A CORRELATION STUDY BETWEEN LEARNING STYLES AND ACADEMIC
ACHIEVEMENT AMONG SECONDARY SCHOOL STUDENTS IN KENYA

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WORK DECLARATION

I declare that the work in this research project is entirely my original work and has never been presented for any academic award in any other University.

Signature: __________________ Date: __________________

MUTUA MESHACK NZESEI

E58/63596/2013

The research project has been submitted for examination with my approval as the university supervisor.

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DEDICATION

I dedicate this research project to my parents. To my Dad, Daniel, I thank you for encouraging me to work hard and to trust in God. To my mum, Regina, thank you for your prayers and support throughout my studies. Special dedication goes to my wife Janet, and my siblings for being there for me when I needed their help most. I love you all.
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I would like to sincerely thank Dr. Karen T. Odhiambo for her guidance, patience, and most importantly, her understanding during my graduate studies. Her mentorship was paramount in providing a holistic experience consistent with my long-term career interests. She encouraged me to not only grow as an educationist and evaluator, but also as a critical and independent thinker.
ABSTRACT

One of the most significant issues in learning to learn is for individuals to take responsibility for their own learning. When learners take the responsibility of their own learning, they attribute meaning to the process of learning, leading to effective learning.

The purpose of this study was to determine ‘the relationship between learning style and academic achievement among secondary school students in Kenya’. The study objectives were to: (a) identify the learning style preference among secondary school students; (b) determine the academic achievement levels of the students; and (c) determine the relationship between learning style and academic achievement of the students by gender. The sampling applied was purposive. The data collection instrument was the Barsch Learning Style Inventory (BLSI). This was used to identify the learning style preference among the students based on Visual (V), Auditory (A) and Kinesthetic (K) modalities. The instrument has a reliability of 0.862.

The findings indicate that majority of the students are trimodal learners, followed by bimodal (VA) learners and thirdly by unimodal (V) learners. The least preferred learning style is the single kinesthetic modality which was preferred by only 2 female students. There is no significant difference in learning style preference among male and female students and among high and low academic achievement groups. There is strong positive and statistically significant relationship between learning styles and academic achievement for the trimodal learners, and among male and female students.
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ABBREVIATIONS AND ACRONYMS

BLSI- Barsch’s Learning Style Inventory
CSI- Cognitive Style Index
DV- Dependent Variable
ELM- Experiential Learning Model
IV- Independent Variable
KCSE- Kenya Certificate of Secondary Education
LSI- Learning Style Inventory
LSQ- Learning Style Questionnaire
VAK- Visual/Auditory/Kinesthetic
CHAPTER ONE

INTRODUCTION

1.1 Background

Academic achievement has, for the past decades, been the center of interest in educational research. Exploring the issue of achievement has extended beyond simple issues of intelligence and prior academic achievement into how learners interact with the learning material. Several factors have been identified in explaining academic achievement: demographic status (Ray, 2010), intelligence (Deary, Strand, Smith, & Fernandez, 2007); behavioral characteristics (Lane, Barton-Arwood, Nelson, & Wehby, 2008); and psychological factors such as attributes (Erdogan, Bayram, & Deniz, 2008) self-esteem (Reasoner, 2005) self-efficacy (Olatunde, 2009) and self-concept (Holliday, 2009).

A specific attention has been given to English language perhaps due to its wide application in the Kenyan 8.4.4 curriculum where all the subjects except Kiswahili which is a compulsory subject and French and German which are optionally taught in some secondary schools. Language is an important aspect of life in all beings especially with the rise of globalization where the human race needs a common and identifiable language for communication (Li & Dan, 2006). Most of the courses in higher education also require good performance in KCSE English subject since the subject is the medium of instruction and the national official language. For these reasons, achievement in English subject has been and continues to be researched on and understood in light of the aforementioned factors affecting achievement.
A number of learning-related concepts, such as perception of academic control and achievement motivation which have been a focus of attention when attempting to identify factors affecting learning-related performance (Cano-Garcia & Hughes, 2000). One concept in particular which has provided some valuable insights into learning in both academic and other educational settings is learning style.

Learning styles has been defined as a consistent way of functioning that reflects the underlying causes of learning behavior (Keefe, 1987). Learning style is both a characteristic which indicates how a student learns and likes to learn, as well as instructional strategy informing the cognition, context and content of learning. 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, & Kinshuk, 2010).

There is general acceptance that the manner in which individuals choose to or are inclined to approach a learning situation has an impact on performance and achievement of learning outcomes. Whilst- and perhaps because-learning style has been the focus of such a vast number of research and practitioner-based studies in the area, there exist a variety of definitions, theoretical propositions, models, interpretations and measures of the construct. To some extent, this can be considered a natural consequence of extensive empirical investigation and is to be expected with any continually developing concept which proves useful in gaining understanding of such a crucial and prevailing endeavor as learning.

Utilizing awareness of learning style within the educational background promotes more effective learning and hence improved academic achievement. As Keefe (1997) claims, the
biggest dilemma would be, ‘how can we improve the achievement 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? There is a strong intuitive appeal in the idea that instructors, course designers and educational psychologists 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. In turn, instructors can respond to individuals’ strengths and weaknesses, then retention and achievement rates in formal programs are likely to rise and ‘learning to learn’ skills provide a foundation for lifelong learning.

Sternberg (1997) proposed that styles are at least in part socialized suggesting that they can, to some extent, be modified. Therefore, learners’ knowledge of their learning style preference can help them optimally develop their meta-cognition and learning skills and abilities thus maximizing learning (Sternberg, 1997). In summary, Sternberg (1997) believed that greater awareness of learning preferences and styles helps teachers to be more flexible in their teaching and to utilize a wide range of classroom methodologies. The aim is not to match teaching style to learner preferences, but to help the learner build their skills and capacities to learn well in both preferred and less preferred modes of learning (meta-learning), thus developing effective and life-long learners who can monitor their learning strategies and evaluate their outcomes or achievement.

Although it has been found that students’ learning styles do significantly influence their academic achievement, these findings are mostly based on research conducted in other countries
and vary depending on the country. According to Gokalp (2013), a country never stops to explore and develop its own methods of learning in order to respond to the demands particular to its environments (Yamazaki, 2005). For instance, Bennett (1993) summarizes that the learning styles of African Americans may be inconsistent with the teaching approaches applied in most schools. Hence it is pertinent that the relationship between learning styles and academic achievement be examined based on a country-context perspective (Bennett, 1993), and so is the purpose of this study. The findings of this research adds to the existing body of discourse and consolidates the belief that learning styles as determined by self-assessment instruments improve academic achievement, since the learner is able to discover his/her preferred way of knowledge acquisition and the learning process they employ in a learning situation especially in the Kenyan context.

1.2 Statement of the Problem

Most Kenyan high school teachers have not established how learners learn languages, particularly English. With the current low achievement in English, it is evident that learners have not yet learned how to learn or discovered their preferred learning styles for different learning material or content in this subject. Also, teachers have not understood the diversity of their learners in a typical classroom, and they keep on embracing the same traditional teaching styles in every context. In consequence, students become bored and inattentive in class, do poorly on tests, get discouraged about the subject, the curriculum, and themselves, and in some worse cases drop out of school. Teachers confronted by poor grades, unresponsive or hostile learners, poor attendance and dropouts, know something is not working; they may become overly critical of their students (making things even worse) or begin to wonder if they are in the right profession.
Learning style theories have been cited as an effective means of helping teachers recognize the incredibly diverse needs learners bring into the classroom, as well as helping the learners discover how they learn best for optimum academic achievement. In addition, these theories provide a framework that enable teachers to reap the very best from their learners through developing a variety of instructional methodologies to benefit all learners, and more importantly helping the student learn how to learn and consequently achieve better academic results. It is therefore imperative to understand learning style preference among the learners and how they relate to academic achievement so as to develop effective and successful learners.

1.3 Purpose of the Study

The purpose of this study is to determine the relationship between learning style preferences and the academic achievement among secondary school students in Kenya.

1.4 Objectives of the Study

The study has three main objectives:

a. Identify the learning style preferences among students;

b. Determine the academic achievement levels of students;

c. Determine the relationship between learning style preference and academic achievement by gender;

d. Make appropriate recommendations based on the findings of the study.

1.5 Study Questions

The study is aimed to answer the following key questions:
a. Is there a significant difference in learning styles preferences among students and between boys and girls?

b. Is there a significant difference in academic achievement between boys and girls?

c. Is there a significant relationship between learning style preferences and the academic achievement among the students by gender?

1.6 Significance of the Study

This study is aimed at assisting teachers and educational psychologists/researchers understand the various learning styles favored by the learners. In addition, the researcher hopes to gather crucial and enough information to help instructors recognize the important relationship between learning styles preferences and academic achievement. If indeed significant relationship is exposed, further credibility will be afforded for the theory that learning styles play a crucial role in students’ academic achievement and the learning style assessment instrument proposed for this study (the Barsch Learning Styles Inventory) would then become a means to assist teachers understand their learners’ learning style preferences and adjust it to maximize learning and hence improve academic achievement.

But more importantly, the teachers will help the learners discover their learning, that is meta-learning, and develop successful and life-long learners. Further, students will benefit from the knowledge about their own learning style and can take control or direct their own learning through modifying their habits and materials for optimum learning. According to Sternberg (1997), when learners learn in a way that suits them, improvements in the effectiveness of the learning process normally ensue.
1.7 Justification of the Study

Learning styles have been investigated in many countries, such as in the United States (Sternberg, 1997), Spain (Cano-Garcia & Hughes, 2000), the Philippines (Bernado, Zhang, & Callueng, 2002), Hong Kong (Zhang & Sternberg, 2002), People’s Republic of China (Zhang, 2004), and more recently in Korea (Park, Park, & Choe, 2005), Malaysia (JilardiDamavandi, Mahyuddin, Elias, Daud, & Shabani, 2011) and Norway (Fjell & Walhord, 2004). However, the scarcity of studies manifests itself in the area of learning styles and academic achievement more so in Kenya. It’s imperative therefore, for researchers and instructors to know how learning styles influence pupils’ academic achievement in the Kenyan schools and from there to design possible means of intervention for promoting effective learning and academic achievement.

1.8 Key Terminologies

Academic achievement- is defined as successful completion, through effort, of the acquisition of academic content and skills mostly determined by the grades or scores that the student gets in a test.

Effective learning – is learning about learning which develops understanding of learning in the changing world. Effective learning involves individuals moving beyond making connections of new ideas to old ones into restructuring their thinking radically by changing the connections among the things they already know or even discard some long-held beliefs about the world.

Learning- is the act of acquiring new, or modifying and reinforcing, existing knowledge, behaviors, skills, values or preferences and may involve synthesizing different types of information. In other words, it is acquiring modification of existing knowledge, skills, habits or tendencies through experience, practice or experience.
**Learning style**-is the characteristic cognitive, affective, social, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment.

**Learning style inventory**-is a 24-item instrument/questionnaire designed and created by Jeffry Barsch to assess individuals’ preferred learning style based on visual/audio/kinesthetic model.

