

**RELATIONSHIP BETWEEN SELECTED STUDENTS' BACKGROUND
CHARACTERISTICS AND ACADEMIC PERFORMANCE IN SECONDARY
SCHOOL BIOLOGY IN NANDI COUNTY, KENYA**

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Instruction) of Egerton University**

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DECLARATION AND RECOMMENDATION

This thesis is my original work and has not been submitted for the award of a degree or diploma in this or any other university.

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DEDICATION

This thesis is dedicated to my beloved parents: Henry and Josphine, my dear wife Ednah, my lovely children Abigael, Nephath, Walter and Carolyne and my siblings.

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ABSTRACT

The main purpose of this study was to investigate the relationship between selected students' background characteristics and academic performance in biology. A descriptive survey research design was adopted in the study. The target population included; 22 principals and 1288 form 4 biology students in public secondary schools in Nandi East Sub County. A sample of 12 principals and 296 students were selected using purposive and proportionate stratified random sampling respectively. Principals' Interview Schedule (PIS) and Students' Background Characteristics Questionnaire (SBCQ) were used as the main instruments for data collection. The reliability of the SBCQ was determined using Cronbach's alpha method with the help of SPSS. The instrument yielded a reliability coefficient of 0.82 and was deemed reliable. Interview schedule being mainly open ended was not tested for reliability. The data was analyzed using both qualitative and quantitative approaches. Quantitative approach technique was used to analyze the data collected from the SBCQ while, qualitative approach was used to analyze the data retrieved from the interview schedule at the 0.05 level using the chi-square test for independence. Data was presented in frequencies and percentages. The findings of the study were that: Students' attitudes towards biology and career preference were significantly related to performance in the subject; Parental socio-economic status and gender does not affect academic performance in biology. It was recommended that, students' attitudes towards biology should be enhanced through use of appropriate instructional methods and motivation to boost their performance in the subject and that, teachers to make students aware of biology related careers and benefits associated with them through vocational counseling as a way of enhancing their interest and performance in the subject. The Ministry of Education, school administrators and the local leaders need to come up with frequent community based forums that are specifically structured towards enhancing parental participation in their children's education. There is also need for policy formulation and implementation that encourage all learners to be treated equally irrespective of gender. Other factors such as availability of teaching/learning resources, motivation and school characteristics that enhance performance in biology should be strengthened so as to improve the students' achievement in the subject.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIDS:	Acquired Immune Deficiency Syndrome.
ASEI:	Activity, Student, Experimentation and Improvisation.
CDE:	County Director of Education.
GoK:	Government of Kenya
HIV:	Human Immune Virus
ICS:	International Council for Science
KCPE:	Kenya Certificate of Primary Education
KCSE:	Kenya Certificate of Secondary Education
KIE:	Kenya Institute of Education
KNBS:	Kenya National Bureau of Statistics
KNEC:	Kenya National Examinations Council
MoEST:	Ministry of Education Science and Technology
NACOSTI:	National Commission for Science, Technology and Innovation
OECD:	Organization for Economic Co-operation and Development
PDSI:	Plan, Do, See, Improve
SCDE	Sub County Director of Education
SES:	Socio-Economic Status.
SMASSE:	Strengthening of Mathematics and Science in Secondary Education.
SPSS:	Statistical Package for Social Sciences.
STEM:	Science Engineering Mathematics and Technology
STIs:	Sexually Transmitted Infections.
TIMSS:	Trends in International Mathematics and Science.
UNICEF:	United Nations International Children's Emergency Fund.
UNESCO:	United Nations Educational, Scientific and Cultural Organization.
USA:	United States of America.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Science education has, and will continue to have a significant influence on quality of life of mankind and sustainable development of the planet (United Nations International Children's Emergency Fund, [UNESCO], 2004). Science education is essential because it equips mankind with the knowledge and skills necessary to promote economic, scientific and technological development (Croxford, 2002). Science education also gives mankind knowledge and skills which enable him/her to make informed decisions on scientific and technological issues. The need for a scientifically literate populace is increasingly recognized as critical in many countries as they face the consequences of increasing population pressures, limited resources and environmental degradation (International Council for Science, [ICS], 2006). Basic science literacy, coupled with scientific ways of knowing namely; drawing conclusions based on observation, experiments and analysis provides citizens with tools needed for rational debate and sound decision-making based on scientific knowledge. Science education begins in pre-school as a diffuse, amorphous introduction of simple scientific concepts through informal but guided activities (Ochong, nd). At lower primary school level, the scientific concepts introduced during pre-school education are further explored in a less formal setting, organized and presented as units. The topics become more detailed in the upper primary and learners are given an indication of the discipline-based structure of the secondary school. In secondary schools, science education is structured as biology, chemistry and physics (Maina, 2015).

Biology is one of the science subjects offered in secondary and tertiary institutions. It is a natural science that deals with the living things: How the world is structured, its functions and what these functions are, how living things came into existence, and how they react to one another and with their environment (Umar, 2011). Biology has many divisions that include; zoology, botany, ecology, genetics, morphology, anatomy, physiology, histology, microbiology, biochemistry and evolution among others (Ahmed, 2008). Secondary school biology aims at equipping the learner with the knowledge, attitudes and skills necessary for controlling and preserving the environment (Kenya Institute of Education, [KIE], 2006). The subject enables the learner to appreciate humans as part of the broader community of living organisms. Contemporary issues such as Human Immune Virus (HIV), Acquired Immune

Deficiency Syndrome (AIDS), Sexually Transmitted Infections (STIs), drug abuse and environmental pollution which have an impact on the learner's life have been incorporated in the study. In accordance with secondary school science curriculum in Kenya, biology is compulsory in Form one and two but it is an optional subject in Form three and four. However, despite its importance, academic performance in secondary school biology in Kenya and in sub counties such as Nandi East has generally been unsatisfactory. For example, the Kenya Certificate of Secondary Education (KCSE) national mean scores for the years 2013 and 2014 were 32.20% and 33.60% respectively (Kenya National Examinations Council, [KNEC], 2015). Table 1 gives a summary of national; Nandi County and Nandi East sub county percentage mean scores for the years 2012 to 2018:

Table 1

National, Nandi County and Nandi East Sub County Biology Performance mean scores in percentage from 2012-2018

Percentage Mean Scores			
Year	National	County	Sub County
2012	26.21	25.75	22.16
2013	32.20	30.14	20.41
2014	33.60	31.02	21.72
2015	34.76	33.34	21.63
2016	29.19	27.20	20.67
2017	18.93	16.22	14.30
2018	19.23	18.37	13.15

Source: KNEC, KCSE Annual Reports 2013, 2014, 2015, 2016, 2017, 2018 and 2019.

Data on Table 1 show that the national mean scores were in the range of 18.93 to 34.76 percent, those of Nandi County ranged from 16.22 to 33.34 percent, while those of Nandi East Sub County were between 13.15 to 22.16 percent. It is evident that students' performance in biology as measured by the KCSE means scores was relatively low in the whole country. It is also evident that students' performance in the subject in Nandi county and Nandi East Sub County was very low.

There has been a public outcry and debate in the country over massive failure that has led to poor grades in performance of science subjects at KCSE and especially in biology and agriculture (Michira, 2017). According to Michira, one of the possible causes of this poor performance has been attributed to the change in the setting of questions which sharply shifted from discriminating the ability to a more analytic approach. Despite the shift in

examining the students, the preparation among the candidates had not changed; students are expected to apply the acquired knowledge, not just memorizing what they had been taught in class. He further reports that, feedbacks from teachers suggest a deliberate shift, which could be undermining the country's education process through unfair grading of candidates. Other possible causes for the poor outcome of performance could be due to teaching skills in preparation for examinations, disconnect between student abilities and the questions set, strict marking and inconsiderable grading. He concludes by noting that, the overall objective of an examination should never be to punish the candidates but to harness their capacities and know where to deploy them.

Many factors have been associated with secondary school students' academic performance in biology. Studies have shown that instructional leadership contributes significantly to students' achievement (Aaronson, Barrow & Sander, 2007; Musungu & Nasongo, 2008). According to Espania (2012), schools require good leaders to organize and supervise the teaching and learning process in order to ensure that learning outcomes are realized. Osuafor and Okonkwo (2013) linked academic performance in biology to availability of facilities, teaching methods and school characteristics such as class size and high teacher-student ratio according to a study conducted in Anambra State, Nigeria. A study conducted in Kenya in selected secondary schools in Nyakach by Owino, Osman and Yungungu (2014) established that there was positive and significant relationship between teacher characteristics and performance, teaching/learning resources and performance, motivation and performance in KCSE biology. Mwangi (2014) demonstrated that learner centred strategies such as Activity, Student, Experimentation and Improvisation (ASEI) and Plan, Do, See, Improve (PDSI) influenced students' biology performance in KCSE.

