accommodating, assimilating Converging and Diverging. Majority of secondary school Agriculture students have converging learning styles.
- ii. Mean scores for converging and assimilating groups are significantly higher than diverging and accommodating groups. Therefore it can be concluded that agriculture students in Eldoret East Sub-County tend to learn best through experimentation and less through reflective observation.
- iii. The learning styles adopted by agriculture students affect their academic achievements as far as gender is concerned. In all the four learning styles, male students have higher mean scores than females.

### **5.4 Recommendations**

The following are the recommendations of this study:

- i. For better performances in Agriculture, Agriculture teachers should identify the learning styles of their students and use teaching strategies that complement them. The use of multiple teaching methods will greatly enhance the process of teaching and learning and make it effective and rewarding.
- ii. Teachers should identify students at risk of poor academic achievement, especially the slow learners and under achievers. Direct individual and group counseling approaches should be utilized by teacher-counselors to help them improve their learning styles.
- iii. Teachers, curriculum planners and experts should apply the use of equal measure in the method of teaching male and female students in schools.
- iv. Curriculum planners and experts should plan and organize the curriculum bearing in mind individual differences in learning styles of students.

### **5.5 Suggestions for further study**

During the course of this study certain areas were identified which were outside the scope of this study, which would require further research. These are:

- i. There is need for studies to determine the teaching style of the secondary school agriculture teachers.
- ii. Further, research need to be conducted to examine the relationship between teaching and learning styles and how both contribute and relate to academic performance in Agriculture.



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## APPENDIX A: KOLB'S LEARNING STYLE INVENTORY QUESTIONNAIRE

### Introduction

My name is Josephine Muge. I am a student in Egerton University taking a Master of Science Degree in Agricultural Education. I am undertaking a research project on the effects of learning styles on students' achievement when utilizing experiential learning in secondary school Agriculture, in Eldoret East Sub County of Uasin Gishu County, Kenya. In order to collect the relevant data I have provided the Kolb's learning style inventory (KLSI) and an Agriculture Assessment Test (AAT) which I kindly request you to complete. The Kolb's learning style inventory describes the way you learn and how you deal with ideas and day to day situations. All the information you will provide will be used only for the purpose of this study and treated confidentially. Therefore do not write your name on this instrument. The KLSI has been field-tested and takes only 10 minutes to complete. Please respond to all questions as truthfully as you can. The AAT will take one hour.

### SECTION A

#### Student's Demographic data

- A. Gender 1. Male  2. female
- B. Mark your age in the appropriate choices given below:
1. 13 years
  2. 14years
  3. 15years
  4. 16 years
  5. 17 years and above

### SECTION B:

#### How to Use Kolb's Learning Style Inventory

- 1. Sentences.** Below are twelve sentences with a choice of four endings. Rank the endings for each sentence according to how well you think each one fits with how you would learn something new.
- 2. Rank** Using the spaces provided rank order each sentence ending starting with 4 for the sentence that best describes how you learn down to a 1 for the sentence ending that seems least like the way you would learn. Be sure to rank all the

endings for each sentence unit. No two endings in a set can be given the same ranking. 4- Most descriptive of you. 1-Least descriptive of you.

**3. React.** In ranking the words use your first impression. There is no right or wrong answer. The real you is best revealed through the first impression. Do not answer as you wish you were or as you think you should be. Just answer as you honestly think you are.

**4. Proceed** -Continue to rank all the twelve sentences one at a time.

**5. Time**-The ranking should not take more than five minutes. When you have finished go to the scoring guide.

### **SCORING GUIDE**

1. Add the numbers in each box down each column
2. Put the total in the box in the total score row.
3. Check the combined total scores. It must be 120.