**Meta-learning**- is the process by which learners become aware of and increasingly in control of habits of perception, inquiry, learning and growth that they have internalized. In other words, being aware of and taking control of one’s own learning.
CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter summarizes the information from other researchers who have conducted their research on the subject of learning styles and academic achievement. The study reviews relevant studies related to learning styles. The specific areas covered are related studies on learning styles and academic achievement, the concept of learning styles, why consider learning styles, learning style theories, concept of academic achievement, implications of learning styles on learning and teaching, learning styles and academic achievement and description of the present study’s theoretical and conceptual framework.

2.1 Related Studies

Significant numbers of studies have been carried out, mainly in the Western and Asian countries, 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; whereby learning styles have been the independent variable (IV) and the academic performance taken as the dependent variable (DV). 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 carried out by Kopsovich (2001) on the relationship between learning styles of students and their Mathematics scores on the Texas assessment of academic skills test established that the learning style preferences of all students in the area of persistence significantly impacted their math achievement scores. Gender and ethnicity were mitigating
factors in the findings (Kopsovich, 2001). The Pearson Product Moment Correlation coefficient and the Point-biserial correlation analysis was applied to the data collected from 500 randomly selected fifth grade students attending a North Texas Intermediate school. There was a significance relationship of 0.542 at the 0.05 level of significance. Part of the data was the student’s responses to the Learning Style Inventory by Dunn, Dunn and Price. In summary, the author suggests that supplying the teachers with information concerning students’ learning style preferences will benefit student achievement.

Another study conducted by (Gappi, 2013), explored on the student’s preferred learning styles and their academic achievements. The specific objectives of the study were to: describe the learning style preferences of the students; to find out whether learning style preferences of the students differed with age, gender and academic program; and determine the relationship between the learning style preferences and the students’ academic performance. The participants of the study consisted of all (131) the freshman students who were accepted during the first trimester of the academic year 2012-2013, composing of 118 national youth and 13 young adults. The Index of Learning Styles (ILS) questionnaire was utilized to carry out the rationale of the study. Permission to use the questionnaire was granted free of charge via internet, and the results demonstrated that generally the students are fairly well balanced in all four dimensions presented in the ILS questionnaire. 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. This study was conducted among first year students in college, and therefore [based on the small age-gaps] the results may not vary substantially.
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, M. (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 19 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 prepared for and taking exams, class participation and motivation (r= -0.007, r= -0.022, r= -0.018, r= -0.040 respectively), the relationship between the scores of posttest and grades was reduced to a very weak negative correlation (r= -0.300, r= -0.008, r= -0.034, r= -0.086 respectively).

A research conducted in 2011 was an investigation of the relationship between learning styles and academic achievement (Abidin, Rezaee, Abdullah, & Singh, 2011). In order to investigate this relationship a total of 317 students in an Islamic school in Malaysia participated in this survey study. The Learning Styles Survey (LSS) instrument which is based on Joy Reid’s Perceptual Learning-Style Preference Questionnaire (1987) was used. The statistical procedures employed in this study were one-way ANOVA, and multiple regression analysis. The analyses of the data indicated a significant relationship between overall academic achievement and learning styles. It was also found that the high, moderate and low achievers have a similar preference pattern of learning in all learning styles. Moreover, the learning styles framework does not change with subjects, where it actually plays an important role across all the subjects. Therefore, the results here suggest avenues of future research to understand this phenomenon.

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, & 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. It is inevitable that diverse assessment instruments of learning styles exist. It is difficult to find a comprehensive assessment instrument because of the complex nature of learning styles. The majority of the assessment instruments are only to measure one or two dimensions of learning styles. Since the above described related studies were conducted in non-African countries, the present study will help in understanding the relationship between learning styles and academic achievement in the African context, and specifically in Kenya.
2.2 Related Literature

2.2.0 The Concept of Learning Styles

Learning is the prerequisite concept of learning style. Learning has been defined, by Jonassen and Grabowski (1993), as the change due to experience. They go on to distinguish between learning as a product which explains the end result or outcome of the learning experience; learning as a process which emphasizes what happens during the course of the learning experience in attaining a given learning product or outcome; and learning as a function which emphasizes certain critical aspects of learning, such as motivation, retention, and transfer and which makes behavioral changes in human learning possible (Jonassen & Grabowski, 1993).

2.2.1 Defining Learning Styles

From the above theoretical definition of learning therefore, learning style is described as the characteristic cognitive, effective, and psychosocial behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment (Keefe, 1987). According to Hartley (1998) learning style is a student’s consistent way of responding to using stimuli in the context of learning. A learning style is a preferential mode, through which a student likes to master learning, solve problems, thinks or simply reach in a pedagogical situation (Allison and Hayes, 1996).

The concept of learning style is used to describe individual differences in the way people learn. Each person has a unique way to absorb and process experiences and information. Confounding research and, in many instances, application of learning style theory has begat the myriad of methods used to categorize learning styles. No single commonly accepted method currently exists, but alternatively several potential scales and classifications are in use. Most of
these scales and classifications are more similar than dissimilar and focus on environmental preferences, sensory modalities, personality types, and/or cognitive styles. Lack of a conceptual framework for both learning style theory and measurement is a common and central criticism in this area.

The terms, *learning style*, *cognitive style* and *learning strategy* are frequently used imprecisely in theoretical and empirical accounts of the topic. The terms learning style and cognitive style are, on some occasions, used interchangeably, whilst at other times they are afforded separate and distinct definitions. Cognitive style is described as an individual’s typical or habitual mode of problem solving, thinking, perceiving and remembering, while the term learning style is adopted to reflect a concern with the application of cognitive style in a learning situation (Allport, 1937). Allport (1937) goes on to describe cognitive style in terms of a bipolar dimension (wholist-analytic) while learning style is seen as encompassing a number of components which are not mutually exclusive. It is also likely that cognitive style—at the very least—can be regarded as one significant component of learning style. Hartley (1998) provides the following definitions: cognitive styles are the ways in which different individuals characteristically approach different cognitive tasks; learning styles are the ways in which individuals characteristically approach different learning tasks.

A student’s learning style is mainly defined in large part by the answers to five questions which an effective teacher should ask themselves:

a) What type of information does the student preferentially perceive: sensory (external) - sights, sounds, physical sensations, or intuitive (internal) - possibilities, insights, hunches?
b) Through which sensory channel is external information most effectively perceived: visual - pictures, diagrams, graphs, demonstrations, or auditory - words, sounds? (Other sensory channels - touch, taste, and smell - are relatively unimportant in most educational environments and will not be considered here.)

c) With which organization of information is the student most comfortable: inductive—facts and observations are given, underlying principles are inferred or deductive—principles are given, consequences and applications are deduced?

d) How does the student prefer to process information: actively—through engagement in physical activity or discussion, or reflectively—through introspection?

e) How does the student progress toward understanding: sequentially—in continual steps, or globally—in large jumps, holistically?

A third key term in the area, learning strategies, is defined as the strategies students adopt when studying (Hartley, 1998). He continues to assert that different strategies can be selected by learners to deal with different tasks. Learning styles might be more automatic than learning strategies which are optional. Learning styles might be considered as stable overtime (structural)-a trait- or as changing with each experience or situation (process) - a state. Perhaps the more workable view is that a style may well exist in some form, that is it may have structure, but that the structure is, to some degree, responsive to experiences-and the demands of the situation (process) to allow change and to enable adaptive behavior. Investigating the issue of stability in learning style (Loo, 1997) did find evidence to support consistency in learning style overtime, but was critical of current techniques of analysis and recommended caution in drawing any firm conclusion regarding stability.
2.2.2 Why Learning Styles?

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?

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, 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.
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. 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.

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 recent work 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 & 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).

2.2.3 Learning Style Theories

Several theories and models have been developed over time by scholars in the field of learning styles. In their book, Coffield, Moseley, Hall and Ecclestone (2004) discussed various learning style theories which have been applied in research and whose inventories have been tested of their reliability and internal consistency. The main learning style theories include the Kolb’s Experiential Learning Theory, Honey and Mumford’s Information Processing Style, Vermunt’s Learning Style Theory, Allinson and Hayes Wholist-Analytics Theory and the Fleming’s Visual/Auditory/Kinesthetic (VAK) Theory whose basis has seen different inventories developed by several scholars including Jeffrey Barsch, and Victoria Chislett and Allan Chapman, among others.

2.2.3.1 Kolb’s Experiential Learning Style

Among the various learning style models, Kolb’s Experiential Learning Model (ELM) and Learning Style Inventory (LSI) (Learning-Centered Processed-Based Approach /Information Processing Style) has been widely utilized and modified to address the various educational contexts. Kolb proposes a four-stage hypothetical learning cycle. Individuals will show a preference for or will cope with some stages better than others and learning is seen as continuous, interactive process (Kolb D. A., 1984). The four stages of the ELM are described as: concrete experience (CE; experiencing) which favors experiential learning; abstract conceptualization (AC; thinking) where there is a preference for conceptual and analytical thinking in order to achieve understanding; active experimentation (AE; doing) involving active
trial-and-error learning; and reflective observation (RO; reflecting) where extensive consideration is given to the task and potential solutions before there is any attempt at action. The four learning orientations form two orthogonal bipolar dimensions of learning.

The first dimension is prehension - the grasping of information from experience - and is constituted by the bipolar orientations CE-AC. The second dimension described is transformation - the processing of grasped information - and is constituted by the remaining orientations AE-RO. Relative positioning along these dimensions defines the learning styles described by Kolb as convergence, divergence, assimilation and accommodation. The individual who adopts a convergent approach uses abstract conceptualization to drive active experimentation. Action is based on abstract understanding of the task and projected strategies for successful completion of the task. Divergers combine reflective observation with concrete experience to devise an often creative solution. Divergers are often described as creative learners because of their propensity to consider multiple potential strategies for learning and problem solving.

Assimilators, concerned primarily with the explanation of their observations, favor abstract conceptualization and reflective observation. As such, assimilators seek mainly to refine abstract theories rather than develop workable strategies and solutions. Lastly, Kolb defines the accommodator using 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).
Assertions that the styles outlined by Kolb will be associated with student performance have been borne out in a number of studies where, for example, convergers perform better on conventional examinations involving concrete answers (Lynch, Woelfl, Steele, & Hanssen, 1998). Despite such support, studies examining the psychometric properties of LSI have raised concerns regarding its reliability and validity (Coffield, Moseley, Hall, & Ecclestone, 2004).

Kolb’s emphasis on experiential learning and the developmental nature of learning suggests a potential for change in style (Lynch, Woelfl, Steele, & Hanssen, 1998). Studies that have examined stability and change using the LSI present a mixed picture. Low test-retest reliability statistics and changes in style classification (Sims, Veres, Watson, & Buckner, 1986) are countered by reports of exceptionally high-retest reliability of 0.99 found by Veres, Sims and Locklear (1991). Although also reporting high test-retest reliability statistics, (Loo, 1997) is cautious about them, believing that inappropriate statistical techniques may be masking individual changes in style in favor of group effects.

2.2.3.2 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.

a. '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).

b. '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).

c. '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.

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).