Students' achievement in the subject has also been associated with students' characteristics. Wabuke (2013) defines students' characteristics as personal attributes of the learner and/or circumstances in school, at home or his/her environment. According to Kithela (2016), students' characteristics include; gender, peers, school environment, physical, social and economic background. Students' characteristics have been associated with academic performance by several scholars. Ebele and Olofu (2017) established that there was significant relationship between students' study habits and their academic performance in biology. A study by Oigara (2011) revealed that school location affected students' achievement. The study showed that schools located in urban areas tend to perform better than those in rural settings. The type of school has also been linked with academic

performance. Owino, Osman and Yungungu (2014) noted that students in national and extra county schools in Kenya always outperform their counterparts in county and sub county schools. Other students' characteristics that have been associated with academic performance include their attitudes, career preference, parental socio-economic status, and gender (Juma, 2016; Kashu, 2014; Nasr, 2011).

Achievement in biology is a function of many interrelated variables which can be grouped as student factors, school factors and home factors (Langat, 2015). Attitude is regarded as one of the key students' factor when attempting to understand and explain students' achievement in biology (Nasr, 2011). Attitude is an opinion or general feeling about something (Encarta Dictionary, 2004). Muellerleile (2005) defined attitude as an approach, temperament, sensation or situation with regard to a person or thing. According to Owoeye and Agbaje (2016), attitude consists of three basic components namely; thinking, feeling and reacting. The thinking component involves self-belief. The feeling component involves issues relating to value, and the reacting component involves the tendency to behave in a certain way. Wabuke (2013) asserts that attitudes influence performance in a subject because it provides students with the drive to participate in the learning process. Owino, Yungungu, Osman and Ogolla (2015) assert that positive attitude improve academic performance because they motivate learners.

Career preference may be among students' characteristics that affect academic performance. Mettoh and Kitainge (2016) define career preference as the tendency of students to like subjects associated with certain careers. According to Hewitt (2010) students' career preference is affected by employment opportunities in that field, prestige, personal interest, parental guidance or family/peer influence. Reynolds (2012) asserts that career preference plays an important role in shaping students' attitudes towards a discipline. It also affects performance in subjects that are associated with the discipline. Aminu and Timothy (2014) demonstrated that students perform better in subjects related to their preferred career. They assert that lack of interest in a career affects students' interest and commitment to a course which in turn influence their academic performance.

Academic performance may also be affected by the socio-economic status of students' parents. According to Nadenge (2015), socio-economic status is a definite background variable that represents a feature of the social structure in the society. Socio-economic status includes features like education, occupation, income, religion, gender, environment in which

the child is brought up among others. Okemwa (2014) asserts that parents who are privileged educationally, socially and economically, promote a higher level of achievement in their offspring. This is in agreement with the findings of Zhang (2012) who examined students and their families' income in China. The study showed that children from low income families exhibited lower levels of cognitive-linguistic skills, lower verbal interactions and lower phonological awareness and generally lower academic performance than their counterparts from high and middle income families. Suman (2011) and Femi and Adewale (2012) noted that parental socio-economic status like education and occupation positively influence academic achievement of children.

Gender has also been cited as one of the student factors that may affect their academic performance. Gender is defined as a range of physical, biological, mental and behavioural characteristics pertaining to, and differentiating between the feminine and masculine population (Filgona & Sababa, 2017). Meredith (2014) considers it as a socially constructed concept that is taught to mankind from the moment one is born. Studies conducted in the past which link gender and academic performance has generated mixed results unlike the other characteristics of learners (Eddy, Brownell & Wenderoth, 2014; Chukwunyeremunwa, 2013). Amedu (2015) examined the effect of gender on achievement of students in biology in Nigeria using the Jigsaw Method. The study showed that there was a significant difference between the mean scores in favour of the males. Kashu's (2014) study revealed that in most, if not all cases, the boys perform better than girls in KCSE, more so in Mathematics and Sciences. Dania (2014) demonstrated that gender (male/female) had no significant effect on students' achievement in social studies. Kimamo and Muraya's (2014) study showed that gender had no significant influence on achievement in biology when cooperative learning approach is used.

Many factors have been cited to affect academic performance in the foregoing observations. It is possible that the poor performance in biology in Nandi East Sub County could have been due to students' characteristics. This study investigated the relationship between selected students' background characteristics namely; attitudes, career preference, parental socio-economic status and gender on academic performance in biology. Attitudes toward biology were selected because it affects students in everything they do, what they are and their behaviour (Getuno, Kiboss, Changeiywo & Ogola, 2015; Yushau, 2006). Odia and Ogiedu (2013) assert that positive attitudes enhance performance because they motivate students and

make them to work hard. The study focused on students' career preference because awareness of careers related to a subject affects students' motivation, attitudes towards it and performance. Parental socio-economic status was examined because it positively influences academic achievement (Suman, 2011; Femi & Adewale, 2012). The data was collected from principals because they are in charge of running of schools and interact a lot with staff, students and parents (Bakhda, 2006). Form 4 biology students provided the bulk of the data because they had been in high school for the longest period compared to other students and had been exposed to most of the secondary school biology curriculum.

1.2 Statement of the Problem

Poor performance in biology in Nandi County and especially in Nandi East Sub County has been associated with high level of indiscipline from students, lack of commitment from parents and teachers and inefficient administrators in secondary schools. In order to improve performance, much has been done to improve the level of discipline in many of these schools and at the same time the ministry of education and other stake holders has done much to put in place efficient administration. In spite of all these, student performance has not significantly improved. Therefore, it is important to establish other factors that are likely to influence students' academic performance in the sub county outside those that are perceived. Such factors may emanate from students' background characteristics. This study focused on the relationship between selected students' background characteristics and academic performance in secondary school biology in Nandi East Sub County in Nandi County. Such students' background characteristics may include attitudes towards the subject, career preference, parental socio-economic status and gender. This study sought to fill this gap by determining the relationship between the selected students' background characteristics and academic performance in secondary school biology in Nandi East Sub County in Nandi County, Kenya.

1.3 Purpose of the Study

The purpose of this study was to investigate the relationship between students' attitudes, career preference, parental socio-economic status and gender and academic performance in biology.

1.4 Objectives of the Study

The study was guided by the following research objectives:

- i) To determine the relationship between secondary school students' attitudes and academic performance in biology in Nandi East Sub County.
- ii) To establish the relationship between secondary school students' career preferences and academic performance in biology in Nandi East Sub County.
- iii) To determine the relationship between parental SES and students' academic performance in biology in Nandi East Sub County.
- iv) To establish the relationship between gender and academic performance in biology in Nandi East Sub County.

1.5 Research Hypotheses

The study tested the following research hypotheses:

- H₀1:** There is no statistically significant relationship between secondary school students' attitudes and academic performance in biology in Nandi East Sub County.
- H₀2:** There is no statistically significant relationship between secondary school students' career preferences and academic performance in biology in Nandi East Sub County.
- H₀3:** There is no statistically significant relationship between parental SES and students' academic performance in biology in Nandi East Sub County.
- H₀4:** There is no statistically significant relationship between gender and academic performance in biology in Nandi East Sub County.

1.6 Significance of the Study

The study may contribute to the advancement of knowledge about the influence of students' background characteristics on academic performance and particularly in biology among secondary school students. The findings of the study may give teachers an insight of the link between learner characteristics and performance in biology not only in Kenya but also in other parts of the world. It may also be beneficial to the Ministry of Education (MoE) in formulation of policies aimed at enhancing students' achievement in biology. This study may further assist teachers in helping students to develop positive attitudes towards learning of biology.

1.7 The Scope of the Study

This study was conducted in Nandi East Sub County, Kenya and it involved only public secondary schools since there are no private secondary schools in the sub county. The study

examined the relationship between students' attitudes, career preference, parental socio-economic status and gender, and academic performance in biology. A total of 12 principals and 296 Form Four biology students participated in the study. Data was collected using a principals' interview schedule and a students' characteristics questionnaire within a period of three weeks.

1.8 Limitations of the study

The main limitation of this study was accessibility to schools in the sub county due to poor terrain and means of transport as a result of the then prevailing rainy season during data collection. Secondly, the findings of the study require replication to demonstrate that they are not unique to the current study sample. Further, the researcher was limited by the variables included in the survey.

1.9 Assumptions of the study

This study was based on the assumptions that:

- i) The teachers within the study area had same competencies and were putting in equal/same effort in the curriculum implementation.
- ii) Biology syllabus coverage in Nandi East Sub-County schools was at par before the administration of the evaluation test.
- iii) Nandi East Sub County evaluation test was standardized to give valid and reliable results.

1.10 Definition of Terms

The key terms of the study have been defined and operationalized as follows:

Academic achievement: The feedback expected after learning. The mark awarded in the test is viewed as an achievement in the study. At KCSE, achievement is graded using grades A to E, where A is the best and E is the worst achievement grade (Maina, 2015). In this study, it refers to the percentage scores/grades achieved by students in biology evaluation test.

Academic performance: As used interchangeably with academic achievement is the extent to which a student, teacher or institution has achieved their short or long-term educational goals (Eze, 2009). In this study, it refers to the percentage scores achieved by students in biology evaluation test.

Attitude: A feeling or opinion about something or someone, or a way of behaving that is caused by this feeling (Encarta Dictionary, 2004). In this study, it refers to the students' score one gets in attitude test as measured using students' background characteristics questionnaire.