### **GRAPHING THE LEARNING STYLE GRID**

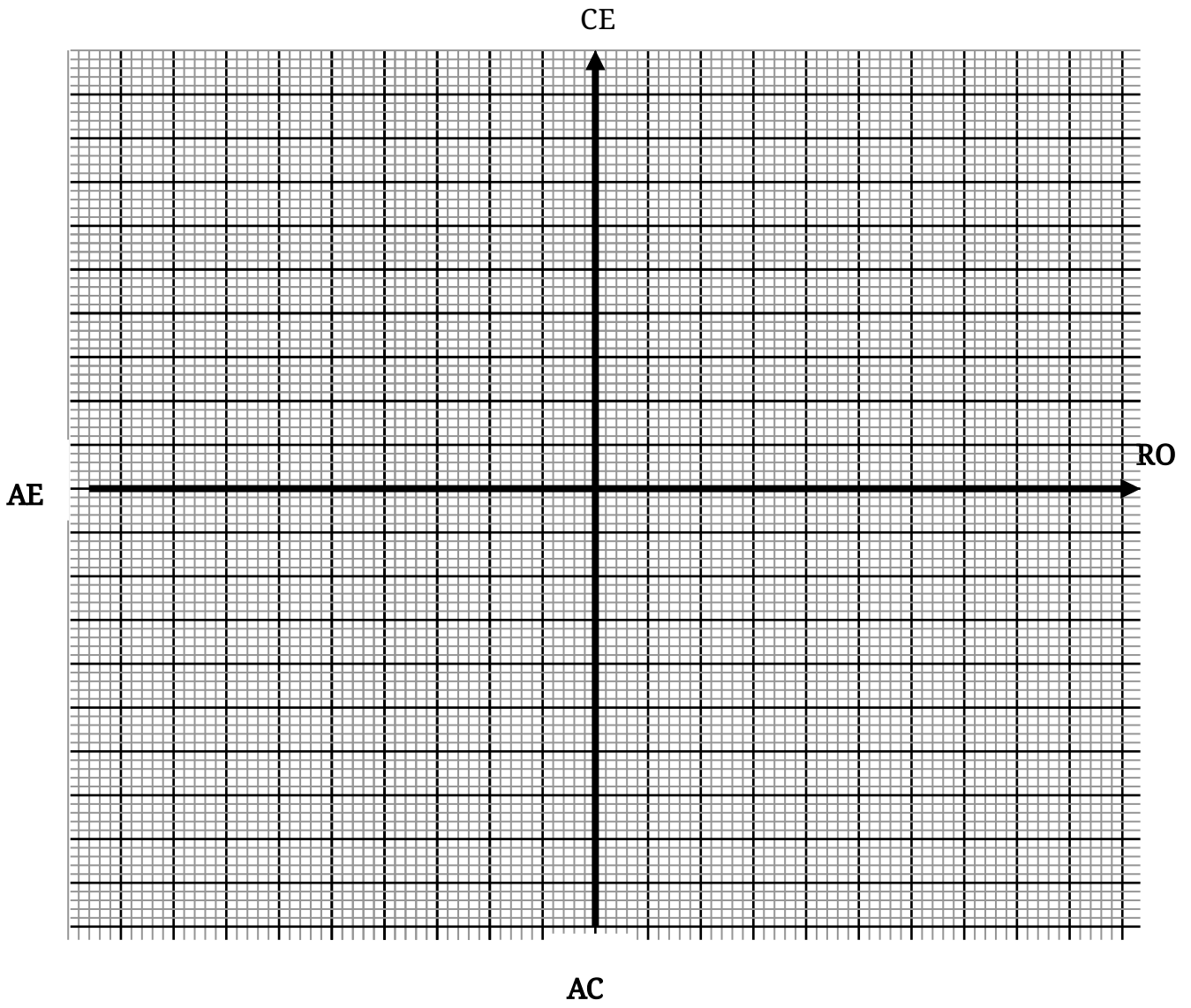
1. On the vertical axis on the grid, pointing towards 12 O'clock, (Concrete experience, CE) place a large dot by the number which corresponds to your total score in column 1.
2. On the horizontal axis on the grid which corresponds to 3 O'clock (Reflective Observation, RO), place a large dot by number which correspond to your total score in column 2.
3. On the vertical axis on the grid pointing towards 6 O'clock, (Abstract Conceptualization, AC), place a large dot by the number which corresponds to your total score in column 3.
4. On the horizontal axis on the grid which corresponds to 9 O'clock (Active Experimentation, AE), place a large dot by the number which corresponds to your total score in column 4.
5. Join the four dots to form a four sided figure. You will have a four graphic representation of your dominant learning style.
6. When you have completed this, give your completed learning style inventory and the grid to your Agriculture teacher without your name on it.