2.2.3.3 Dunn and Dunn’s Learning Style Theory

Through their work in schools, they observed distinct differences in the ways students responded to instructional materials. They liked to learn alone, while others preferred learning in groups or from a teacher. Out of this preliminary work, they identified five key dimensions on which student learning style differed: (a) Environmental, (b) Emotional support, (c) Sociological composition, (d) Physiological, and (e) Psychological elements (Sternberg, 1997).
In terms of the environment, the Dunn’s noted that students differed in terms of their definition of an ideal place to learn. Some wanted a warm, brightly lit place with desks, many people, and much verbal interaction, while others preferred cooler, more subdued lighting with a quieter, more informal environment. Though many teachers believe that they have little control over these elements, Dunn and Dunn describe how the standard square box of a classroom can be partitioned into separate areas with different environmental climates.

The emotional dimension centers on the extent to which students are self-directed learners. At one end of the continuum are self-starters who can be given a long-term project and who monitor and pace themselves until finishing the job. At the other end are students who need considerable support and have to have their assignments in small chunks with periodic due dates. Semester-long projects without periodic checks would be disastrous with these students. Understanding your students’ apparent needs for support allows you to design learning experiences that help students succeed and learn more effectively (Coffield, Moseley, Hall, & Ecclestone, 2004).

Students also differ in how they react to peer interaction. Some dislike group projects, preferring instead to learn by themselves; others thrive on the companionship and support provided by group work. Still others prefer the more traditional approach of learning from an adult. You can capitalize on these preferences by varying your teaching techniques based on different learning configurations.

Another important dimension identified by the Dunn’s relates to individual differences in terms of physiological preferences. Probably the most important element here is learning modality; some of us are visual; others prefer auditory channels. Mobility, or the ability to
periodically move around, is another element here. Another important element in this dimension is time. Some of us are morning people, while others don’t function fully until later in the day. Teachers accommodate this dimension when they set up learning centers that allow student movement. This dimension may be one of the hardest for teachers to accommodate (Coffield, Moseley, Hall, & Ecclestone, 2004).

A fifth and final learning style dimension is psychological. This dimension refers to the general strategies students use when attacking learning problems. Some attack them globally, looking at the big picture, while others prefer to address individual elements of a problem separately (Coffield, Moseley, Hall, & Ecclestone, 2004). In a similar way, some students jump into problems, figuring things out as they go along, while others are more reflective, planning before beginning.

2.2.3.4 Vermunt’s Learning Style Model

The concept of learning style has also been described by Vermunt in the Learning-Centered Processed-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 J. D., 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 J. D., 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.

2.2.3.5 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).

There are four combinations of perceptual qualities and ordering abilities based on dominance: a) Concrete Sequential; b) Abstract Random; c) Abstract Sequential; d) Concrete Random. Individuals with different combinations learn in different ways—they have different strengths, different things make sense to them, different things are difficult for them, and they ask different questions throughout the learning process.

2.2.3.6 Fleming’s VAK Learning Style

One of the most common and widely used theories in learning style field is Neil D. Flemings VARK model (also VAK) which expanded upon earlier neuro-linguistic programming (VARK) models: visual learners, auditory learners, reading-writing preference learners and kinesthetic or tactile learners. According to Fleming, as a teacher, ones best option is to use a variety of teaching techniques to give all students the best chance to succeed. Further, most
people possess a dominant or preferred learning style, however some people have a mixed and evenly balanced blend of the three types: visual, auditory and kinesthetic (Fleming, 1995).

The table below summarizes the VAK dimensions, how students tend to learn and what the teachers need to do to ensure that learning is maximized:

**Table 1: VAK Learning Style Dimensions**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Learners tend to:</th>
<th>Teachers need to encourage learners to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>Learn through seeing; Think in pictures and need to create vivid mental images to retain information; Enjoy looking at maps, charts, pictures, videos, and movies; Have visual skills which are demonstrated in puzzle building, reading, writing, understanding charts and graphs, a good sense of direction, sketching, painting, creating visual metaphors and analogies (perhaps through the visual arts), manipulating images, constructing, fixing, designing practical objects, and interpreting visual images</td>
<td>Use graphics to reinforce learning, Colour code to organise notes and possessions, Use colour to highlight important points in text, Take notes, Illustrate ideas as a picture before writing them down, Ask for written directions, Use flow charts and diagrams for note taking, Visualise spelling of words or facts to be memorised.</td>
</tr>
<tr>
<td>Auditory</td>
<td>Learn through listening; Have highly developed auditory skills and are generally good at speaking and presenting; Think in words rather than pictures; Learn best through verbal lectures, discussions, talking things through and listening to what others have to say; Have auditory skills demonstrated in listening, speaking, writing, storytelling, explaining, teaching, using</td>
<td>Read aloud; Recite information to learn; Use tunes or rhymes as mnemonic devices; Read aloud and tape test questions or directions; Use verbal analogies and storytelling to demonstrate their point.</td>
</tr>
</tbody>
</table>
humour, understanding the syntax and meaning of words, remembering information, arguing their point of view, and analysing language usage

| Kinaesthetic | Learn through moving, doing and touching; Express themselves through movement; Have good sense of balance and eye-hand coordination; Remember and process information through interacting with the space around them; Find it hard to sit still for long periods and may become distracted by their need for activity and exploration; Have skills demonstrated in physical coordination, athletic ability, hands on experimentation, using body language, crafts, acting, miming, using their hands to create or build, dancing, and expressing emotions through the body. | Make models or role play to physically experience learning; Skim through reading material before reading it in detail; Annotate text and write questions while reading; Translate information into diagrams or other visual study tools; Recite a list of items by counting on fingers; Memorise or drill while moving e.g. when walking; Listen to music while studying. |

Fleming claimed that visual learners have a preference for seeing (think in pictures; visual aids that represent ideas using methods other than words, such as graphs, charts, diagrams, symbols, etc.). Auditory learners’ best learn through listening (lectures, discussions, tapes, etc.). Tactile/kinesthetic learners prefer to learn via experience—moving, touching, and doing (active exploration of the world; science projects; experiments, etc.). Its use in instruction allows teachers to prepare classes that address each of these areas, especially in languages. Students can also use the model to identify their preferred learning style and maximize their learning by focusing on the mode that benefits them the most. It is on this learning style that the present study is anchored on (Fleming, 1995).
2.2.4 The Concept of Academic Achievement

The constructs "academic achievement" and "academic performance" are often used in manners that create confusion in reference to the different levels of measurable and observable behavior of learners. It is hardly surprising that there seems to be a lack of consensus among researchers regarding the similarities and differences among the constructs: academic achievement and academic performance. One of the major conceptual problems of this measurement constructs, that is, academic performance and academic achievement in educational research is that on one hand they mean different things to some researchers and to others they mean the same thing.

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 and 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 and 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. Students may not be permitted to graduate from high school, for example, if they are unable to maintain a specific grade point average or percentage score or pass a high stakes graduation test.

According to Steve (2000), academic achievement is distinguished from academic performance in that academic achievement is long-term (‘end’) while academic performance is measurable at any point in time (‘continual’). In other words, achievement can be measured as stagnating, falling or improving over a long period. Steve (2000) further classified activities that occur in performance as academic performance index, for instance, students’ performance based on reading, selection of one or more schools within each district, among others. According to him, 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.
Performance is defined as the observable or measurable behavior of a person in a particular situation usually experimental situation (Simpson & Weiner, 1989). This means that performance measures the aspect of behavior that can be observed at a specific period. To determine performance, a performance test is conducted. Steve (2000) defined performance test as the type of mental test in which the subject is asked to do something rather than to say something. Performance test is the type of test which throws light on the ability to deal with things rather than symbols (Steve, 2000). In relation to educational research, academic performance of a student can be regarded as the observable and measurable behavior of a student in a particular situation. For example, the academic performance of a student in English includes observable and measurable behavior of a student at any point during a course. In English students' academic performance consists of his/her scores at any particular time obtained from a teacher-made test. Therefore, we can equate academic performance with the observed behavior or expectation of achieving a specific statement of or statement of educational intention in a research. Academic performance of students consists of scores obtained from teacher-made test, first term examination, mid-term test, and so on (Steve, 2000).

Academic achievement has always been influenced by the learner’s previous education performance (Staffolani & Bratti, 2002), parents’ income and social status (Considine & Zappala, 2002; Graetz, 1995), student’s social and emotional status or wellbeing (Erdogan et.al.2008), the school environment (Sparkles, 1999; Sentamu, 2003) learner’s attitude (Erdogan et. al., 2008), among other factors. The present study is aimed at determining the relationship between learning styles and academic achievement without really understanding the causal-effect relationship. An experimental research can be conducted in future to examine the causal-effect relationship.
relationship between the two variables so as to confidently and empirically state whether or not learning styles determines achievement in education.

2.2.5 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. Thus, ‘learning style’ is a concept that is important not only in shaping teaching practices, but also in highlighting issues that help school administrators think more deeply about their roles in facilitating student learning.

When teaching takes place in or out of the classroom, students are expected to learn. Because teaching is intended to result in learning, high school teachers can benefit from understanding and applying certain principles of learning when designing and implementing their teaching initiatives. Also because neglect or misapplication of principles of learning could easily result in teaching that fails to achieve results, it is important that teachers become familiar with the underlying principles in learning. 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, & Kinshuk, 2010).

According to Sims & Sims (1995), learning may not take place if the teaching is not structured to facilitate learning even when the teaching mode is appropriate. Learning factors (principles) that will affect the learning of students and the success of teaching efforts are setting the stage –provide clear instructions and modeling appropriate behavior when emphasizing
particularly skills or competencies, increasing learning during teaching- providing active participation, increasing self-efficacy, matching teaching techniques to students’ self-efficacy, providing opportunities for inactive mastery, ensuring specific, timely, diagnostic, and practical feedback and providing opportunities for students to practice new behaviors and maintaining basic knowledge in particular areas- developing learning points to assist in knowledge retention, setting specific goals, identifying appropriate reinforces, teaching students how to reinforce their learning and teaching students how to take responsibility of their own learning.

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 (Sims & Sims, 1995). The challenge to the teachers is the attempt to bridge this gap.

Proponents of learning style assessment contend that optimal instruction requires diagnosing individuals learning style and tailoring instruction accordingly. Assessments of learning style typically ask people to evaluate what sort of information presentation they prefer (e.g. words versus pictures versus speech) and/or what kind of mental activity they find most engaging or congenial (e.g. analysis versus listening) although assessment instruments are extremely diverse. The most common-but not the only-hypothesis about the instructional relevance of learning style is the meshing hypothesis, according to which instruction is best provided in a format that matches the preferences of the learner (e.g. for a visual learner emphasizing visual presentation of information).
According to Dunn (2000), the chalk and talk method of teaching hypothetically ignores differences in students' learning styles and the potential increase in student academic achievement associated with matching instructor's teaching methods with students' learning styles. It is ironic that the practitioners of the discipline devoted to the study of efficiency principles are implicitly accused of being inefficient in their approach to teaching that discipline. According to Dunn and Dunn, learning style methodology (2000) optimal method of teaching is the method that most closely matches students' learning styles. Learning styles are composed of multidimensional preference for elements within environmental, emotional, sociological, and psychological strands.

According to Coffield, Moseley, Hall, and Ecclestones (2004), a comprehensive review of learning styles, an instructor wishing to utilize a learning style approach must decide which of the many different learning style theories or approaches is to be adopted. Hawk & Shah (2007, p. 11) suggests that '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 or school terms'. Results of a study conducted by Terregross et al. in 2009 indicated that the learning style characteristics of students appeared to have a significant relationship to the students' achievement. A reasonable reference from the findings was the manner in which knowledge is conveyed to students by instructors. Particularly the congruence of that manner to the learning style of the students can be expected to systematically influence the performance of those students in learning the material.