Career Preference: Predisposition in favour of a particular occupation or profession in life (Metto & Kitaiinge, 2016). In this study, it refers to a desire for a profession which leads to a student developing interest in subjects related with it.

Family Structure: The primary socializing agent which moulds the child in society (Michelle, 2012). In this study, it refers to people who may or may not include a husband or wife but composed of persons related to one another by blood, marriage or adoption and share a common residence.

Gender: A range of physical, biological, mental and behavioural characteristics pertaining to, and differentiating between the feminine and masculine population (Filgona & Sababa, 2017). In this study, it refers to a learner/student being a male or a female. Though it is not one of the students' background characteristics, it is discussed together with some of the selected students' characteristics.

Influence: The power to manipulate something or the ability to change the development of outcomes (Hewitt 2010). In this study, it refers to the effects of students' characteristics; attitudes, career preference, parental socio-economic status and gender on academic performance as measured by Nandi East evaluation test.

Socio-economic status: Position of a person in the society on the basis of social, economic or educational level (McMillan & Westor 2002). In this study, it refers to the position of the students' parents in the society with regard to education, income, housing, family size and employment.

Students' Background Characteristics: Attributes of individual learners who are enrolled in an educational institution (Stebbleton, 2007). In this study, it refers to features within students which included attitude, career preference and parental socio-economic status that affect their learning and academic achievements.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of related literature on the students' background characteristics and academic performance in biology. It reviews the following themes: academic performance in secondary school biology, students' attitudes, career preference, parental socio-economic status and gender on academic performance in biology. The last two sections of the chapter present the theoretical and conceptual frameworks of the study.

2.2 Academic Performance in Secondary School Biology

Academic performance of students at various levels of learning is always a concern to educators and scholars because it is one of the key indicators of an effective education system (Ndiewo, Raburu & Aloka, 2016). Academic performance is one of the measures of the extent to which a student, a teacher or institution have achieved the set educational goals (Bakari & Balarabe, 2013). It is used as an expression or representation of a student's scholastic standing. Academic performance of learners is often measured using scores obtained in assignments, continuous assessment tests and examinations (Levin, Wasanga & Somerset, 2011). Learners academic performance is also measured using scores attained in practical, project and research work (Ukwuije, 2012). The academic performance of learners in biology and other subjects is often expressed in percentages.

Biology is one of the core subjects in secondary school curricula of many nations as it is a prerequisite for admission to quality courses in tertiary institutions. Students' performance in secondary school biology in Kenya has generally been unsatisfactory as it ranges from average to poor (Arokoyu & Chimuanya, 2017). Blair-Walters and Soyibo (2004) examined the correlations among five variables and Jamaican high school students' performance in biology. The students obtained a mean score of 64% which was rated as fairly good. Elavogan and Ismail's (2014) study among form three students in Malaysia revealed that learners' performance in biology was average. They noted that students had challenges mastering topics such as cell division because they had misconceptions about mitosis and meiosis.

Ali, Toriman and Gasim (2014) study conducted among secondary schools in Kano State, Nigeria noted that students' achievement in biology was generally low. They attributed this to lack of qualified teachers, poor attendance of the lesson by the teachers, lack of or

insufficient library and laboratory facilities, inadequacy of computers in schools, and over enrolment of students. Lebata and Madau (2014) investigated secondary students' performance in biology in selected high schools in Lesotho. The study revealed that majority of students obtained less than 50% in the subject. Lebata and Madau attributed the low performance to teacher quality, medium of instruction, inadequate facilities, lengthy syllabus and methods of assessment. Study done by Maganga (2016) in Tanzania found out that students performed better in biology when taught in Kiswahili than in English because this would improve their participation and performance in the subject. Many learners could not master English as language of instruction, and they had very poor knowledge of vocabularies leading to poor performance in biology. Verspoor (2006) in a study in Uganda revealed that about 85% of secondary school graduates achieved below standard in biology. A candidate who scores below standard is regarded as showing poor academic performance in school.

Performance in secondary school biology is also generally low in Kenya. Mwirigi (2011) noted that performance in biology is low despite the key role the subject plays in industrialization and other sectors of the economy. Siringi (2010) observed that performance in KCSE biology has been consistently low over the years. Siringi argues that the low achievement in biology and other science subjects is a pointer that the country is not providing its citizens with quality education. Siringi further argues that unless this trend is reversed, Kenya may not attain her Vision 2030 goals which are driven by science and technology. Mwangi (2014) examined the influence of learner-centered strategies on students' biology performance in Kenya Certificate of Secondary Education in Kinangop Sub-County, Nyandarua County, Kenya. Mwangi noted that although learner-centered instructional strategies enhanced achievement, performance in biology in most schools was still low.

Secondary school biology aims at equipping learners with knowledge, skills and attitudes that are necessary for controlling and preserving the environment. It is also a foundation for careers such as health, agriculture, environment and education and is a precursor of biotechnology which is essential for industrial and technological development. Despite the importance of biology, performance in the subject in Nandi East Sub County has been poor over the recent years. The poor achievement in the subject has been of concern to education stakeholders as it denies secondary school graduates admission to quality courses in tertiary institutions and universities. Determining the cause of this poor performance was one of the motivations behind this study.

2.3 Students' Attitudes and Academic Performance

Biology is a natural science that deals with how living things came into existence and how they react to one another and with their environment (Umar, 2011). Biology is an important science subject because it is the bedrock upon which many science courses that are of great economic importance to nations like medicine, biochemistry, genetics and agriculture are based on (Aniaku, 2012). It is a prerequisite subject for many careers such as medicine, pharmacy, nursing, agriculture, forestry and biotechnology among others (Ahmed & Abimbola, 2011). Biology is one of the subjects offered in secondary schools and tertiary institutions.

Students' academic performance in secondary school biology has been associated with many factors. Onan (2012) established that teaching methods affect achievement in biology and that the inquiry teaching method enhances performance as it promotes students' interest in the subject. Gambari, Yaki, Gana and Ughovwa (2014) demonstrated that students taught using video based multimedia instruction performed better than their colleagues in the conventional teaching methods. Owino *et al* (2014) established that there was a positive and significant relationship between teacher characteristics, teaching/learning resources, students' motivation and academic performance in biology. Attitudes have also been cited as a determinant of academic performance in biology (Nasr & Ashgar, 2011).

Attitudes are defined as psychological orientations developed as a result of one's experiences (Mensah, Okyere & Kuranchie, 2013). They are beliefs, feelings and behavioural tendencies towards a person, an object or a process and are either positive or negative (Sanchal & Sharma, 2017). They influence one's views of situations, objects, people and how an individual respond to them. Attitude toward biology can therefore be considered as a disposition towards the subject, that has been acquired by a student through his or her beliefs and experiences but which can be changed (Eshun, 2004). Some authorities regard attitude towards biology as just a like or dislike for the subject, while others extend the meaning to embrace beliefs, ability, and its usefulness (Owoeye & Agbaje, 2016). Students' attitudes towards a subject are influenced by factors such as perceptions and beliefs, learning abilities and competence, and also previous performance and ranking of the subject in schools (Lang'at, 2015).

Several studies have associated students' attitudes towards biology with performance in the subject. Attitudes have been associated with performance because they affect students' level

of engagement, interest, personal effort without which one can hardly perform (Garden & Smith, 2001). Ramírez, (2005) investigated the students' attitudes towards mathematics and academic performance in Chile. The results indicated that students' attitudes were significant predictors of achievement in mathematics. Lindell and Davidson (2004) examined the relationship between final year medical students' attitudes to consultation skills and their academic results. They noted that the students' attitudes correlated significantly with academic performance. Omwirhiren and Anderson (2016) investigated the effects of class size and students attitudes on academic performance in chemistry of secondary students in Zaria State, Nigeria. The t-test results revealed that attitudes significantly affect students' achievement in the subject. Ballah and Okoronka (2015) examined the influence of attitudes on secondary school students' achievement in physics in Nigeria. They established that the relationship between the two constructs was positive and significant.

Manoah, Indoshi and Othuon (2011) examined the performance on attitudes on students' achievement in Mathematics in Kisumu East District in Kenya. The results of the regression analysis revealed that attitudes explained a significant variation in mean scores in mathematics. Wabuke's (2013) study found that majority (89.5%) of student and (92%) teacher respondents were of the opinion that attitude affects students' performance in biology. According to Owiti (2001), attitudes affect achievement because it influences learners' thoughts, feelings and how they react.

The foregoing review has shown that attitudes affect students' academic achievement in biology and other subjects. Positive attitude leads to greater achievement because it creates interest in the student. Although the literature review was on attitudes and academic achievement, most of them were not on biology neither were they conducted in Nandi East Sub County. The poor performance in biology in the sub county could perhaps be due to students' attitudes, filling this gap was one of the motivations behind this study.