## KOLB'S LEARNING STYLE INVENTORY

| Statement             | CE                                   | RO                              | AC  | AE                                 |
|-----------------------|--------------------------------------|---------------------------------|---|------------------------------------|
| 1. When I learn       | I like to deal with my feelings      | I like to watch and listen      | I like to think about ideas                     | I like to be doing things          |
| <b>Scores</b>         |                                      |                                 |   |                                    |
| 2. I learn the best   | I trust my hunches and feelings      | I listen carefully and watch    | I rely on logical thinking                      | I work hard to get things done     |
| <b>Scores</b>         |                                      |                                 |   |                                    |
| 3. When I am learning | I have strong feelings and reactions | I am quiet and reserved         | I tend to reason things out                     | I am responsible about things      |
| <b>Scores</b>         |                                      |                                 |   |                                    |
| 4. I learn by         | Feeling                              | Watching                        | Thinking  | Doing                              |
| <b>Scores</b>         |                                      |                                 |   |                                    |
| 5. When I learn       | I am open to new experiences         | I look at all sides of an issue | I like to analyze things break them into points | I like to try things out           |
| <b>Scores</b>         |                                      |                                 |   |                                    |
| 6. When I am learning | I am an intuitive person             | I am an observant person        | I am a logical person                           | I am an active person              |
| <b>Scores</b>         |                                      |                                 |   |                                    |
| 7. I learn best from  | Personal relationships               | Observations                    | Rational theories                               | A choice to try and practice       |
| <b>Scores</b>         |                                      |                                 |   |                                    |
| 8. When I learn       | I feel personally involved           | I take my time before acting    | I like ideas are theories                       | I like to see results from my work |
| <b>Scores</b>         |                                      |                                 |   |                                    |

|                        |                                |                          |                        |                             |
|------------------------|--------------------------------|--------------------------|------------------------|-----------------------------|
| 9. I learn best when   | I rely on my feelings          | I rely on my observation | I rely on my ideas     | I can try things out myself |
| <b>Scores</b>          |                                |                          |                        |                             |
| 10. When I am learning | I am unaccepting person        | I am a reserved person   | I am a rational person | I am a responsible person   |
| <b>Scores</b>          |                                |                          |                        |                             |
| 11. When I learn       | I get involved                 | I like to observe        | I evaluate things      | I like to be active         |
| <b>Scores</b>          |                                |                          |                        |                             |
| 12. I learn best when  | I am receptive and open minded | I am careful             | I analyze ideas        | I am practical              |
| <b>Scores</b>          |                                |                          |                        |                             |
| <b>Total score</b>     |                                |                          |                        |                             |

# THE GRID



**APPENDIX B: AGRICULTURE ASSESSMENT TEST (AAT)**

**Section A: Crop production**

1. State four reasons for carrying out primary cultivation

(2marks)

.....  
.....

2. State four ways by which plant nutrients may be lost from the soil.

(2marks)

.....  
.....

3. Calculate the plant population per hectares of a maize crop planted at a spacing of 100cm x 50cm

(2marks)

.....  
.....

4. Explain a reason for carrying out each of the following practices in a tomato nursery

(2marks)

(i) Pricking out .....

(ii) Hardening off .....

5. List four factors considered when designing a crop rotation programme

(2marks)

.....  
.....

6. Give two characteristics of a good root stock for grafting.

(2marks)

.....  
.....

7. State four reasons for pruning fruit crops

(2marks)

.....  
.....