In teaching, whether teachers are aware of it or not, an assumption underlying many of the current teaching practices is that students are 'empty vessels' and teachers' role is to fill them with knowledge and academic content. But increasingly, research on student learning suggests the metaphor of 'dialogue' is more appropriate in that it emphasizes 'the interactive, cooperative,
relational aspects of teaching and learning (Tiberius, 1986). Once faculty shifts from the ‘empty vessel’ model to a dialogue and communal one; old habits in teaching begin to shift. A lecture class no longer entails simply a scripted delivery of information (no matter how well done), but it may also include a variety of ‘active learning’ techniques that truly engage students in the collective dialogue. This is built on the fact that students’ bodies are increasingly diverse, not only in terms of ethnicity and gender, but also in terms of age, nationality, cultural background, etc. This diversity can affect classroom settings in many ways, including the diversity of learning styles. For example, older students who can draw from their life experience are more likely to be independent, ‘self-directed’ learners (Knowles, 1980). Despite the apparent tendencies, it is equally important not to pigeonhole students on the basis of expected learning styles since a vast range of individual differences is evident with any demographic group (Knowles, 1980).

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 (Sternberg, 1997). For example, in a typical fifty minute lecture class, students retain 70% of what is conveyed in the first 10 minutes but only 20% from the last 10 minutes (McKeachie, 1995). If the teachers (therefore) want to get the message across, they need to orchestrate the content and material in a multi-faceted way across the range of student learning styles.

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’s 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.

2.2.6 Learning Styles and Academic Achievement

There have been a number of researches conducted to show the relationship between learning style and academic success or achievement, and which show that matching teaching styles to learning styles can significantly enhance academic achievement of students at the primary and secondary level (Griggs & Dunn 1984; Smith & Renzulli 1984).

Dedicated teachers have made attempts to enhance their students’ academic achievements (Abidin et al., 2011) in many ways. One of these ways according to Abidin (2011) is to identify each student’s learning style to determine strengths for academic achievement. In a study of Castro and Peck (2005) on learning styles and learning difficulties of foreign language students, they claimed that the preferred learning style of the student can be a help or a hindrance in the success of the student in the foreign language classroom. Abidin et al. (2011) implied that the students in their study possessed multiple learning styles or a combination of different learning styles, thus, they are able to learn effectively. They indicated that learning styles make an impact on the students’ overall achievement. Dunn et al. (1995) argued that students who were taught by
an approach compatible with their learning style did better than those whose learning styles were not matched with the teaching methodologies.

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).
2.3 Theoretical and Conceptual Framework

The present study is embedded on the VAK [Visual (V), Auditory (A) or Kinesthetic (K)] theory originally developed by Neil Flemings (2001). Based on this theory, several scholars have developed learning style inventories which can be applied in research and classroom setup including Barsch, J. and which categorizes learners based on their sensory perceptions. One family of learning style models that has gained popularity recently has been those which have emphasized sensory modalities as a means of providing stimuli to the learner, known as VAK (Coffield, Moseley, Hall, & Ecclestone, 2004). This model comprises of three sub modes: Visual (V), Auditory (A) and Kinesthetic (K).

Presently, one of the most common modes of exchanging information in today’s modern society is speech, and it is attributed as auditory in the VAK model through the reception of this information by the ear. Other group of learners may show a preference for visual learning (V) a group, which ‘have not been particularly well covered by the methods of teaching in the high schools (Galasinski, 2000). Lastly, a group of learners within this model are the learners who prefer to experience their learning via multiple sense, including touch, hearing, smell, taste etc., which are described by the literature as kinesthetic learners (K) and as such, ‘want concrete, multisensory experiences in their learning (Fleming, 1995). According to Kolb, most language and creative students are mainly auditory (Kolb D. A., 1984).

The way learners receive information, based on the VAK theory, has been divided into three categories, sometimes referred to as modalities: visual—sights, pictures, diagrams, symbols; auditory—sounds, words; kinesthetic—taste, touch, and smell. An extensive body of research has established that most people learn most effectively with one of the three modalities and tend to miss or ignore information presented in either of the other two. There are thus visual,
auditory, and kinesthetic learners, although there are some learners who tend to use a combination of both visual and auditory senses and have been termed as tactile learners (Doyran, 2000). Visual learners remember best what they see: pictures, diagrams, flow charts, time lines, films, demonstrations. If something is simply said to them they will probably forget it, common occurrences in language teaching contexts. Auditory learners remember much of what they hear and more of what they hear and then say. They get a lot out of discussion, prefer verbal explanation to visual demonstration, and learn effectively by explaining things to others (Doyran, 2000).

Visual learners prefer to learn by reading books, seeing words, or looking at some teaching tools. They prefer to look at the written words on the blackboard than to only listen to the teacher. Therefore they like the teacher to write more than to talk more in classroom. The PowerPoint presentation is suitable to these learners because it presents words, and pictures or charts. This type of learners will feel comfortable when teacher use the translation-grammar teaching approach in language teaching. Auditory learners also referred to as verbal learners, prefer to learn by listening. For them, they may enjoy to have interactions with others by talking. They may dislike reading books. So in formal instruction settings, they would rather listen more than see more. A few teaching approaches may suit them, such as the oral approach, the situational approach, the audio-lingual approach, and communicative approach. Tactile learners and kinesthetic learners are similar (Doyran, 2000). The former prefer to learn by feeling or touching something with their hands while the later like movement. Learners of these two kinds will feel comfortable when teacher use the total physical response approach.

According to Sternberg (1997), learning will be more effective if it is tailored around the learning style approaches by the learners. The instructor/teacher should therefore establish the
learning style preference of his/her learners in order to design an effective instruction. Doyran (2000) puts this in the context of language [English] teaching, arguing that the English class should take into account the visual, auditory and kinesthetic learner by designing instructional methods that involve these modalities in a typical class. Only then, can we believe that each learner has been reached at his/her learning point of need.

Based on the VAK theory, instructors should ensure that activities are designed and carried out in ways that offer each learner the chance to engage in manner that suits them best. Since the students’ needs in a typical classroom are much diverse, the English teacher will have to employ different instructional methods which help each of the individual learners interact with the content in a manner that he/she understands it well. For example, the teacher should utilize lecture and recorded conversation methods to cater for the auditory learner; flip charts and PowerPoint presentations to meet the visual learner and writing/note taking and dramatization to meet the kinesthetic learner.

By doing this, the learners will be met at their point of learning: they will discover their preferred learning styles and strategies, strengths and weaknesses in learning contexts and leverage on those opportunities for better academic achievement and ultimately acquire life-long learning attitude.
Learner Diversity

**VISUAL LEARNER**
- Needs to see it to know it,
- Strong sense of color,
- May have artistic ability,
- Trouble following lectures,
- Misinterpretation of spoken words.

**AUDITORY LEARNER**
- Must hear it to know it,
- Difficult following written directions,
- Prefers listening to reading and writing,
- Inability to read body language and facial expression.

**KINESTHETIC LEARNER**
- Prefers hands-on learning,
- Difficulty sitting still,
- Learns better when physical activity is involved.

Best Practices

**DIVERSIFIED TEACHING METHODS**
Use visual aids: Flipcharts, Filmstrip, Flashcards, Demonstration and PowerPoint;
Use auditory aids: Lecture, Discussions, Tapes and Recordings;
Use kinesthetic aids: Taking notes, Dramatize, Use Scratch Papers, Experiment;

Outcomes

- Effective Learning
- Motivated Learners,
- High Academic Achievement
- Life-long Learners

Figure 1: Conceptual Framework
CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the researcher describes the procedures that were followed in conducting the study. The research involved quantitative data collection of students’ bio data, learning style preference and academic achievement. Description of the research design, target population, sample and sampling technique, research instruments and their validity and reliability aspects, data collection and analysis procedures is done. The limitations of the study are also outlined.

3.2 Research Design

Research design refers to the way a study is planned and conducted, the procedures and techniques employed to answer the research problem or question (McMillan & Schumacher, 1984). This study used a descriptive research design. In descriptive research design, data collection is carried out in a structured process. Kumar (2005) argues that the goal of descriptive research is to describe the characteristics of a selected phenomenon and involves the collection of data without manipulation of variables. The study was designed along the lines of a correlation research. Gay (1996) described correlation research as that involving the collection of data in order to determine whether and what degree a relationship exists between two or more quantifiable variables.

The study used purely quantitative method to gather data from the students. According to Hunter, Laura and Leahey (2008), the objective of quantitative method in research is to develop and employ mathematical models, theories and hypotheses on the phenomena. Quantitative data was gathered using self-administered semi-structured questionnaires among the students.
Further, content analysis was used to collect quantitative data on the students’ academic achievement in Mathematics, English, Biology and History tests. Average test scores were determined and used as the measure for academic achievement.

### 3.3 Study Population

According to Saravanel (1992), a population is an aggregate of all units possessing certain specified characteristics on which the sample seeks to draw inferences. In other words it is the totality or the universe of units from which samples of various sizes may be drawn (Saravanavel, 1992).

This study was conducted in four schools in Machakos County. The schools were selected based on their academic achievement and specifically 2014 KCSE and the consistency of achievement in the previous national examinations. The 4 schools were categorized into two: two-high performing schools (with mean score of 8-12) and four-low performing schools (with mean score of 0-4). The target high performing schools are Machakos Girls’ High School and Kathiani Boys’ High School while the low performing schools are Kitie Secondary and Gen. Mulinge Secondary School. The total population of the four schools was 613, consisting of both boys and girls. A correlation study needs a larger sample size since the estimate of the relationship is less likely to be biased if you have a high participation rate in a sample selected randomly from a population (Gupta, Dette, & Loh, 2014).

The table below summarizes the target schools, their populations and their performance in the 2014 KCSE.
Table 2: Target Schools and their Mean Scores in the 2014 KCSE

<table>
<thead>
<tr>
<th>School</th>
<th>KCSE 2014 Mean Score</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 School A</td>
<td>9.451</td>
<td>214</td>
</tr>
<tr>
<td>2 School B</td>
<td>8.138</td>
<td>178</td>
</tr>
<tr>
<td>3 School C</td>
<td>3.537</td>
<td>149</td>
</tr>
<tr>
<td>4 School D</td>
<td>3.556</td>
<td>72</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>613</strong></td>
</tr>
</tbody>
</table>

3.4 Sample and Sampling Technique

3.4.1 The Sample

According to Bulmer, M. G. (1979), a sample is a subset of subjects that is representative of the entire population and which must have sufficient size to warrant statistical analysis. Based on the total targeted population (613), the researcher sought to randomly select a sample population of 280 students in the four schools.

Depending on the total Form 3 student population per school, the researcher proportionately distributed the 280 sample population among the 4 schools.