2.4 Students' Career Preferences and Academic performance

Career preference has been cited by several scholars as one of the determinants that influence academic performance. Linderman (2010) has defined career preference as one's best alternative based on compatibility and accessibility at any one given time. According to Lerdpornkulrata, Koulb and Sujivorakul (nd) students' career preferences are influenced by family, peers, prestige, marketability, teachers, school and classroom environments, social values, socio-economic status and their experiences. Verma and Bakshi (2017) assert that

students perform well in subjects related to their preferred careers because they represent their aspirations and goals in life. As a result, students dedicate themselves to achieving these goals by attending classes where learning takes place.

Abaru (2016) investigated factors affecting career track and strand choices of grade 9 students in Antipolo and Rizal divisions, Philippines. The study noted that students tend to perform better in subjects that are related to their preferred careers. Abaru attributed the good performance to interest in the subjects related to the preferred careers and motivation to learn. Levett-Jones, Lathlean, Higgins and McMillan (2009) established that career preference affected academic performance of trainee nurses. They noted that the trainees who preferred nursing performed better because they were motivated and dedicated to the career. Aminu and Timothy (2014) examined career choice and academic performance of microbiology students in Ahmadu Bello University, Nigeria. They found out that there was a significant relationship between students' career preference and their academic performance in the subject. Mettoh and Kitainge (2016) examined the influence of career preference on academic performance and graduation of male students in universities in the western region of Kenya. They established that career preference positively influence students' academic performance. They noted that when students are forced to enroll in programmes or take subjects that are not related to their preferred careers, they perform poorly because they get demoralized, dissatisfied and frustrated.

Literature reveals that quite a number of studies on the relationship between students' career preference and academic performance have been conducted (Pendergrass, 2008). Scholars like Abiola (2012) have argued that career preference affects academic performance because it creates interest in learners and motivates them to study. Students in secondary schools are greatly influenced by the potential for career opportunities and advancement, therefore, the more valuable a subject is to a future career, the greater the likelihood a student will perform well in it. Students have their own perceptions of the values attached to the specific subjects that they would wish to undertake. A series of factors play an important role on the value associated with the subject, these can include the suitability in the job market and career preference. This notwithstanding, there appears to be no specific study that has examined the influence of career preference on secondary school students' academic performance in biology in Nandi East Sub County, hence filling this gap was among the intentions of this study.

2.5 Parental Socio-Economic Status and Students' Academic Performance

It has been observed that parental socio-economic status influences students' academic performance (Udida, Ukway & Ogodu, 2012). Socio-economic background or status has been defined as person's position in a given group, society or culture as determined by wealth, occupation, education and social class (Onyanha, Njoroge and Mukolwe, 2015). It is concerned with one's level of education, occupation, income, housing, family structure and possessions. Socio-economic status is a sociological classification indicating the close relationship between someone's relative wealth and that person's social status. It is also regarded as an economic and sociological combined total measure of a person's work experience and an individual's or family's income and social position in relation to others, based on income, education and occupation, (Kraus, 2008). Amutabi (2003) argues that socio-economic status affects academic performance because social and economic classes, ethnicity, dictate neighborhood, housing and access to resources affect enrichment or deprivation as well as the acquisition of specific value systems.

Usman, Mukhtar and Auwal's (2016) study conducted in Nigeria demonstrated that parents' socio-economic status influences students' academic performance. The study attributed the higher academic performance to parental interest and active involvement in their children's education, provision of learning materials, family size, family income and social stratification. Abdu-Raheem (2015) examined the parents' socio-economic status as predictor of secondary school students' academic performance in Ekiti State, Nigeria. The study confirmed that parents' socio-economic status was a significant predictor of secondary school students' academic performance. Onyanha, Njoroge and Mukolwe (2015) examined the influence of parents' socio-economic status on students' academic performance in public secondary schools in Keumbu Division, Kisii County, Kenya. The study established that socio-economic status plays a significant role in influencing students' academic performance. They concluded that the lower the parents' socio-economic status, the lower the students average grade and aggregate points in performance. Conversely, the higher the students' parents socio-economic status, the higher the academic performance of the students.

2.5.1 Economic Background and Students' Academic Performance

Parental economic status has been identified as a cogent factor that positively impacts on the academic and vocational success of students (Ogunshola & Adewale, 2012)). Economic status is usually measured by income as it is relatively easy to compute. Income has been defined as all the benefits and gains due to a person from his/her investments, inheritance and

employment expressed in monetary terms (Osonwa, Adejobi, Iyam & Osonwa, 2013). Income refers to wages, salaries, profits, rents, and any flow of earnings received. Income can also come in the form of employment or worker's compensation, social security, pensions, interests or dividends, royalties, trusts, alimony, or other governmental, public, or family financial assistance. Parental economic status affects academic performance because low income families focus on meeting immediate needs and have very little time and resources to invest in their children's education (Altschul, 2011). Families with higher and expendable income on the other hand can meet their immediate needs and also provide for their children's learning needs.

Several studies have shown that parental income is one of the key determinants of academic performance. Zhang (2012) investigated pupils reading skills, verbal interaction and phonological awareness in relation to their families' income in China. The results showed that children from families with low incomes exhibited lower levels of cognitive-linguistic skills, verbal interactions and phonological awareness than their counterparts from high and middle income families.

Sean (2013) study conducted in the United States of America demonstrated that family economic status affects performance. Sean posited that the impact of the parents' income can be shown in the early timing of the students' learning. The study maintained that parents of higher income take their children to school earlier than their lower income counterparts. They can afford to take their children through pre-school learning and this has a great impact in their later educational outcomes since it provides them with the required cognitive and social development. Juma (2016) investigated the influence of parental socio-economic status on students' academic performance in public secondary schools in Tana River County, Kenya. The study revealed that the relationship between parental income and academic performance was positive and significant. This implies that parents' income influences students' academic performance. These studies have demonstrated that parental income affects students' performance. Even though the studies link parental income and academic performance, they are not on biology and neither were they conducted among secondary schools in Nandi East Sub County. This study intended to fill this gap by examining the link between students' parental socio-economic status and academic performance in biology in Nandi East Sub County.

2.5.2 Parents' Education Level and Students' Academic Performance

Children spend most of their time at home and the type of environment affects them in their development (Kainuwa & Yusuf, 2013). The home environment not only affects the children's behaviour, but also their character and cognitive development. The people whom the children interact with at home such as parents and siblings also play a key role in their cognitive development. Literature shows that the level of education which parents have achieved affect children's cognitive development as literate parents have the ability to instill knowledge acquired to their children (Khajehpour & Ghazvini, 2011). The educational background of parents basically means the highest level which he/she has attained (Shapiro, 2009). Research has shown that children of educated parents are more confident, resourceful and experienced than the children whose parents have no formal education (Azhar, Nadeem, Naz, Perveen & Sameen, 2014). Parents, who are better educated, tend to communicate better with their children when compared to parents who are less educated. Educated parents interact with the children at home by way of reading, conversing and directly teaching them social skills. All these help to improve the knowledge base of the children and also their performance in school.

Parents' level of education is important to schooling as parents want their children to maintain the status quo (Mallam, 2009). It is also believed that parents with higher educational levels have stronger confidence in their children's academic abilities and they also have higher expectations of their children. They expect that their children will earn good grades, behave well in school and attend college. These expectations and confidence in their children motivate them to do well in school. Khan, Iqbal and Tasneem (2015) conducted a study among secondary school students in India. They established that parental education level was the best predictor of student academic achievement. They noted that educated parents help to improve education attainment of their children. They observed this by monitoring their children's school attendance, enquiring about the teaching methods used by teachers, assisting them with their homework, and arranging tuition classes for them.

Singh, Horo and Singh (2016) examined the effects of parental level of education on students' performance in mathematics in India. The chi-square test indicated that there was a significant relationship between parental education level and academic performance of students. Rana (2015) carried out a study on the relationship between the parents' level of education and academic performance of their children in South Punjab town, Pakistan. The

results showed that there was a significant positive relationship between parents' level of education and students' academic performance.

Juma, Simatwa and Ayodo (2012) in their study in Kisumu East found that parental level of education affects academic achievement of girls and that, the way the parents perceive their daughter's capabilities would motivate the girl child to do better in school. The results of a study conducted in Kiamokama Division of Kisii County, Kenya by Okemwa (2014) concur with those in Juma, Simatwa and Ayodo's study. Okemwa noted that there was a significant relationship between the education level of fathers and the academic performance of pupils in the study area. The study also noted that the relationship between the mothers' education and pupils' academic performance was significant. Juma (2016) conducted a study on influence of parental socio-economic status on students' academic performance in public secondary schools in Tana River County, Kenya. The simple regression test was used to determine the association between the constructs. The results of the test revealed that, the relationship between parents' level of education and students' performance was positive and significant.

2.5.3 Parents' Occupation and Students' Academic Performance

Employment or being in an occupation to many people means economic security through earning and access to financial resources (Hussan, 2008). It has been established that parental occupation has significant effect on the welfare of their children. According to Ogunshola and Adewale (2012), an occupation provides parents with an income and ability to fund their children's education. Abdu-Raheem (2015) concurs with Ogunshola and Adewale by asserting that parents of low occupational status are always not in a position of assisting their children in school work due to finances and time constraints

Memo, Muhammad and Muhammad (2010) examined the impact of socio-economic status on students' educational achievement at secondary schools in Malir District, Karachi, India. They found that there was significant relationship between parents' occupation and students' academic performance in matriculation examination. They observed that students whose fathers had better occupations performed well in matriculation examination than students whose fathers had a less prestigious occupation. They noted that parents in high occupations are in better positions to assist and encourage their children towards educational attainment.