8. State two ways in which inorganic mulch helps to conserve moisture in the soil (2marks)

.....  
.....

9. State two methods of controlling blossom end rot in tomatoes (2marks)

.....  
.....

10. State two factors that determine the stage at which a grain crop is ready for harvesting (2marks).

.....  
.....

**Section B: Agricultural Economics**

1. Name four sources of agriculture credit in Kenya (2marks)

.....  
.....  
.....

2. List two types of inventories used in farm accounts. (2marks)

.....  
.....

3.State four problems that farmers are likely to face when marketing their produce.(2marks)

.....  
.....

4. List any four types of records a farmer should keep (2marks)

.....  
.....

5. What are the advantages of planning in a farm business?

(2marks)

.....  
.....

6. Define the term opportunity cost as used in economics

(2marks)

.....  
.....

7. State two variable costs in the production of coffee in an established field of coffee.(2mks)

.....  
.....

8. State two objectives of land settlement which have been undertaken in Kenya (2marks)

.....  
.....

9. Explain two ways in which land consolidation helps to improve farm management (2marks)

.....  
.....  
.....  
.....

10. State four reasons for keeping health records in livestock production

(2marks)

.....  
.....  
.....

**Section C: Livestock production**

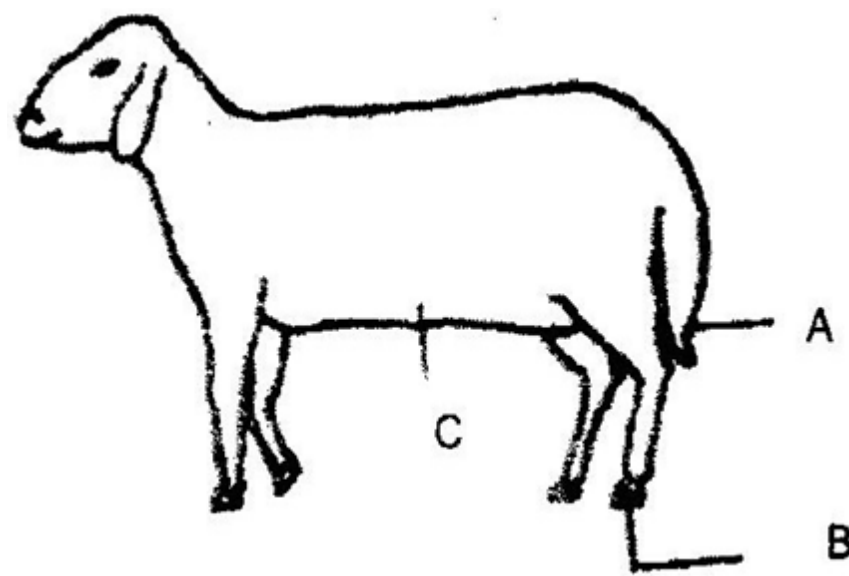
1.Explain why Jersey breeds of cattle are better suited for marginal areas than Friesians (1mark)

.....  
.....  
.....

2. State four signs of infestation by external parasites in livestock (2marks)

.....  
.....  
.....  
.....

3. Below is a diagram of a sheep with some parts labeled A, B, and C. Study the diagram and answer the questions that follow.



(i) What operation is usually carried out on the part labeled A? (1/2mark)

.....  
.....

(ii) Why is it necessary to carry out the operation in (i) above? (1/2mark)

.....  
.....

(iii) State two methods of carrying out the operation in (i) above, (1mark)

.....  
.....