Table 3: Target School Populations and Sample Sizes

<table>
<thead>
<tr>
<th>School</th>
<th>Population</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High Performers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 School A</td>
<td>214</td>
<td>76</td>
</tr>
<tr>
<td>2 School B</td>
<td>178</td>
<td>87</td>
</tr>
<tr>
<td><strong>Low Performers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 School C</td>
<td>149</td>
<td>79</td>
</tr>
<tr>
<td>4 School D</td>
<td>72</td>
<td>38</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>613</strong></td>
<td><strong>280</strong></td>
</tr>
</tbody>
</table>
3.4.2 Sampling Method

Kothari (1990) defines sampling as the selection of part of an aggregate or totality on the basis on which a judgment of inference about the aggregate or totality is made. It is the process of drawing samples that would be a representative of the population of the study. Its objective is to secure a sample which subject to limitations of size will produce the characteristics of the population as closely as possible (Kothari, 1990).

Simple random sampling was used to select boys and girls in Form 3 to participate in this study. The study specifically utilized a lottery method. Simple random sampling techniques give every subject within the target population a chance to be included in the study, and therefore the sample was representative and the findings generalizable.

3.5 Instrument for Data Collection

The Barsch’s Learning Style Inventory (BLSI) was used to identify the preferred learning style by the students, and whose permission was formally sought and granted online. BLSI is a simple and convenient set of 24 likert-scale questions which takes approximately 10-15 minutes to complete. The learning styles tested in this inventory are visual (V), auditory (A) and kinesthetic (K). There are 24 statements each of which has been assigned scores: 5 points for often true, 3 points for sometimes true and 1 point for seldom preferred. The students would select the description/statement that suit them and write the score of their selected items.

Content analysis guide was used to retrieve the Form 3 students’ academic achievement scores from the subject (Mathematics, English, Biology and History) teacher or class teacher’s records. Average scores were calculated and used as the academic achievement measure.
3.6 Validity and Reliability of the Instruments

The study put into account the validity and reliability of the research instruments and the results.

3.6.1 Validity

Validity is defined as the accuracy and meaningfulness of inferences, which are based on the research results (Mugenda & Mugenda, 2003). In other words, it is the degree to which a study tool measures what it purports to measure. A research instrument is valid if its content is relevant and appropriate to research objectives (Eshiwani, 2004).

To ascertain content validity of the research instrument the researcher consulted with the academic supervisor. The consultation was aimed at examining the contents and structure of the instruments and judged their adequacy for use in the present study. The resultant suggestions and recommendations were used to make appropriate amendments in to the instruments.

3.6.2 Reliability

The reliability of the questionnaire was determined by the author at 0.862. Reliability is a measure of the degree to which a research instrument yields consistent results or data the same way each time it is used under the same condition with the same subjects (Mugenda & Mugenda, 2003). Since the reliability of the students’ questionnaire was already determined, the researcher did not conduct a pretest.
3.7 Data Collection

3.7.1 Data Collection Preparation

The researcher carried out data collection after getting an introduction letter from the University of Nairobi, and clearance from the Machakos and Kathiani Sub-Counties where the schools were selected (See Appendices A, B and C).

3.7.2 Data Collection Procedures

Self-administered method was used where the students filled the BLSI which takes 5-10 minutes, in the class. Before the students started to fill in the questionnaire, the researcher gave detailed instructions and the students were allowed to ask questions in the process in case they did not understand something.

The respondents were assured that all the results of the study would be applied to research work only and their responses would have nothing to do with instructors’ evaluation of them. Further, and more importantly, the respondents were assured of their free-will in participating in the study: they could quit the participation any time. In the final analysis, only valid questionnaires were considered.

Using the score analysis table, the researcher captured the students’ scores in Mathematics, English, Biology and History for the End of Term 1 2015. The table was designed to ensure that the learners were distinguished by gender, their first name and the name of the school, and the results were distinguished by term. The researcher would either use the class teachers’ or the subject teachers’ records to analyze the scores.
3.8 Data Analysis and Presentation

The purpose of data analysis is to organize, provide structure to, and elicit meaning from research data (Eshiwani, 2004). The collected data will be entered, cleaned and analyzed using SPSS version 20.0.

Statistical treatment was integrated the computation of mean, percentage and frequencies to present the number of students with the different learning style preference and the level of academic achievement. Pearson Product Moment Correlation coefficient was calculated between learning style and the average academic scores to show whether a relationship exists and how strong or weak it is by gender. The difference in the relationships between male and female students was represented statistically.

Tables and charts were used to present data on the learning style preferences and academic achievement. A table summarizing the relationship between the two variables and by gender, together with the statistical values for the Pearson Moment Correlation coefficient was used.
CHAPTER FOUR

RESEARCH FINDINGS

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.

4.2 Students’ Profiles

The research findings presented here are based on a sample population of 273 that was achieved in this study. The targeted sample population of 280 was not achieved due to drop out of the respondents during the data collection process, thus achieving a response rate of 97.5%.

4.2.1 Gender of the Students

In terms of the gender of the respondents, Figure 2 shows that majority of the respondents are male 151 (55.3%) and the minority 122 (44.7%) are female. This is not surprising because the number of male students is greater than male students in Kenyan secondary schools.

Figure 2: Gender Profiles of the Students
4.2.2 Academic Achievement Levels of the Student Groups

The sample population was drawn from four secondary schools selected based on the schools’ achievements levels in the 2014 KCSE and by gender. Table 4 below shows that among the selected girls, 76 (62.3%) were high achievers as compared to 46 (37.7%) who were low achievers. Among the male students, 87 (57.6%) were high achievers as compared to 64 (42.4%) who were low achievers.

Table 4: Level of Academic Achievement by Gender

<table>
<thead>
<tr>
<th>Gender of the Student</th>
<th>Level of achievement Cross-tabulation</th>
<th>Count</th>
<th>% within Gender of the Student</th>
<th>% within Level of achievement</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>High Achievers</td>
<td>Low Achievers</td>
<td>Total</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>76</td>
<td>62.3%</td>
<td>46</td>
<td>122</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>87</td>
<td>57.6%</td>
<td>64</td>
<td>151</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>163</td>
<td>59.7%</td>
<td>110</td>
<td>273</td>
</tr>
</tbody>
</table>

In terms of the academic achievement levels, among the high achievers, 46.6% were females while 53.4% were males. Among the low achievers, 41.8% were girls while 58.2% were boys.
4.3 Objective One: Students’ Learning Style Preference

The respondents were asked to answer the statements listed in BLSI on their preferred learning style. The three learning styles were tested in BLSI include: Visual (V), Auditory (A) and Kinesthetic (K). A score of 21 and above in a given dimension would mean that the student prefers that particular learning style. However, for the purpose of this study, the mean scores of the learning style dimensions will not be emphasized because they show the strength of that modality and less information about the preference. Further, in this study, the students’ learning style preferences reported include: unimodal (one strong dimension), bimodal (two strong dimensions) and trimodal/multimodal (three strong dimensions).

4.3.1 Overall Students’ Learning Style Preferences

Table 5 below shows that the most preferred learning style by the students is the multimodal dimension (Visual/Auditory/Kinesthetic) with 39.6% which involves all the three modalities. In other words, majority of the students have strong visual, auditory and kinesthetic modalities.

Table 5: Overall Learning Style Preference among the Students

<table>
<thead>
<tr>
<th></th>
<th>Visual learner</th>
<th>Auditory Learner</th>
<th>Kinesthetic Learner</th>
<th>VA Learner</th>
<th>VK Learner</th>
<th>AK Learner</th>
<th>VAK Learner</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>29 (10.6%)</td>
<td>8 (2.8%)</td>
<td>2 (0.6%)</td>
<td>99 (36.3%)</td>
<td>19 (7.0%)</td>
<td>10 (3.7%)</td>
<td>108 (39.6%)</td>
</tr>
<tr>
<td>Mean</td>
<td>29.93</td>
<td>31.00</td>
<td>28.00</td>
<td>29.30</td>
<td>28.84</td>
<td>28.50</td>
<td>29.04</td>
</tr>
<tr>
<td>SD</td>
<td>3.525</td>
<td>5.345</td>
<td>2.828</td>
<td>2.439</td>
<td>2.478</td>
<td>3.171</td>
<td>2.148</td>
</tr>
<tr>
<td>Variance</td>
<td>12.424</td>
<td>28.571</td>
<td>8.000</td>
<td>5.948</td>
<td>6.140</td>
<td>10.056</td>
<td>4.615</td>
</tr>
<tr>
<td>Skewness</td>
<td>.603</td>
<td>.239</td>
<td>.367</td>
<td>.079</td>
<td>.470</td>
<td>.136</td>
<td></td>
</tr>
<tr>
<td>Kurtosis</td>
<td>-.312</td>
<td>-1.510</td>
<td>-.085</td>
<td>-.562</td>
<td>-.185</td>
<td>-.396</td>
<td></td>
</tr>
<tr>
<td>Sum</td>
<td>868</td>
<td>248</td>
<td>56</td>
<td>2901</td>
<td>548</td>
<td>285</td>
<td>3136</td>
</tr>
</tbody>
</table>

a. Multiple modes exist. The smallest value is shown
The trimodal learning style is followed by the Visual/Auditory (bimodal) with 99 (36.3%) of the respondents reporting their preference on the same and on third position is the single Visual dimension with 10.6% of the respondents reporting their preference on it. The least preferred learning style dimensions are the single Auditory and Kinesthetic learning styles which had 2.8% and 0.6% preference levels respectively.

### 4.3.2 Learning Style Preference by Students’ Gender

When examined through a gender perspective, there is no big difference in percentages of the students who prefer various learning styles. For example, some students prefer the trimodal (VAK) learning style (male=40.4% vs. female=38.5%), others prefer bimodal learning styles such as Visual/Auditory (male=33.1% vs. female=38.5%), Visual/Kinesthetic (male 8.6% vs. female 4.9%), Auditory/Kinesthetic (male 4.6% vs. male 2.5%); while others prefer unimodal learning styles such as Visual (male 10.6% vs. female 10.7%), Auditory (male 2.6% vs. female 3.3%) and kinesthetic which had a preference of 1.6% among the female students only.

**Table 6: Learning Style Preference by Gender**

<table>
<thead>
<tr>
<th>Descriptive Statistics&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Visual learner</td>
<td>29.88</td>
<td>3.686</td>
</tr>
<tr>
<td>Auditory Learner</td>
<td>29.00</td>
<td>4.761</td>
</tr>
<tr>
<td>Kinesthetic Learner</td>
<td>29.15</td>
<td>2.609</td>
</tr>
<tr>
<td>VAK Learner</td>
<td>27.86</td>
<td>3.338</td>
</tr>
</tbody>
</table>

<sup>a</sup> The least preferred learning style dimensions are the single Auditory and Kinesthetic learning styles which had 2.8% and 0.6% preference levels respectively.
Graphically presented, the learning styles between male and female students’ groups were as shown below:

![Figure 3: Learning Styles among Male and Female Students](image)

**4.3.3 Learning Style Preferences among High and Low Achievers**

Table 7 shows the results of the learning style preference analyzed based on the high achieving group of the students. Generally, there is no big difference of learning styles preference based on the academic achievement levels. Majority of the high achievers (40.5%) prefer trimodal (VAK) learning styles. Others are bimodal learners, for example, 34.4% are Visual/Auditory, 6.1% are Visual/Kinesthetic and 3.7% are Auditory/Kinesthetic learners. The rest are unimodal: 12.9% are Visual and 2.5% are Auditory. There is no kinesthetic learner among this group.
Similarly, among the low achievers, majority (39.1%) are Visual/Auditory followed closely by the trimodal (VAK) learners with 38.2%. Other bimodal learners include Visual/Kinesthetic (6.4%) and Auditory/Kinesthetic learners (3.6%). The rest are unimodal: Visual (7.2%), Auditory (3.6%) and the least being the kinesthetic learners (1.8%) among this group.