Saifi and Mehmood (2011) conducted a research on the effect of parental socio-economic status on students' academic performance. The study showed that parental occupation was a significant determinant of academic performance. Saifi and Mehmood noted that employment

had a significant effect on the welfare of their children because it is a source of income which was essential for meeting the child's educational needs. The study further noted that possession of a job reduces the time available for parents to spend with their children and to involve themselves in their life at school. Parents therefore need to strike a balance that optimizes their time use.

Usaini and Abubakar (2015) investigated the impact of parents' occupation on academic performance of secondary school students in Kuala Terengganu, Malaysia. Data was analyzed using regression analysis. The result of the study indicated that students of parents in formal employment performed better than those of parents in informal employment. Usaini and Abubakar concluded that whenever parents possess the resources and skills, they apply them efficiently and joyfully for upbringing of their children.

Muola (2010) found a significant correlation between parental occupation and academic achievement of pupils in Machakos District, Kenya. Children raised by parents who hold professional jobs grow up to be more inquisitive and active in their learning when compared to children of parents who are not working. Nadenge (2015) examined the relationship between parental socio-economic status and student academic achievement: The case of selected secondary schools in urban informal settlements in Westlands Division, Nairobi County. The study found out that parents' occupation affected their children's academic performance both positively and negatively. The study noted that occupation determined whether parents have enough time with their children and get involved in their learning or being able to pay fees and provide for their needs. The results of Nadenge's study are in agreement with those of Muola.

As can be noted from the foregoing discussion, socio-economic status is a term used to refer to the social stratification that an individual may belong to in the society. This can be high, medium or low socio-economic status. These groupings do affect students' achievement depending on one's class. Continued inequalities in society perpetuate social inequality which eventually leads to low achievement among students in school. As a result of this, the education, occupation and income levels tend to have an impact on the performance of learners which can be positive or negative depending on the social class of the students' parents. In regard to this, a student from high socioeconomic backgrounds tends to achieve highly in school when compared with children from low socio-economic status. The present

study aimed at establishing whether this is the case in Nandi East Sub County, more so in the performance of secondary school students' biology.

2.5.4 Family Structure and Students' Academic performance

Family setting and structure play a crucial role in a student's academic performance as it is the primary socializing agent which moulds the child in society (Michelle, 2012). There is usually confusion about what is meant by family as it refers to people from a social class and culture who share common values and norms. However, there is consensus that the smallest unit of the family known as "conjugal family" must include a husband and wife (Mozhgan, & Mohammadreza, 2011). A nuclear family may or may not include a husband or wife but is composed of any two or more persons related to one another by blood, marriage or adoption and share a common residence (Billings, 2012). Families differ in structure, they may be polygamous or single parent depending on the number of members in them (United Nations International Children's Emergency Fund [UNICEF], 2011). Family structure and setting have significant influence on a student's academic achievement as it affects his/her interest in school and aspirations for the future.

Suleman, Hussain, Khan and Nisa (2012) carried out a study on effects of family structure on the academic achievement of students at elementary level in Karak District, Pakistan. The study established that large family size; large number of brothers and sisters; domestic issues and tension among the family members; low socio-economic status, lack of parent's participation affects student's educational attainment negatively. Olaitan (2017) investigated the impact of family structure on the academic performance of secondary school students in Yewa local government area of Ogun state, Nigeria. The study showed that the mean score of children from two parent families was higher and significantly different to the mean of those from single parent families. This was an indication that family structure affects students' academic performance. Olaitan attributes this to the tendency of stable families to support their children's education.

Uwaifo (2012) examined the effects of family structures on the academic performance of students in a Nigerian university. The results showed that significant differences existed between the academic performance of students from single-parent families and those from two-parent family structures. The results also indicated significant differences in academic performance of male and female students compared on two types of family structures. The study concluded that two parent families enhanced academic performance. Nato (2016)

conducted an analysis of family structure influence on academic performance among secondary school students in Bungoma East Sub-County, Kenya. The study revealed that nuclear family background positively influenced academic performance of students and it significantly accounted for 16.7% variance in student performance. However, single parent family background negatively affected academic performance of students and it significantly explained the 1.6% variance in students' performance.

The foregoing studies have demonstrated that family structure influences students' academic performance. The focus of the studies however, were not on biology, neither were they conducted among public secondary schools in Nandi East sub county. Filling of this gap was one of the motivations behind this study.

2.6 Students' Gender and Academic Performance

Gender has been associated with students' academic performance by several scholars especially in science subjects (Amedu, 2015; Kashu, 2014; Jack & Johannes, 2001). The importance of examining performance in relation to gender is based primarily on the socio-cultural differences between boys and girls. Some vocations and professions have been regarded as men's. For example, parents assign tasks like car washing, grass cutting, bulb fixing, and climbing ladders to fix roof tops to the boys. On the other hand, chores like washing dishes, cooking; cleaning and so on is assigned to the girls (Mustafa, Khan & Ullah, 2011).

Several studies that link gender and academic achievement have been conducted. These studies have generally generated mixed results. Onsomu, Kosimbei and Ngware (2005) noted that, in most developing countries gender differences in education appear in terms of participation, internal efficiency and in cognitive performance. An analysis of the Trends in International Mathematics and Science (TIMSS) conducted by OECD (2009) of which Kenya was not included, revealed that at the secondary school level, girls had higher mean scores than boys in both mathematics and science. The study also revealed that graduation rates of the girls were higher. A study conducted by Eddy, Brownell and Wenderoth (2014) among university students revealed that females consistently underperform on introductory biology. Owoeye and Agbaje (2016) established that relationship between students' gender and academic performance in biology was not statistically significant. These findings support those of Chukwunyeremunwa (2013) that showed that the interaction between gender and students' mean scores in biology was not statistically significant. The results are in line with

those of Muraya and Kimamo's (2011) study conducted in Machakos District, Kenya which revealed that gender had no significant effect on achievement in biology.

Studies conducted on gender are not explicit on its effects on achievement (Ma, 2011). Nwona and Akogum (2013) noted that there is gender imbalance against women in science, technology and mathematics as they are perceived as masculine subjects. A study conducted in Nigeria by Chukwunyeremunwa (2013) established that performance of boys in biology was comparable to that of girls. Kashu (2015) conducted a study that compared academic performance between boys and girls in KCSE examination across a period of five years (2007-2011). The study revealed that the performance of boys was higher than that of the girls, more so in mathematics and sciences. The literature reviewed so far points to the fact that, there still exist differences in academic performance between boys and girls. The research reports are conflicting; in addition, none of them were conducted among secondary school students in Nandi East Sub County. Filling these gaps was among the rationale behind this study.

2.7 Theoretical framework

This study was guided by the theory of educational productivity developed by Walberg in 1981. In education, productivity is often taken to mean inputs and processes of schooling in ways that increase desired outcomes. The most common measures of outcomes have been students' academic achievement while they are in school often measured by scores on standardized tests. Walberg's (1981) theory of educational productivity includes nine factors hypothesized to the learner's cognitive outcomes. These nine factors include (a) ability or prior achievement, (b) age, (c) motivation or self-concept, (d) quantity of instruction, (e) quality of the instructional experience, (f) the home environment, (g) the classroom or school environment (h) the peer group environment, and (i) the mass media (DiPerna, Volpe & Elliot, 2002). The first three variables in Walberg's model (ability, age and motivation) can each be seen as internal traits to the learner. Ability or prior achievement includes factors that can be measured by standardized test, age variable includes chronological age but also developmental and stage of maturation (Keith, 2002). Motivation or self-concept is operationalized as scores on personality tests of the student's willingness to persevere intensively on learning tasks

The next two variables, quantity of instruction and quality of the instructional experience, examine instructional factors. Quantity of instruction is described as the amount of time

students engage in learning, including the time scheduled, allowed, or assigned for a given instructional unit by the teacher as well as the fraction of this time the student actually spends learning the content. Walberg measured the quantity of instruction through reports of weekly homework and class attendance. In addition, this variable has been measured through effective use of class time, interruptions during class, and teachers' ability to gain students' attention quickly. Others have measured quantity of instruction as time on mathematics homework in school and outside of school (Ma & Wang, 2001). The final variables: home environment, classroom or school environment, peer group environment, and mass media are characterized as environmental factors. Home environment refers to the support given to students while at home. It has been measured in various ways, including family interest in school and in science, parental education, number of times the dictionary is used at home, and home socio-economic status.

Classroom and school environment, including classroom morale refers to the classroom as a social atmosphere and has been measured through access to classroom materials (Keith, 2002). Others have measured classroom and school environment through student reports of feeling put-down by the teacher or by other students in the classroom (Walberg, 1981). Peer group experience refers to how well students get along with each other outside of the school environment. Measures have included how important schooling and grades are among friends, peers seeing themselves as good students, planning on attending college, and doing well in science (Ma & Wang, 2001). The mass media variable refers to the minimum leisure-time television viewing, and the reading of books or magazines. Walberg and his colleagues have tested this model in a national sample of high school seniors and found the included variables to be good predictors of learner achievement across gender and race.