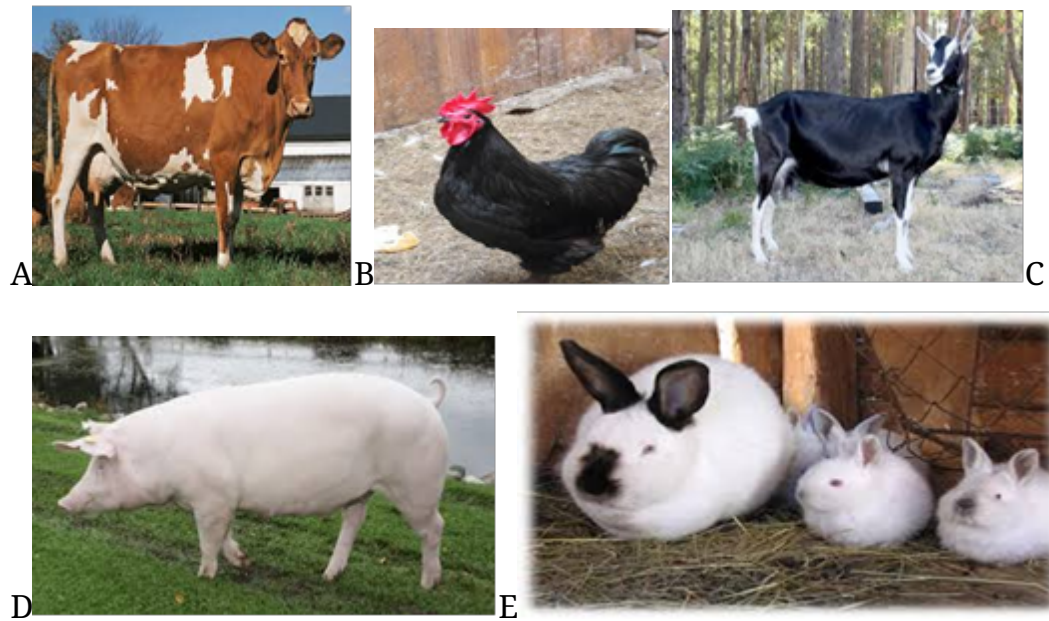
(iv) IV) Which operation is usually carried out on part labeled B?

(1/2mark)

.....

.....

4. Identify the following livestock breeds.(2marks)



A..... B .....

C ..... D.....

E .....

5 Which is the appropriate method of controlling liver flukes in livestock? (1mark)

.....

.....

6 State two ways used to improve production in indigenous cattle (2marks)

.....

.....

7.State two nutritional diseases in livestock (2marks)

.....

.....

8. Which livestock disease is transmitted by each of the following ticks? (2mks)

- (i) Blue tick (*Boophilous decoloratus*) .....
- (ii) Brown ear tick (*Rhipicephalous appendicula tus*) .....

9. State two factor which determine the amount of feed an animal

(2marks)

.....  
.....

10. State two management practices in fish rearing

(2marks)

.....  
.....

**Section D: Farm power and structures**

1. Describe the procedure of erecting wooden posts for fencing (3marks)

.....  
.....

2. List two reasons for treating timber to the used in construction of farm  
(1mark)

.....  
.....

3. State four sources of farm power (2marks)

.....  
.....

4. Name two animal drawn implements (2marks)

.....  
.....

5. Briefly describe two types of water pumps (2marks)

.....  
.....

6. State two advantages of using wood in the construction of farm buildings  
(2marks)

.....  
.....

7. State one advantage and one disadvantage of using barbed wire instead of  
plain wire for fencing paddocks. (2marks)

.....

.....

8. One of the recommended ratio of mixing ingredients for making Concrete block is 1:3:4, Name ingredients represented by the numbers 1, 3 and 4 in the mixture (2marks)

.....  
.....

9. State four features of a good maize granary.(2marks)

.....  
.....