Graphically presented, the learning styles between the high and low achieving groups were as shown below:

<p>| Table 7: Learning Style Preference among High Achievers |
|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|</p>
<table>
<thead>
<tr>
<th></th>
<th>Visual learner</th>
<th>Auditory Learner</th>
<th>VA Learner</th>
<th>VK Learner</th>
<th>AK Learner</th>
<th>VAK Learner</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Valid</td>
<td>21 (12.9%)</td>
<td>4 (2.5%)</td>
<td>56 (34.4%)</td>
<td>10 (6.1%)</td>
<td>6 (3.7%)</td>
<td>66 (40.5%)</td>
</tr>
<tr>
<td>Mean</td>
<td>30.00</td>
<td>31.00</td>
<td>29.29</td>
<td>29.17</td>
<td>29.00</td>
<td>29.45</td>
</tr>
<tr>
<td>SD</td>
<td>4.000</td>
<td>6.218</td>
<td>2.333</td>
<td>2.552</td>
<td>4.050</td>
<td>2.164</td>
</tr>
<tr>
<td>Variance</td>
<td>16.000</td>
<td>38.667</td>
<td>5.444</td>
<td>6.515</td>
<td>16.400</td>
<td>4.683</td>
</tr>
<tr>
<td>Skewness</td>
<td>.497</td>
<td>0.000</td>
<td>.309</td>
<td>.329</td>
<td>0.000</td>
<td>.054</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>-.841</td>
<td>-2.433</td>
<td>-.229</td>
<td>-1.262</td>
<td>-1.664</td>
<td>-.257</td>
</tr>
<tr>
<td>Sum</td>
<td>630</td>
<td>124</td>
<td>1640</td>
<td>350</td>
<td>174</td>
<td>1944</td>
</tr>
</tbody>
</table>

| Statistics* (Level of achievement = Low Achievers) |
|---------------------------------------------------|---------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| N Valid                                           | 8 (7.2%)                                          | 4 (3.6%)                                        | 2 (1.8%)                                        | 43 (39.1%)                                      | 7 (6.4%)                                        | 42 (38.2%)                                      |
| Mean                                              | 29.75                                              | 31.00                                           | 28.00                                           | 29.33                                           | 28.29                                           | 27.75                                           |
| SD                                                | 1.982                                              | 5.292                                           | 2.828                                           | 2.598                                           | 2.430                                           | 1.258                                           |
| Variance                                          | 3.929                                              | 28.000                                          | 8.000                                           | 6.749                                           | 5.905                                           | 1.583                                           |
| Skewness                                          | 1.486                                              | .864                                            | .427                                            | -.659                                           | -1.129                                          | .156                                            |
| Kurtosis                                          | 2.973                                              | -.286                                           | .091                                            | .609                                            | 2.227                                           | -.689                                           |
| Sum                                               | 238                                                | 124                                             | 56                                              | 1261                                            | 198                                             | 111                                             |

Similarly among the low achievers, majority (39.1%) are Visual/Auditory followed closely by the trimodal (VAK) learners with 38.2%. Other bimodal learners include Visual/Kinesthetic (6.4%) and Auditory/Kinesthetic learners (3.6%). The rest are unimodal: Visual (7.2%), Auditory (3.6%) and the least being the kinesthetic learners (1.8%) among this group.

Graphically presented, the learning styles between the high and low achieving groups were as shown below:
4.4 Objective Two: Academic Achievement of the Students

In this study, the academic achievement aspect was established by determining the mean score of four subject areas: languages (English), Mathematics, sciences (Biology) and humanities (History and Government). In terms of distribution, the overall academic achievement scores are widely spread, indicated by the higher variance of 49.308 and the standard deviation (SD) of 7.022. The skewness value of -0.054 show that the distribution is approximately symmetrical (but not exact) while the kurtosis value of -0.069 show that the distribution is not flat and scores not highly distributed.
Table 8: Academic Achievement Statistics by Gender

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Valid</td>
<td>273</td>
<td>151</td>
<td>122</td>
</tr>
<tr>
<td>Mean</td>
<td>61.55</td>
<td>60.79</td>
<td>62.48</td>
</tr>
<tr>
<td>SD</td>
<td>7.022</td>
<td>7.119</td>
<td>6.814</td>
</tr>
<tr>
<td>Variance</td>
<td>49.308</td>
<td>50.684</td>
<td>46.433</td>
</tr>
<tr>
<td>Skewness</td>
<td>-.054</td>
<td>-.424</td>
<td>.505</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>.606</td>
<td>.626</td>
<td>.129</td>
</tr>
<tr>
<td>Sum</td>
<td>16802</td>
<td>9180</td>
<td>7622</td>
</tr>
</tbody>
</table>

### 4.4.1 Academic Achievement Scores by Gender

In terms of gender, the female students achieved higher with a mean of 62.48 (SD=6.814) compared to male students with the mean of 60.79 (SD=7.119). The male students’ scores are highly distributed as indicated by the relatively higher standard deviation of 7.119 compared to those of the female students.

The figure below shows the base of the curve ranging between 50 and 80. This indicates the distribution and concentration of scores.
The female students’ score distribution (SD=6.814) show that the gap between the highest achieving female student is not wide from the lowest performing female student, as it is the case with the male students’ scores. As Figure 6 below shows, the male students’ scores have a wider base ranging/concentrating between 40 and 80. This indicates that the female student
group is more homogenous compared to the male students.

![Male Students' Academic Achievement Scores](image)

**Figure 6: Male Students' Academic Achievement Scores Distribution Graph**

### 4.4.2 Academic Achievement Scores by Achievement Levels

The academic achievement scores were also analysed by the academic achievement levels of the students groups to establish if there exist any difference. When examined by the achievement levels of the students, the high achieving group of students scored higher (Mean=62.91, SD=7.406) compared to the low achieving group which had a mean score of 59.53 (SD=5.885).

Table 10 below summarizes the results.
Table 9: Academic Achievement Statistics by School Achievement Levels

<table>
<thead>
<tr>
<th>Statisticsa</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>110</td>
<td>163</td>
</tr>
<tr>
<td>Valid</td>
<td>59.53</td>
<td>62.91</td>
</tr>
<tr>
<td>Mean</td>
<td>5.885</td>
<td>7.406</td>
</tr>
<tr>
<td>Variance</td>
<td>34.637</td>
<td>54.850</td>
</tr>
<tr>
<td>Sum</td>
<td>6548</td>
<td>10254</td>
</tr>
</tbody>
</table>

Presented graphically the shapes of the curves and the width of the base would clearly show the difference in terms of the distribution of the achievement scores. As presented in the graph (Figure 3) below, the achievement scores for the low academic achievement group, the scores mainly concentrate between 45 and 70.

![Academic Achievement Scores among Low Achieving Group](image)

Figure 7: Academic Achievement Score Distribution Graph for Low Achievers
The scores for the high achieving group has a wider base (width) indicating a wider distribution of scores. This main describe the diversity of the group, in that we have relatively high achievers as well as low achievers in this group as compared to the low achievers.

### Academic Achievement Scores among High Achieving Group

<table>
<thead>
<tr>
<th>Frequency</th>
<th>25</th>
<th>20</th>
<th>15</th>
<th>10</th>
<th>5</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Achievement Scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 8: Academic Achievement Score Distribution Graph for High Achievers**

The graph above (Figure 4) shows that the scores are mainly concentrated between 50 and 80 indicating a greatly distributed set of scores indicated by the SD of 7.406.
4.5 Objective Three: Relationship between Learning Styles and Academic Achievement

In order to establish the relationship between learning styles and academic achievement of the students the Pearson Moment Correlation Coefficient was used. Table 11 below show that there is generally positive relationship between learning styles and academic achievement with varying strengths ranging from 0.246 and 0.777 and also the number of students in preference for a certain learning style.

**Table 10: Correlation Coefficients between Learning Styles and Academic Scores by Gender**

<table>
<thead>
<tr>
<th>Correlations*</th>
<th>Overall</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Visual learner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.396</td>
<td>.373</td>
<td>.509</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.033</td>
<td>.155</td>
<td>.076</td>
</tr>
<tr>
<td>N</td>
<td>29</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td><strong>Auditory Learner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.777</td>
<td>.917</td>
<td>.843</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.023</td>
<td>.083</td>
<td>.157</td>
</tr>
<tr>
<td>N</td>
<td>8</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><strong>Kinesthetic Learner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>1.000**</td>
<td>b</td>
<td>1.000**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>VA Learner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.246</td>
<td>.225</td>
<td>.267</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.014</td>
<td>.115</td>
<td>.064</td>
</tr>
<tr>
<td>N</td>
<td>99</td>
<td>50</td>
<td>49</td>
</tr>
<tr>
<td><strong>VK Learner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.666</td>
<td>.775**</td>
<td>.541</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.002</td>
<td>.002</td>
<td>.268</td>
</tr>
<tr>
<td>N</td>
<td>19</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td><strong>AK Learner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.462</td>
<td>.147</td>
<td>.895</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.178</td>
<td>.753</td>
<td>.294</td>
</tr>
<tr>
<td>N</td>
<td>10</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td><strong>VAK Learner</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.738</td>
<td>.754**</td>
<td>.743**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>108</td>
<td>61</td>
<td>47</td>
</tr>
</tbody>
</table>

b Too small to be computed
**. Correlation is significant at the 0.01 level (2-tailed).
According to the Table 11 above, a general positive relationship was reported among all the various learning style dimensions, except for the kinesthetic dimension which had a frequency of 2 and the correlation coefficient could not be computed due to the small size of the sample. The overall trimodal (VAK) coefficient of 0.738 (n=108) indicated a strong correlation which is also significant at 0.05. Further, the relationship for the trimodal for both male (r=0.754, n=61) and female (r=0.743, n=47) students was strong and significant at 0.01.

The other unimodal (V, A and K) and bimodal (VA, VK and AK) learning style dimensions had a positive relationship but which were not significant at 0.021 or 0.05 levels. For instance, the relationship for the V-learners was 0.396 (n=29); A-learners, 0.777 (n=8); VA-learners, 0.246 (n=99); VK-learners, 0.666 (n=19) and AK-learners 0.462 (n=10). This indicated positive relationships, but they were not significant. When examined from a gender perspective, the relationships for the unimodal and bimodal learning styles were not significantly different. The small samples for the various learning style categories may justify why the relationships are not significant at 0.01 or 0.05 levels.