This study is concerned with educational productivity and how this affects students' academic performance in school. Walberg's theory expounds clearly this by showing how learners' characteristics are linked to academic performance. It is due to the differences in learners' backgrounds characteristics that make various students from varied backgrounds to vary greatly in academic achievement while in school. In regard to the foregoing, the theory fits well into this study.

2.8 Conceptual framework

The study was based on the premise that students' academic performance in biology depends on their background characteristics. The interaction between the study variables is illustrated

on the conceptual framework. A conceptual framework is a diagrammatic representation of variables that shows the relationships among them (Orodho, 2009).

The relationship among the variables is depicted in Figure 1.

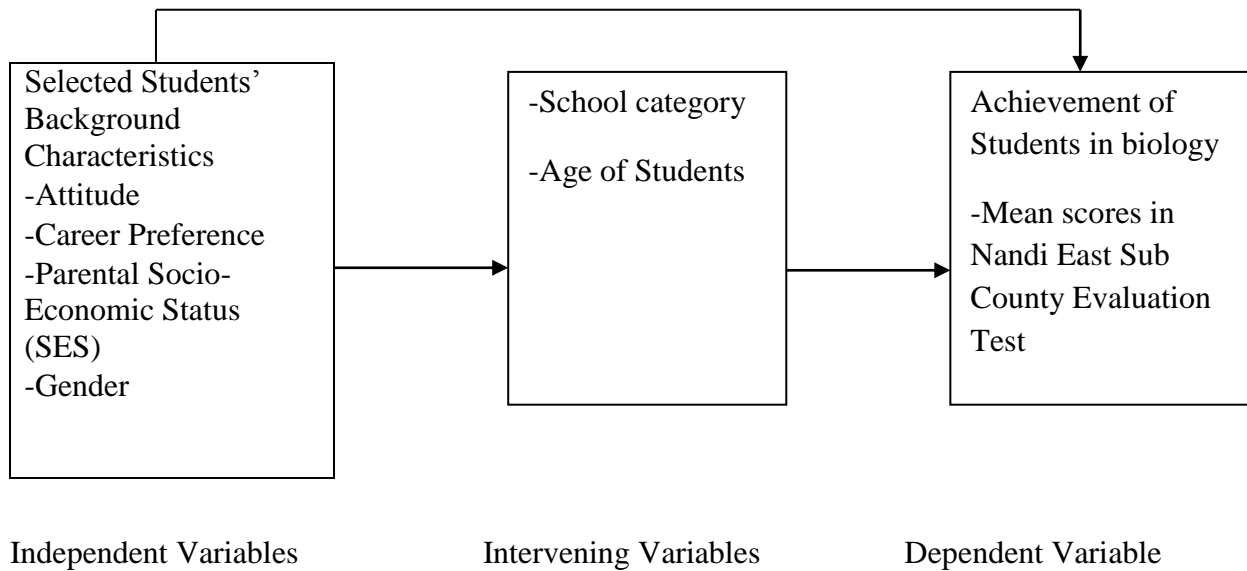


Figure 1 : Conceptual framework showing relationship among variables

In the conceptual framework shown in fig.1, students' background characteristics are depicted to affect the academic performance of students. Students' background characteristics are defined in terms of independent variables: students' attitudes, career preferences, parental socio-economic status and students' gender. The framework clearly indicates that students' academic performance (dependent variable) is influenced by students' attitudes, career preferences, parental socio-economic status and students' gender. Between the independent and dependent variables are the intervening variables expressed in terms of school category and students' age. The effect of intervening variables on the outcome was minimized through sampling. The county and sub county secondary schools that had biology laboratories with most of the basic facilities for teaching-learning the subject were involved in the study thus minimizing the effects of school category. In addition age factor was controlled by involving only form four students who are relatively of the same age because of secondary school admission policy.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives a description of research methodology that was used in the study. The themes described are research design, location of the study, target and accessible population, sampling procedure and sample size as well as instrumentation, data collection, analysis procedures and summary of data analysis.

3.2 Research Design

This study adopted a descriptive survey research design. According to Mugenda and Mugenda (2003), descriptive survey research design entails a systematic and empirical inquiry in which the researcher does not have a direct control of independent variables as their manifestation has already occurred. This design was used in this study mainly because it is useful in describing the characteristics of a large population and makes use of large samples, thus making the results statistically significant even when analyzing multiple variables. Many questions can also be asked about a given topic giving considerable flexibility to the analysis. The design allows use of various methods of data collection like questionnaire and interview methods. It makes use of standardized questions where reliability of the items is determined (Orodho, 2005). Descriptive survey research design also allows the researcher to study how the independent variable affects the dependent variable.

3.3 Location of the Study

Nandi County in North Rift of Kenya has 5 administrative Sub-Counties: Nandi East, Nandi Central, Nandi North, Nandi South and Tinderet (KNBS, 2013). The study was conducted in Nandi East Sub County. The sub county has 22 public secondary schools of which it includes 6 county schools (3 boys' and 3 girls' schools) and 16 sub county mixed schools. The sub county was chosen for the study due to its continuous poor performance in KCSE biology examinations (KNEC, 2016).

3.4 Target and Accessible Population

Kothari (2011) defines target population as all members of a real and hypothetical set of people, events or objects to which an investigator wishes to generalize the results of the study. Nandi East Sub County has a total of 22 public secondary schools. The target population consisted of all the principals in public secondary schools and all secondary school biology students in Nandi East Sub County. The accessible population of the study was 22 principals and 1288 form 4 biology students (SCDE's Office Nandi East Sub County, 2016). These two groups were considered to be in the best position to provide quality information on the selected factors under study and performance in biology. Furthermore, as instructional and transformational leaders, the principals were selected as respondents to provide valuable insights into their daily practices that foster an environment which is supportive of high-student achievement. The accessible population of the study by school category is summarized in Table 2.

Table 2:

Accessible Population by School Category

School category	Principals	Students
County	6	637
Sub County	16	651
Total	22	1288

3.5 Sample Size

A sample is a group in a research study from which information is obtained (Hunt and Tyrell, 2001). According to Mugenda and Mugenda (2003) a sample of 10-30% is representative to a given population. The schools were organized by school category (County and Sub County) to ensure that all of them were included in the study, 12 principals and 296 form four biology students were selected to form the sample size. This generated 308 respondents representing 24% of the population for this study.

3.6 Sampling Procedure

In surveys, it is usually impossible to question every member of the target population, hence the need for sampling (Asiamah, Mensah, & Oteng-Abayie, 2017). According to Seltman (2015), sampling is the process of choosing units of the target population which are to be included in the study in such a way that the selected elements represent the population. The

purpose of sampling is to secure a representative group which will enable the researcher to gain information about an entire population when faced with limitations of time and funds. Kasomo (2006) recommends use of the largest possible sample because results generated from large samples are more accurate.

The study used both probability and non-probability sampling techniques. Purposive sampling technique was used to choose 12 school principals from schools that had biology laboratories with most of the basic facilities for teaching–learning the subject. Biology being a practical subject, schools with laboratories would provide a more uniform and valid yardstick of students’ ability and achievement. According to Kombo and Tromp (2006), the power of purposive sampling lies in its ability to help researchers select informants best placed to provide information central to issues being investigated. Proportionate stratified random sampling techniques were used to select students from county and sub county category of schools. Kathuri and Pals (1993) recommended that a minimum sample for survey type of research should be 100 for major sub groups and 20 to 50 for minor groups. A sample of 296 was drawn from the two categories of schools. This sample size was reached using Krejcie and Morgan (1970) table on the required size for randomly selected sample. The table is given in Appendix C while the formula is as follows:

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

Where:

- S = required sample size
- N = the given population size
- P = population proportion that for table construction has been assumed to be .050, as this magnitude yields maximum possible sample size required.
- d² = the degree of accuracy as reflected by the amount of error that can be tolerated in the fluctuation of sample proportion p about the proportion P – the value of d being .05 in the calculations for entries in the table, a quantity equal to plus or minus 1.96 σ p.
- X² = table value of chi square for one degree of freedom relative to the desired level of confidence, which is 3.841 for the .95.

Table 3 shows the sample size of the target population studied; the county and sub county number of public secondary schools, principals and biology students by school category.

Table 3:

Distribution of the Study Sample by School Category

School category	Principals	Students
County	4	121
Sub County	8	175
Total	12	296

Table 3 shows that, four principals and 121 students were drawn from county category of secondary schools, while eight principals and 175 students were drawn from sub county category. This represented 54.55% of principals and 22.98% of the students. The sample size was sufficient to improve the distribution of attributes in the study population, thus, this led to greater level of variability by minimizing chances of sampling error (Mugenda & Mugenda, 2008).