10. State two reasons why maintenance of farm structures is important.(2marks)

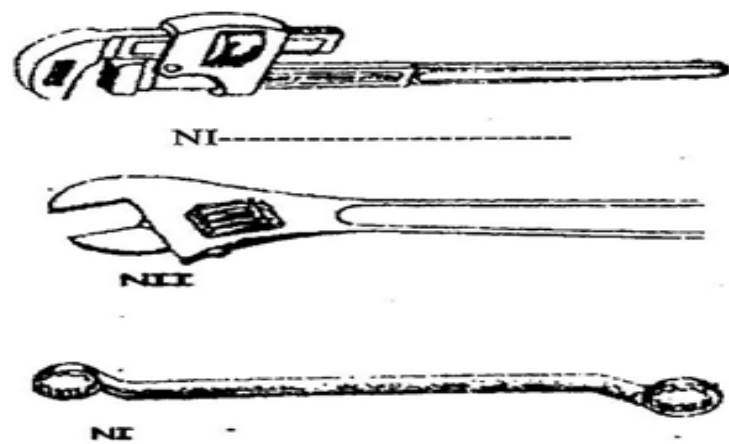
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**Section E: Farm Tools and Equipments**

1. State the major categories of farm tools and equipments (3marks)

.....  
.....

2. The diagram labeled N I, N II, N III below represent some tools used in farms.



(i)What functional advantage does the tool labeled NII have over the tool labeled NIII? (1mark)

.....  
.....

(ii) What is the function of tool labeled NI? (1/2 mark).

.....  
(iii) State one maintenance practice of NI? (1/2mark)

.....  
3. State one use of each of the following tools (2marks)

(i) Spoke shave .....

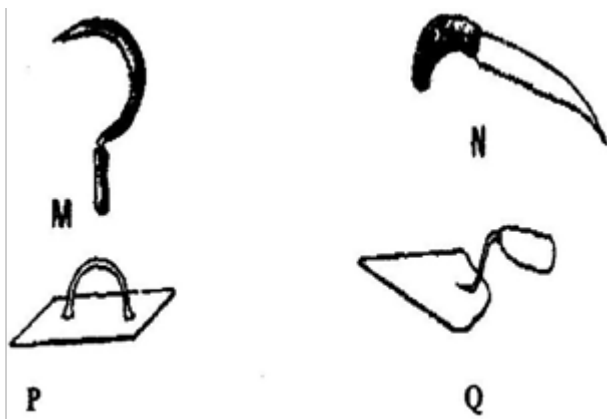
(ii) Plumb bob .....

4. State one factor considered when selecting a garden tool for primary cultivation (1mark)

.....  
.....  
5. Outline two reasons for proper maintenance of farm implements.(2marks)

.....  
.....  
6. List four tools used when constructing a wooden fence. (2marks)

.....  
.....  
7. The diagram M, N, P and Q below represent some farm tools



(i) Identify the tools

M.....(1/2 mark)

Q..... (1/2 Mark)

(ii) State the use of tool P ..... (1/2Mark)



(iii) State the one maintenance practice of tool N (1/2mark)

.....

8. State two reasons for proper maintenance of farm tools.  
(2marks)

.....

.....

9. Outline two factors considered when selecting a garden tool for primary cultivation. (2marks)

.....

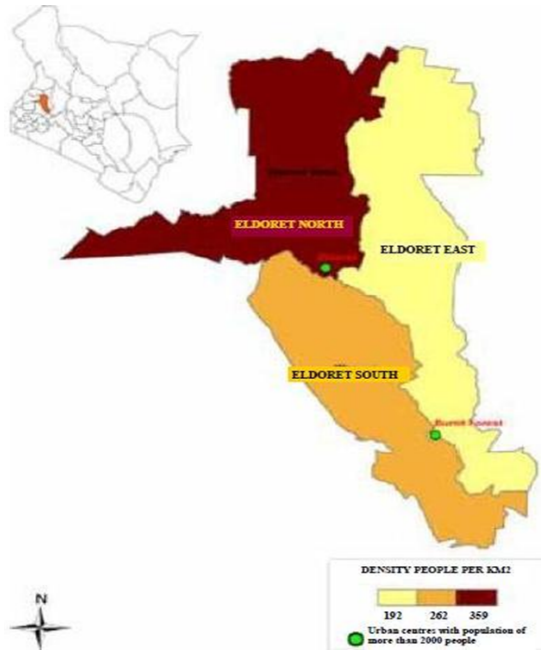
.....

10. State one use of each of the following hammers.  
(2marks)

(i) Ball pein hammer.....