When the data was disaggregated by the academic achievement levels (high and low), the relationship between learning styles and academic achievement was positive and varying from weak to strong relationships. Further, only the relationship among trimodal learners for both high (r=0.691; p<0.001; n=66) and low achievers (r=0.800; p<0.001; n=42) was significant, while the rest were not. The strongest relationship existed between the auditory learners and academic achievement, and among high (r=0.830; p>0.05; n=4) and low achievers (r=0.986; p>0.05; n=4), although the sample for the auditory learners was quite small and the relationship was not statistically significant.
Table 11: Correlations among High and Low Achievers

<table>
<thead>
<tr>
<th></th>
<th>High Achievers</th>
<th>Low Achievers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pearson Correlation</td>
<td>.496*</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.022</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>21</td>
</tr>
<tr>
<td><strong>Auditory Learner</strong></td>
<td>Pearson Correlation</td>
<td>.830</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.170</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>4</td>
</tr>
<tr>
<td><strong>Kinesthetic Learner</strong></td>
<td>Pearson Correlation</td>
<td>.</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>0</td>
</tr>
<tr>
<td><strong>Visual/Auditory Learner</strong></td>
<td>Pearson Correlation</td>
<td>.323*</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.015</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>56</td>
</tr>
<tr>
<td><strong>Visual/Kinesthetic Learner</strong></td>
<td>Pearson Correlation</td>
<td>.718*</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.008</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>12</td>
</tr>
<tr>
<td><strong>Auditory/Kinesthetic Learner</strong></td>
<td>Pearson Correlation</td>
<td>.585</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.223</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>6</td>
</tr>
<tr>
<td><strong>Visual/Auditory/Kinesthetic Learner</strong></td>
<td>Pearson Correlation</td>
<td>.691*</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>66</td>
</tr>
</tbody>
</table>

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
b. Cannot be computed because at least one of the variables is constant.

4.6 One-Way Analysis of Variance

A one-way analysis of variance (ANOVA) was conducted to investigate the existence of possible differences among learning style dimensions and the two academic achievement groups. To determine whether any of the differences between the means are statistically significant, a comparison between the p-value and the significance level was done to assess the null hypothesis. The null hypothesis states that the population means are all equal. The results of the analysis are displayed in Table 12 below.
According to the Table 12 above, the difference among high and low achievement groups is trivial with respect to the trimodal (VAK) learning style dimension \((F = 5.200, \text{df}=27, p<0.05\) level). The results also denote that there is not much difference in preference for this learning dimension among high and low achievement groups. The preference for both learning style dimensions among high and low achievement groups are the same. On a whole, the academic achievement groups have similar preference for all the three learning style dimensions.
4.7 Summary of the Research Findings

This correlation study between learning styles and academic achievement among high school students has shown the following key findings:

1. Several learning style preferences dimensions were identified in this study: trimodal learners prefer Visual/Auditory/Kinesthetic (VAK) dimensions; bimodal, those who prefer Visual/Auditory (VA), Visual/Kinesthetic (VK) and Auditory/Kinesthetic (AK); and unimodal, preferring single learning style dimension Visual (V), Auditory (A) and Kinesthetic (K).

2. Majority (39.6%) of the high school students are multimodal learners (having preferences for visual, auditory and kinesthetic learning style modals), followed by the bimodal learners preferring visual and auditory learning styles with (36.3%) and unimodal learners preferring only visual learning style dimension. The least preferred learning style is the single kinesthetic learning style dimension which had a preference of 0.6% among the high school students.

3. In terms of academic achievement, the data was disaggregated by both gender and academic achievement levels of the students groups. Among the male students, a mean academic achievement score of 60.79 (SD=7.119) was lower than the females’ 62.48 (SD=6.814). Based on the academic achievement groups, the low achievers scored low mean of 59.53 (SD=5.885) as compared to the high achieving group which had a mean of 62.91 (SD=7.406).

4. There is generally a correlation between the various learning styles and academic achievement scores, with the weakest correlation being 0.147 for the males’ AK dimension. A strong positive relationship between the trimodal (VAK) learning styles
and Mathematics achievement as demonstrated by the overall correlation coefficient of 0.738 (p<0.05), for male students (r=0.754, p<0.05) and female students (r=0.743, p<0.05). Due to the small number (2) for the kinesthetic learners, the correlation coefficient could not be computed.

5. The relationship among the trimodal (VAK) male and female learners is significant at 0.01 level. This means that the positive relationship may not have occurred by chance although the cause-effect relationship is not what the present study aimed to determine. The rest (unimodal such as V, A and K; and bimodal such as VA, VK and AK) were not significant at either 0.05 or 0.01 levels, and this can be explained by the small sample sizes for each modality.
CHAPTER FIVE

DISCUSSIONS, SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter involves a discussion based on the literature review and the outcome of the study findings in Chapter 4. Further, summary of the study, research gaps that highlight areas that need further research, recommendations and conclusion are also presented.

5.2 Discussion

5.2.1 Identify Learning Style Preferences among Students

The present study was aimed to establish the relationship between learning styles and academic achievement among high school students. The study findings generally indicate that the multiple-style learners (those with bimodal and trimodal learning styles) were the majority compared to those who preferred single learning style, e.g. visual, auditory and kinesthetic. Specifically, the kinesthetic learning style was the least preferred modal. This is consistent with the findings of Amran, et al (2011) who found out that kinesthetic learners were the least among their study population. However, the findings are contrary to what Vaishnav and Chirayu (2013) found in their study on learning styles and academic achievement where they found out that the kinesthetic learners were the majority. The difference may be explained by the cultural contexts, considering that these studies were conducted in different continents and countries. According to Felder (1995), the cultural environment of the student- to a large extent -dictate the way the student receives and processes information in a learning environment.

In particular, the study found that the trimodal learners (with the mixture of the three VAK modalities) were the majority. According to Phan (2008), this is not surprising and it
should be noted that in the general sense, all physically unimpaired students are multimodal, using all their senses to take in information at any given time. This preference for multimodal learning is in agreement with a study on secondary school students (Phan, 2008). These students prefer a mixture of the three learning style modalities (i.e. visual, auditory and kinesthetic). This finding matches the results of a study conducted by Laxman, Govil and Rani (2015) who also found that the trimodal learners were the majority in their classrooms. The rest of the unimodal (visual and auditory) and bimodal (VA, VK and AK) learning styles shared almost equal preference among the high and low achieving students and also between the male and female students. This is consistent with Thambusamy (2002) and Syed Jamal Abdul Nasir (2006) who also found that the learning styles were not significantly different between male and female students, and Abdin, et al. (2011) who found that there was no significant difference in learning style preference among high and low achieving groups of students.

The multimodal preference of the majority of male and female secondary school students contrasts, however, with previous study of secondary students. In their study Kharb, et al. (2013) observed that the male students had multimodal preferences, but female high school students preferred unimodal styles. It is possible that multimodal learners have stronger learning outcomes that give them a competitive edge in academics achievement over the unimodal learners. Although both males and females preferred multimodal learning to a similar degree, non-significant variations between the genders were revealed upon further classification based on the possible combinations of sensory modalities. Specifically, female styles may be more diverse, with more combinations represented in this population. Male styles were relatively more concentrated in a smaller subset, with 3 of the 7 possible combinations represented. However, the male had no representation in the kinaesthetic modality. This supports the findings of
Philibin (2001), who, with the use of the Kolb Learning Style Inventory, found that males identified with a small subset of learning styles, whereas females distributed more broadly across the learning style spectrum.

The tendency toward greater diversity among the female population, as shown by the study findings, extends to other educationally pertinent areas besides learning style. Female adolescents reported a preference for variety in the social context of their learning, including opportunities to work independently, in pairs, with peers, in larger groups, and with teachers (Hyland, 1993). Males did not express this preference. Additionally, Jorge (1990) found that while male students primarily preferred to use participatory resources to learn new information, female students preferred to have more variety in their educational resources. These observations are of special note due to the fact that the majority of the high school students in Kenya are male. Without conscious attention to varying presentation styles, the social context of learning, and the resources available to students, a predominantly male faculty may inadvertently aim its instruction at a subset of students.

5.2.2 Determine the Academic Achievement Levels of Students

This study revealed no percentage differences in students’ overall academic achievement. It showed that the female students tend to achieve relatively higher than their male counterparts. This finding is supported by Erton (2010) and Gokalp (2013) who found that the female students tend to record higher academic achievement compared to the males. The academic achievement among low and high achievers groups recorded a significant difference as the high achievers recorded high academic achievement mean score.
5.2.3 Determine the Relationship between Learning Styles and Academic Achievement, and by gender

The study findings on the relationship between learning styles and academic achievement of the secondary school students showed that there is a positive relationship between the two variables. Since there were seven (7) learning style dimensions, ranging from the unimodal to trimodal, the correlation was strong, consistent among the male and female students and also significant among the trimodal (VAK) learners. According to Dunn and Dunn (1986), multi-style learners tend to achieve more and score better than learners with one or two learning styles. As such, it is inferred that 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.

Most educational psychologists would agree that multiple learning styles can significantly enhance academic achievement (Felder, 1995). Dunn and Dunn (1986) state that in most cases, a successful learner learns in several different ways. However, students with naturally one or two learning styles can improve significantly when taught through other learning styles. This is particularly imperative in the present study since the unimodal (V, A and K) and bimodal (VA, VK, and AK) indicated a positive relationship between the two variables, but the relationship was not statistically significant. To this end therefore, it is essential for teachers to know the effective way of teaching. By this way, teachers can come close to providing optimal learning environment for most students in their classrooms (Felder, 1995). These facts reveal that each learning style has its own strengths and weaknesses. Some students learn in many ways, while others might only favour one or two. Those students with multiple learning styles tend to
gain more and obtain higher scores compared to those who rely solely on one style (Dunn, Beaudry and Klavas, 1989).

According to Peacock (2001), when instruction in an education setting is matched with the students' learning style preferences, students seem to achieve higher scores than when mismatched (Peacock, 2001). Miller (2008) found that both student examination scores and student's attitude toward learning scores were significantly higher when presentation was matched with student learning styles. Insight into the specific preferences of individual classes would help instructors tailor both their presentations and methods of assessment for each individual class. In addition, the present study suggests that females may have a broader range of learning preferences than males. Instructors need to be cognizant of these differences and broaden their range of presentation accordingly.

An opposing viewpoint that exists in the literature asks whether it is most advantageous to teach primarily using a mode that matches an individual's preferred learning style or whether a deliberate mismatch may actually produce stronger results for the learner. Grasha (2013) argued that an environment in which delivery of the material is matched to the learner's preferred style would eventually bore the student, causing the learner to disengage. A deliberate mismatch could prevent boredom and stretch an individual to grow and learn. This was supported by research that showed that even individuals with strong learning style preferences preferred a variety of teaching approaches to avoid boredom (Felder, 1995). Kelly and Tangney (2005) showed that students with "low levels of learning activity" actually learned more when presented first with their least preferred material and resources. It is important to note that the efficacy of mismatching as a primary strategy for improving student learning outcomes has not been shown
Mismatching is suggested as an occasional teaching strategy employed to stimulate interest, and not as an alternative or replacement for matching. In any case, whether the reasoning for using multiple styles of delivery is to match students' learning style preferences, or to offer a combination of preferred/mismatched styles to hold attention and stretch the student, an instructor who varies teaching approaches is more likely to meet student needs.