3.7 Instrumentation

The research instruments used to collect data in this study were Principals' Interview Schedule (PIS) and Students' Background Characteristics Questionnaire (SBCQ). Zohrabi (2013) asserts that using a variety of tools to collect information enhances the validity and dependability of data. Interview schedule was used to collect qualitative data from the principals. This instrument was used since it generally yields highest cooperation and lowest refusal rates, offers high response and takes advantage of interviewer presence and its multi-method data collection, which combines questioning, cross-examination and probing approaches (Edwards & Holland, 2013; Potter, 2003). The guide comprises both closed and open ended questions. Further, the guide was subdivided into two main sections. The first section was used to generate data on school profile while the second section had five open ended questions and was used to gather data on parents' socio-economic background and students' academic performance in biology. The data generated through interviews was used to counter check and supplement those provided by the students.

Questionnaire was used as the key data collection instrument to collect quantitative data from the students. This instrument was used simply because it can reach a large number of respondents within a short time (Salkind, 2009). The instrument gives the respondents adequate time to respond to the items, offers a sense of security (confidentiality) to the respondents and lastly it tends to be objective since there is no bias resulting from the personal characteristics (Sekaran & Bougie, 2010). The questionnaire consisted of a number

of questions printed or typed in a definite order on a form. The questionnaire was subdivided into various sections: The first section had six questions and was used to generate student's bio-data while the second section with eleven questions was used to elicit data on attitudes towards biology. Section three had thirteen questions and was used to capture data on career preference while the last section with twelve questions generated data on parental socio-economic status. The instrument was constructed using both open and close ended items. Biemer and Lyberg (2003) recommend use of open-ended items because they enable researcher to gather additional information by asking follow-up questions. The closed ended items were included in the instrument because they allow uniformity of responses and easy coding of data (Sills & Song, 2002). This simplifies the data analysis process.

3.7.1 Validity of the Research Instruments

Drost (2011) defines validity as the accuracy and meaningfulness of the inferences which are based on research results. It is therefore the degree to which results obtained from the instruments actually represents the phenomena under study. Borg and Gall (2003), contend that validity of an instrument is improved through expert judgment. The researcher validated the research instruments in terms of content and face validity. The content related technique measured the degree to which the question items reflect the specific areas covered. The validations of the questionnaire and interview schedule were done through the following ways: the researcher requested research experts and professionals in education to review the items on the instrument to determine whether the set of items accurately represent the variables under study. They were asked to read, judge, make recommendations and give feed back to the researcher and the comments were used to refine the instrument.

Face validity concerns the extent to which the researcher judges that the instrument is appropriate. The researcher consulted the research experts to verify whether the instruments were valid. After the construction of the questionnaires and interview schedule the researcher reviewed items with the help of supervisors, lecturers in the department of curriculum, instruction and educational management and scrutiny of peers. The suggestions given were incorporated to refine the instruments.

3.7.2 Reliability of Instruments

Reliability is the ability of a research instrument to consistently measure characteristics of interest over time (Orodho, 2005). It is the degree to which a research instrument yields consistent results or data after repeated trials. If a researcher administers a test to a subject twice and gets the same score on the second administration as the first test, then there is

reliability of the instrument (Mugenda & Mugenda, 2003). An error may arise at the time of data collection and may be due to inaccuracy by the researcher or inaccuracy by the instrument. To establish the reliability of the research instrument, the researcher carried out a pilot test of the questionnaire using a complete class of 38 students with the same characteristics as the one targeted in the study. A test –retest method of testing reliability was used whereby questionnaire was administered at an interval of two weeks. After this the data from the questionnaire was analyzed using the SPSS package whereby Cronbach’s Alpha was employed in determining the accuracy of reliability of the questionnaire. The instrument yielded a reliability coefficient of 0.82 and was deemed reliable as its reliability coefficient was above the 0.7 threshold recommended by Fraenkel and Wallen (2002). Interview schedule being mainly open ended, was not tested for reliability.

3.8 Data Collection procedures

Prior to the commencement of data collection, the researcher obtained all the necessary documents, including a research permit from the National Commission for Science, Technology and Innovation (NACOSTI) through the Board of Postgraduate Studies, Egerton University. Audience with the respective schools was also sought through the Sub-County Director of Education, Nandi East Sub County to clarify the purpose of the study. Upon getting an appointment, the researcher in person administered the questionnaire to the students. Assistance from the school administration was sought by the researcher. This was for the purpose of enhancing full cooperation and coordination among the respondents and the researcher. During the distribution of the instruments, the purpose of the research was explained. The researcher then interviewed the school principal in the school.

3.9 Data Analysis

Data analysis is a process of summarizing the information gathered so as to give meaning to such data. The collected data was analyzed using both quantitative and qualitative data analysis approaches. The data analysis started by checking for completeness, cleaning of errors and missing data, then coding of the information obtained from the participants. This resulted in the fluctuations in the sample sizes of the results. The responses in the questionnaires were assigned numerical values. The data obtained from the questionnaires for quantitative analysis was combined into themes and then summarized into frequencies and percentages. Data was then put in tabular forms for analysis by using Statistical Package for

Social Sciences (SPSS). Descriptive statistics consisted of tabulation of frequencies, percentages and chi-square.

The qualitative analysis on the other hand was used in this study to analyze the data obtained from the interview guide. The data was categorized in themes in accordance with research objectives and reported in narrative form along with quantitative presentation. The qualitative data was used to reinforce the quantitative data. The four hypotheses were tested at the 0.05 level using the chi-square test for independence. The test was chosen because the independent variables (students' attitudes, career preference, parental socio-economic status and gender) were measured at nominal scale while the dependent variable, (achievement in biology) was at ordinal scale. Field (2013) recommends use of the test when determining the relationship between constructs measured at nominal, ordinal or a combination of the two. A summary of the statistics are in Table 4.

Table 4:
Summary of Data Analysis

Hypotheses	Independent variables	Dependent Variable	Statistical test
H₀₁: There is no statistically significant relationship between students' attitudes and academic performance in biology.	Students' attitudes towards biology	Academic performance in biology	Frequencies, percentages and Chi-Square
H₀₂: There is no statistically significant relationship between students' career preference and academic performance in biology.	Students' career preference	Academic performance in biology	Frequencies, percentages and Chi-Square
H₀₃: There is no statistically significant relationship between students' parental SES and academic performance in biology.	Parental socio-economic status	Academic performance in biology	Frequencies, percentages and Chi-Square
H₀₄: There is no statistically significant relationship between student's gender and academic performance in biology.	Gender	Academic performance in biology	Frequencies, percentages and Chi-Square

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents and discusses the results of the study based on the objectives in Section 1.4 of chapter one. The chapter begins by presenting the characteristics of the principals and the students who participated in the study. It then examines the relationship between students' attitude towards biology and their career preferences, and academic performance in biology. The last two sections of the chapter present the relationship between students' parental socio-economic status and gender, and their academic performance.

4.2 Demographic Characteristics of Respondents

The demographic characteristics of the principals and students who participated in this study were investigated. The characteristics of the principals were school type and category as summarized in Table 5.

Table 5:

Type of Schools from which the Principals were drawn

Scale	Characteristic	Frequency	Percentage
School type N = 12	Boarding	6	50.00
	Day	5	41.67
	Day and boarding	1	8.33
School category N = 12	County	4	33.33
	Sub county	8	66.67

Table 5 indicates that a half (50.00%) of the principals were drawn from boarding schools; more than a third (41.67%) were from day schools while slightly less than a tenth (8.33%) were drawn from day and boarding school. A high proportion of the principals were from boarding schools because majority of schools in Nandi East Sub County are in that category (Nandi East Sub County Director of Education, 2016). The results further revealed that only a third (33.33%) of principals were from county schools while two thirds, (66.67%) were from sub county schools. This is in harmony with the records of the Sub County Director of Education Nandi East which show that sub county schools are the majority. This finding was deemed necessary because it gives a better understanding of the context in which a study was

conducted (Newhouse & Beegle, 2005). It also enables a researcher to conduct additional analysis around variables (Cynthia & Megan, 2008).

The characteristics of the students who participated in the study were also investigated with respect to age and school status as shown in Table 6.

Table 6:

Characteristics of the Sampled Students

Scale	Characteristic	Frequency	Percentage
Age N = 296	15 – 17 years	75	25.34
	18 – 20 years	204	68.92
	21 and above	17	5.74
Status N = 289	Boarder	189	65.40
	Day scholar	100	34.60

Table 6 indicate that slightly more than two thirds (68.92%) of the students were aged between 18 – 20 years while a quarter (25.34%) were within 15-17 years age bracket. The results also indicate that a few (5.74%) of the respondents were aged above 21 years. A reasonable number of the respondents were above the age limits provided by MoEST which stipulate that a student should be through with his/her secondary education at 18 years (GoK, 2015). Table 6 also reveals that nearly two thirds (65.40%) of the students were boarders while slightly more than a third (34.60%) were day scholars. This is also in harmony with the records of the Sub County Director of Education Nandi East which show that majority of the students are boarders.