(ii) Sledge hammer.....

## APPENDIX C: MAP OF UASIN GISHU COUNTY



**EGERTON**

Tel: Pilot: 254-51-2217620  
254-51-2217877  
254-51-2217631  
Dir.line/Fax: 254-51-2217847  
Cell Phone



**UNIVERSITY**

P.O. Box 536 - 20115  
Egerton, Njoro, Kenya  
Email: [bpqs@egerton.ac.ke](mailto:bpqs@egerton.ac.ke)  
[www.egerton.ac.ke](http://www.egerton.ac.ke)

**OFFICE OF THE DIRECTOR GRADUATE SCHOOL**

Ref:.....EM11/3365/12.....

Date:..1<sup>st</sup> December, 2015

The Secretary,  
National Commission for Science Technology and Innovation,  
P. O. Box 30623-00100  
**NAIROBI.**

Dear Sir,

**RE: REQUEST FOR RESEARCH PERMIT – MS. JOSEPHINE  
CHEPCHUMBA MUGE, REG. NO. EM11/3365/12**

This is to introduce and confirm to you that the above named student is in the Department of Agricultural Education & Extension, Faculty of Education & Community Studies.

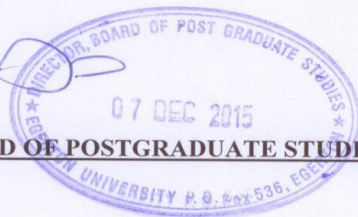
She is a bona-fide registered M.Sc student in this University. Her research topic is “Effects of Students’ Learning Styles on their Achievement in Secondary School Agriculture.”

She is at the stage of collecting field data. Please issue her with a research permit to enable her undertake the studies.

Your kind assistance to her will be highly appreciated.

Yours faithfully,

**Prof. M. A. Okiror**  
**DIRECTOR, BOARD OF POSTGRADUATE STUDIES**



MAO/vk



**NATIONAL COMMISSION FOR SCIENCE,  
TECHNOLOGY AND INNOVATION**

Telephone: +254-20-2213471,  
2241349, 310571, 2219420  
Fax: +254-20-318245, 318249  
Email: secretary@nacosti.go.ke  
Website: www.nacosti.go.ke  
When replying please quote

9<sup>th</sup> Floor, Utalii House  
Uhuru Highway  
P.O. Box 30623-00100  
NAIROBI-KENYA

Ref: No. **NACOSTI/P/16/6717/9199**

Date:

**27<sup>th</sup> January, 2015**

Josphine Chepchumba Muge  
Egerton University  
P.O Box 536-20115  
**EGERTON.**

**RE: RESEARCH AUTHORIZATION**

Following your application for authority to carry out research on *“Effects Of students learning styles on their achievement in secondary school agriculture,”* I am pleased to inform you that you have been authorized to undertake research in **Nandi and Uasin Gishu Counties** for a period ending **25<sup>th</sup> January, 2017.**

You are advised to report to **the County Commissioners and the County Directors of Education, Nandi and Uasin Gishu Counties** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

  
**DR. S. K. LANGAT, OGW**  
**FOR: DIRECTOR GENERAL/CEO**

Copy to:

The County Commissioner  
Nandi County.


The County Director of Education  
Nandi County.


  
**COUNTY COMMISSIONER**  
**UASIN GISHU COUNTY**

5/2/16.

**THIS IS TO CERTIFY THAT:**  
**MS. JOSPHINE CHEPCHUMBA MUGE**  
**of EGERTON UNIVERSITY, 8357-30100**  
**ELDORET, has been permitted to conduct**  
**research in Nandi Uasin-Gishu**  
**Counties**  
**on the topic: "EFFECTS OF STUDENTS'**  
**LEARNING STYLES ON THEIR**  
**ACHIEVEMENT IN SECONDARY SCHOOL**  
**AGRICULTURE"**  
**for the period ending:**  
**25th January, 2017**