In most cases, a very successful learner learns in several different ways. On the whole, every student has certain degree of preferences in each type of learning style, and the majority of them have dominance in one or more styles of learning. Within the learning style dimension, the findings revealed that the subjects strongly preferred the physiology type which includes the visual, auditory and kinaesthetic elements. In terms of learning style element, out of seven selected learning styles, students selected three learning styles as major learning styles, beginning with the trimodal learners (who prefer the three modalities), followed by bimodal (visual/auditory) and visual learning styles. Moreover, it can be understood from the results that there is a similar preference for bimodal and trimodal learning styles among the students. As a result, we can infer that most students possessed multiple learning styles or a combination of different learning styles. As such, they are able to learn effectively.

Based on the findings of this study, it is clear that the utility of the VAK theory and tools as Fleming (2000) suggested, it is most appropriately used as a catalyst for reflection and discussion and students should use the information to adjust study habits to correspond to their individual learning strengths. Data suggests that merely being knowledgeable about learning styles can improve student learning outcomes. To that end, instructors could administer the VAK
questionnaire to students to raise students' awareness level of their preferred learning modality, to give students and instructors a common language for discussing learning, and to help empower students to adjust their learning behaviours to take advantage of their strengths and preferences. This type of knowledge may increase students' ability to actively cope with the rigorous academic demands of secondary school education in Kenya.

Teachers can also use the self-reported VAK results from each individual class to become aware of the distribution of information intake preferences among each class and to adjust their method of information delivery to correspond with these preferences. These adjustments would benefit both male and female learners. For example, the visual learners can be targeted by the presence of models and demonstrations (Kadir, 2013). Auditory learners can be reached through discussion during peer instruction, collaborative testing, debate, games, and answering questions (Gardner, 1999). Manipulating models and role playing can satisfy the kinaesthetic learners (Felder, 1995). Furthermore, researchers have reported an increase in students' achievement with the use of simulations and games, and students usually expressed positive feelings about the experiences (Bandura, 1987). Awareness of an individual class' learning preferences allows for effective and reflective teaching that will reach students learning via different modalities.

5.3 Summary

The present study reveals that majority of the students are trimodal learners: preferring the three learning dimensions (visual, auditory and kinaesthetic) in learning followed by the bimodal and lastly the unimodal learners. However, there is no gender differences in preferred methods of information delivery and suggests that the general student population is more diverse, encompassing a broader range of sensory modality preferences covering unimodal, bimodal and
trimodal styles. Instructors need to be cognizant of the student differences and broaden their range of presentation styles accordingly to be an effective educator.

It is now clear that although categorizing each person as a specific type of learner is easy, individual’s memory efficiency is not limited by sensory modality nor are people able to learn in the same way in all situations. Instead, most people are likely multimodal and multi-situational learners, changing learning strategies depending on the context of the to-be learned material. Thus, helping individuals learn effective memory strategies across all stimulus modalities and contexts, rather than only assessing learning type, may prove to be better for both the student and the education system.

According to the study findings, it is valid to argue that presenting material to students in multiple sensory modalities is undoubtedly beneficial to learning and interest (Morrison, Bryan, & Chilcoat, 2002). The present study supports these assertions by emphasizing the advantage of multimodal presentation which is attributable to individual learning styles and higher academic achievement. It has also been indicated that both low and average achievers earn higher scores on standardized achievement when they are taught within the realm of their learning styles. From the study, it is also noted that low achievers tend to have poor auditory memory. Although they often want to do well in school, their inability to remember information through lecture, discussion or reading causes their low achievement especially in traditional classroom environment where teachers dominate and students mostly listen or read. It is not only the low achievers learn differently from the high achievers, they also vary among themselves. This is crucial information for teachers which they can leverage on to improve the learning experiences of their students.
The present study findings show that there is a positive relationship between learning styles (all dimensions) and academic achievement and in all the male and female students. The relationship is however significant in the trimodal (VAK) dimension and between boys and girls. It is possible that multimodal learners have stronger learning outcomes that give them a competitive edge in academics achievement over the unimodal learners.

It is imperative to confirm that there are no significant differences in the relationship between learning styles and academic achievement between boys and girls. Although both males and females preferred multimodal learning to a similar degree, non-significant variations between the genders were revealed upon further classification based on the possible combinations of sensory modalities.

5.4 Areas of Further Research

Further, research need to be conducted to examine the relationship between teaching and learning styles and how both contribute and relate to academic performance.

According to Bloomer and Hodkinson (2000), learning styles are a minor factor determining how learners react to stimuli and that the effects of contextual, cultural and relational factors play a much larger role. More studies need to be conducted to examine the claim in the African, and particularly in the Kenyan context.

5.5 Conclusion

Today’s teacher knows that the ways in which students learn vary greatly. Individual students have particular strengths and weaknesses which can be built upon and enhanced through effective instruction. Project-based learning with technology is a powerful way to use students’ strengths to help them become better thinkers and more independent learners. Project tasks that
allow students to use their individual learning styles are not a direct path to higher-order thinking, however. It is possible to create products that reflect shallow and superficial thought. Nevertheless, the motivating factors associated with choice when individual learning styles are addressed in projects, suggest that teaching thinking skills in the context of individual learning styles increases the likelihood that students will learn them.

5.6 Recommendations

The present study yielded some important insights into learning style preferences among high school students and the following recommendations are made:

a. Teachers/instructors need to take into account their students’ diverse learning styles, design instructional methods that take care of those diversities and remain sensitive of such during the instruction process;

b. Teachers should also help their students to understand their learning style preferences and make use of such to develop life-long learners;

c. School administrators need to provide various learning materials which can bring diversity in the classroom by employing visual, auditory and kinesthetic materials such as use of technology and students project writing and presentation among other methods.
REFERENCES


APPENDIX A

INTRODUCTION LETTER FROM THE UNIVERSITY

UNIVERSITY OF NAIROBI
FACULTY OF ARTS
DEPARTMENT OF PSYCHOLOGY

June 23, 2015

TO WHOM IT MAY CONCERN

RE: MESHACK NZESEI MUTUA - E58/63596/2013

Mr. Mutua is a student in the Department of Psychology studying Master of Education Degree (Measurement and Evaluation) Programme at the University of Nairobi. He is doing a project on: *A Correlation Study between Learning Styles and Academic Achievements among High School Students*. The requirement of this course is that the student must conduct research project in the field and write a thesis.

In order to fulfill this requirement, I am introducing to you the above named student for you to kindly grant him permission to collect data for his M.Ed Degree project.

Thank you very much for accepting our students in your setting. If you have any questions, you may address them to Dr. Luke Odiemo, Chairman, and Department of Psychology.

Dr. Luke Odiemo
Chairman,
Department of Psychology
APPENDIX B

PERMISSION TO COLLECT DATA

MINISTRY OF EDUCATION SCIENCE AND TECHNOLOGY
Office of the Education Secretary, State Department of Education

Email: deokathiani@gmail.com

SUB-COUNTY EDUCATION OFFICE
P.O. BOX 5, 90105
KATHIANI

When replying please quote 06/07/2015

The Principals,
Ministry of Education Science & Technology,
Kathiani Sub-County

RE: AUTHORITY TO CONDUCT FIELD RESEARCH
MR. MESHACK NZESEI MUTUA- E58/63596/2013:

The above mentioned is a student at University of Nairobi. He has authority to conduct field research in our Secondary schools in the Sub- County on a correlation, study between Learning Styles and Academic Achievements among High School Students.

Kindly accord him the necessary assistance to enable him go through his Masters Degree.

Thank you.

MIRIAM J. KIEMA
SUB-COUNTY DIRECTOR OF EDUCATION
KATHIANI
MINISTRY OF EDUCATION SCIENCE AND TECHNOLOGY
State Department of Education

Telegrams: "SCHOOLING" Machakos
Telephone: Machakos (044) 21800
Fax: Machakos (044) 20646
Email – officemachakos@yahoo.com
When replying please quote
OUR REF: MKS/GA/90/A/91

SUB-COUNTY EDUCATION OFFICE,
P.O. BOX 28,
MACHAKOS.

3rd July, 2015

The Principals,
Ministry of Education Science & Technology,
Machakos Sub County

RE: AUTHORITY TO CONDUCT FIELD RESEARCH
MR. MESHACK NZEKI MUTUA – ES58/63596/2013

The above mentioned is a student at University of Nairobi. He has our authority to conduct field research in our secondary schools in the sub county on a correlation study between Learning Styles and Academic Achievements among High School Students.

Kindly accord him the necessary assistance to enable him go through his Masters Degree.

Yours faithfully,

BENSON KILUNDA
FOR: SUB COUNTY DIRECTOR OF EDUCATION
MACHAKOS COUNTY
APPENDIX C

STUDENTS’ QUESTIONNAIRE

Student Name_____________ Admission Number_____________ Date________

To better understand how you prefer to learn and process information, place a check in the appropriate space after each statement below, and then use the scoring directions at the bottom of the page to evaluate your responses. Use what you learn from your scores to better develop learning strategies that are best suited to your particular learning style.

This 24-item survey is not timed. Respond to each statement as honestly as possible.

1. I can remember best about a subject by listening to a lecture that includes information, explanations and discussions,
2. I prefer to see information written on a chalkboard and supplemented by visual aids and assigned readings
3. I like to write things down or take notes for a visual review,
4. I prefer to use posters, models or actual practice and other activities in class,
5. I require explanations of diagrams, graphs or visual directions,
6. I enjoy working with my hands or using tools,
7. I am skillful with and enjoy developing and making graphs and charts
8. I can tell if sounds match when presented with pairs of sounds
9. I can remember best by writing things down several times,
10. I can easily understand and follow directions on maps
11. I do best at academic subjects by listening to lectures and tapes
12. I play with coins or keys in my pocket
13. I learn to spell better by repeating the words out loud than by writing the words on paper
14. I can understand a news article better by reading it in the paper than by listening to radio
15. I chew gum, or snack while studying
16. I feel the best way to remember something is to picture it in your head
17. I learn the spelling of words by “finger spelling” them
18. I would rather listen to a good lecture or speech than read about the same material in a text book
19. I am good at working and solving jigsaw puzzles and mazes
20. I grip objects in my hands during learning periods
21. I prefer listening to the news on the radio rather than reading the newspaper
22. I prefer obtaining information about an interesting subject by reading about it
23. I feel very comfortable touching others, hugging, handshaking, etc.
24. I follow oral directions better than written ones.

1 The Barsch Learning Style Inventory was used in identifying students’ learning style preference. The permission to use the inventory was formally sought and the letter is appended.
APPENDIX D

DATA RECORDING TOOL

The academic achievement of the student was determined by calculating the mean score of four subjects namely English, Mathematics, Biology and History/Government. The test scores of the End of Term 1 examination were captured using the table below:

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APPENDIX E

PERMISSION TO USE THE BSLI INVENTORY

Performance Measurement Inc.
5482 Kingsway, Burnaby, Canada.
Tel: 601-440-8115
Fax: 601-440-8112
Email: info@performancemeasurement.com

17th June 2015

Dear Meshack Mutua,

RE: PERMISSION TO USE THE BSLI

Thank you for contacting PM Inc.

Your request was received and you are hereby permitted to use the BLSI in your Masters Degree project. We would also like to request you- if the university does not restrict- to share with us an overview of your findings once you are through with your research.

We wish you well as you continue exploring the dynamics of classroom teaching and learning.

Yours sincerely,

[Signature]

Smith Tomszewski