**Permit No. : NACOSTI/P/16/6717/9199**  
**Date Of Issue : 27th January, 2016**  
**Fee Received : ksh 1000**

  
**Applicant's Signature**

  
**Director General**  
**National Commission for Science, Technology and Innovation**

**CONDITIONS**

- 1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit**
- 2. Government Officers will not be interviewed without prior appointment.**
- 3. No questionnaire will be used unless it has been approved.**
- 4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.**
- 5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.**
- 6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice.**

  
**NACOSTI**  
**National Commission for Science, Technology and Innovation**

**RESEARCH CLEARANCE PERMIT**  
**Serial No. 7680**  
**CONDITIONS: see back page**

**THE PRESIDENCY**  
**MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT**

Tel: 053 52621, 52003, Kapsabet  
Fax No. 053 – 52503  
E-mail:  
nandicountycommissioner@gmail.com  
When replying, please quote



County Commissioner's Office  
Nandi County  
P.O. Box 30,  
KAPSABET.

Ref: No.NC.EDU/4/1/VOL.III/(178)

1<sup>st</sup> February, 2016

Josphine Chepchumba Muge,  
Egerton University,  
P.O. Box 536 - 20115  
**EGERTON**

**RE: RESEARCH AUTHORIZATION**

This is in reference to letter No. NACOSTI/P/16/6717/9199 dated 27<sup>th</sup> January, 2016 from the Director General/CEO, National Commission for Science, Technology and Innovation on the above subject matter.

You are hereby authorized to conduct a research on **“Effects of students learning styles on their achievement in secondary schools agriculture”** in Nandi County for the period ending **25<sup>th</sup> January, 2017**

Wishing you all the best.

KANGETHE THUKU,  
County Commissioner,  
**NANDI.**



REPUBLIC OF KENYA



**MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY**  
**STATE DEPARTMENT OF EDUCATION**

Telegrams: "EDUCATION", Eldoret  
Telephone: 053-2063342 or 2031421/2  
Mobile : 0719 12 72 12/0732 260 280  
Email: cdeuasingishucounty@yahoo.com  
: cdeuasingishucounty@gmail.com

When replying please quote:

Office of The County Director of Education,  
Uasin Gishu County,  
P.O. Box 9843-30100,  
**ELDORET.**

Ref: No. MOEST/UGC/TRN/9/Vol II/124

1<sup>st</sup> February, 2016

Josphine Chepchumba Muge  
Egerton University  
P.O. Box 536 - 20115  
**EGERTON**

**RE: RESEARCH AUTHORIZATION**

This office has received a letter requesting for an authority to allow you carry out research on "*Effects of students learning styles on their achievement in secondary school agriculture*", Within Uasin Gishu County".

We wish to inform you that the request has been granted for a period ending **25<sup>th</sup> January, 2017**. The authorities concerned are therefore requested to give you maximum support.

We take this opportunity to wish you well during this research.

*Wamukoya Magdalene*  
For: County Director of Education  
**UASIN GISHU.**

**MINISTRY OF EDUCATION SCIENCE AND TECHNOLOGY  
STATE DEPARTMENT OF EDUCATION**

Telephone: Kapsabet 0773044624  
E-mail: [cdenandicounty@yahoo.com](mailto:cdenandicounty@yahoo.com)  
Fax: 05352084

When replying please quote

Ref: NDI/CDE/GEN/1/VOL 11/88

Josphine Chepchumba Muge,  
Egerton University,  
P.O Box 536-20115,  
**EGERTON.**



**County Director of Education  
Nandi County,  
P. O. Box 36,  
KAPSABET.**

1/2/2016

**RE: RESEARCH AUTHORISATION.**

The above named person has been granted permission by the CDE to carry out research on "*Effects of students learning styles on their achievement in secondary school agriculture,*" in Nandi County Kenya.

Kindly provide her all necessary support she requires.



For: *County Director  
of Education  
NANDI COUNTY*

Arita Bwana,  
For: County Director of Education,  
**NANDI COUNTY.**