4.3 Influence of Students' Attitudes towards Biology

The first objective of the study sought to determine the influence of students' attitudes towards biology on academic performance in the subject. The students' attitudes and academic achievement were measured and the association between the two variables was established using the Chi-Square test.

Data on attitudes towards biology was gathered using items on attitudes in the students' questionnaire. The attitudes were measured using fourteen closed ended Likert-type items based on the extent to which the respondents agreed with them (strongly disagree to strongly agree). The responses to the items are given in Table 7.

Table 7:
Students' Responses to Items on Attitudes towards biology

Statement	N	Responses in Percentages				
		SA	A	U	D	SD
Biology is very interesting	292	39.4	52.7	2.4	2.1	3.4
I do not like biology because it scares me	283	2.1	4.6	4.2	29.7	59.4
I am always under a lot of strain during biology lessons	283	4.9	8.5	6.0	39.2	41.3
Biology is enjoyable as it is fun to learn	284	40.5	51.4	3.5	2.5	2.1
I am comfortable learning biology because of its stimulating experiences	287	27.9	48.4	10.8	8.7	4.2
Biology makes me uncomfortable	291	3.8	4.5	4.5	23.4	63.9
I generally have good feelings about biology	290	56.2	35.8	2.8	2.4	2.8
I generally dislike the word biology	291	3.1	1.4	3.8	28.9	62.9
I approach biology with a feeling of hesitation	285	8.4	11.2	13.0	36.8	30.5
I really like biology	281	52.0	40.2	3.6	1.8	2.5
I have always enjoyed learning biology	280	46.8	43.9	2.9	2.5	3.9
Thinking about biology experiments makes me nervous	289	21.8	22.8	11.4	20.1	23.9
I like biology very much because I am at ease during lessons	292	3.4	3.4	6.2	46.6	40.4
I enjoy biology because I react positively to it	290	54.8	37.6	2.4	2.8	2.4

Table 7 reveals that majority of the respondents agreed with all the items by agreeing with the positive ones and disagreeing with the negative ones. For example, majority (92.1%) of the students agreed with “Biology is very interesting” which is a positive item and disagreed (91.8%) with “I generally dislike the word Biology” which is a negative item. The responses to the items suggest that the students had positive attitudes towards biology.

The students attitudes towards biology was established by re-coding the responses to the items that were used to measure the construct from 5 points (Strongly Disagree, Disagree, Undecided, Agree, Strongly Agree) to 3 points (Disagree, Undecided, Agree). The recoded data was then used to determine the attitudes of the students. The attitude of a student was categorized as positive when he/she “Agreed” with majority of the items, Neutral when Undecided was dominant and Negative when “Disagreed” was the majority. The attitudes were then summarized using frequencies and percentages as shown in Table 8.

Table 8:
Students Attitudes towards Biology (N= 294)

Category	Frequency	Percentage	Attitudes
Disagreed with majority of the items	6	2.04	Negative attitude
Undecided on majority of the items	52	17.69	Neutral
Agreed with majority of the items	236	80.27	Positive attitudes

The results in Table 8 show that over three quarters (80.27%) of the students agreed with majority of the items, a few (17.69%) were undecided on majority of the items while very few (2.04%) disagreed with most of the item statements. These results indicate that majority (80.27%) of the students had positive attitudes towards biology. This can be attributed to the fact that being an optional subject, biology is selected by only those who like it. Very few (2.04%) had a negative attitude towards the subject as captured in their responses in most of the items while a few others (17.69%) had a neutral attitude.

Students' achievement in biology was measured using their mean scores in Nandi East Sub County biology evaluation test records. The test is usually administered at the end of second term to form four students and it is marked out of 100%. The percentage mean scores of the respondents obtained in the test are summarized in Table 9.

Table 9:
Students' Academic Performance in Biology (N = 296)

Marks	Frequency	Percent
19% and below	4	1.35
20 - 39%	64	21.62
40 - 59%	149	50.34
60 - 79%	74	25.00
80% and above	5	1.69

Table 9 shows that slightly more than a half (50.34%) of the students obtained between 40-59% while about a quarter (25.00%) scored between 60 – 79%. Only a few (1.35%) students obtained scores below 19% while a few other students (1.69%) scored above 80%. The students' academic performance in biology was rated average given it was marked out of 100%.

An analysis was conducted to find out whether students' performance in biology is related to their attitudes towards the subject. The students' academic performance in biology was analyzed by their attitudes towards the subject as shown in Table 10.

Table 10:

Students' Academic Performance in Biology by Attitude (N= 294)

Marks (Mean score)	Positive n = 236		Undecided n = 52		Negative n = 6	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
19% and below	2	0.85	1	1.92	1	16.67
20 - 39%	45	19.07	17	32.70	0	0.00
40 - 59%	119	50.42	26	50.00	4	66.66
60 - 79%	69	29.24	4	7.69	1	16.67
80% and above	1	0.42	4	7.69	0	0.00

Table 10 reveals that nearly a third (29.66%) of the students with positive attitudes had a mean score of 60% and above while only a few with neutral attitudes (15.38%) and negative attitudes (16.67%) had a similar mean score of 60% and above. The big difference in the number of students with positive attitudes with mean scores of 60% and above and who did well in the test, and that of their counterparts with neutral or negative attitudes and who failed the test, is an indication that attitudes affect academic achievement in biology.

Chi-Square was used to find out whether students' attitudes towards biology had an influence on their academic performance in the subject. The independent sample Chi-Square was chosen because attitudes and academic achievement were at nominal and ordinal scale respectively. Warner, (2012) recommends use of the test when determining the relationship between constructs measured at nominal, ordinal or a combination of the two. The students' academic performance in biology was cross tabulated with their attitudes towards the subject. The results of the test are summarized in Table 11.

Table 11:
Cross Tabulation of Students' Attitudes towards Biology and Academic Performance in the Subject (N= 294)

Performance	Positive n = 236	Undecided n = 52	Negative n = 6	
	Frequency	Frequency	Frequency	Total
Very poor	2	1	1	4
Poor	45	17	0	62
Average	119	26	4	149
Good	69	4	1	74
Very good	1	4	0	5
Total	236	52	6	294

Table 11 gives the frequency of valid cases of 294 students' performance by attitudes. Very poor performance is a score of 19% and below, poor is between 20-39%, average is 40-59%, good is 60-79% while very good is 80% and above (KNEC, 2016). This academic performance evaluation scale in biology is given in Appendix D and it is derived from KNEC. Test of significance was then carried out and the results were summarized in Table 12.

Table 12:
Test of Significance of Students' Attitudes towards Biology and their Academic Performance (N= 294)

Scale	Value	df	p-value
Pearson Chi-Square	37.638	8	.000*
N of valid cases	294		

*Significant at 0.05

Table 12 indicates that the relationship between students attitudes towards biology and academic performance in the subject was statistically significant at 0.05 level, $X^2(8, N = 294) = 37.638, p < .05$. This means that students with positive attitudes towards biology tend to perform well in the subject. These results do not support the first hypothesis which states that students' attitudes towards biology do not significantly affect their academic performance in the subject. On the basis of these results, the hypothesis was rejected.

Table 12 reveals that the students' attitudes towards biology influence their academic performance in the subject. The finding is in agreement with those of a study in Iran by Nasir and Asghar (2011) who established that the relationship between students' attitudes towards biology and their academic achievement in the subject was positive and statistically significant. The results are in harmony with the findings of a study conducted in Nigeria by Owoeye and Agbaje (2016). The study showed that there was a significant relationship between students' attitudes towards biology and academic performance in the subject. Wabuke (2013) argue that attitudes and interest influence performance in a subject because it provides the drive within a student to participate in the learning process. Owino, Yungungu, Osman and Ogolla (2015) assert that positive attitudes affect academic performance because they activate motivation, thinking and feelings of an individual. These feelings and abilities are the drivers of good performance.

4.4 Influence of Students' Career Preference on Academic Performance in Biology

The second objective of the study sought to establish the influence of career preference on students' academic performance in biology. Students were asked whether they were aware of careers that studying biology could lead to, their responses were summarized in Table 13.

Table 13:

Responses on Awareness of Career Preferences in Studying Biology (N = 283)

Response	Frequency	Percent
No	18	6.36
Yes	265	93.64

Table 13 indicates that majority (93.64%) of students were aware of careers that studying biology leads to. Examples of biology related careers mentioned by the students were nursing and medicine. Awareness of careers related to a subject under study is important as it affects students' attitudes and motivation, which play a key role in their performance in the subject. Odia and Ogiedu (2013) assert that positive attitudes enhance performance because they motivate students and make them work hard.

Students' career preferences to those related to biology was established using data generated by a set of 11 closed ended items in their questionnaire. The responses to the items are given in Table 14.

Table 14:

Students' Career Preferences

Statement	N	Responses in percentages				
		SA	A	U	D	SD
Biology will assist me pass the national examination	289	55.0	38.4	2.4	1.7	2.4
My parents/guardians encourage me to take biology for my future career	289	30.8	33.2	12.8	13.1	10.0
Biology is the easiest option	288	29.9	40.6	12.8	8.3	8.3
Biology best suits my future career	282	40.4	33.7	9.6	7.8	8.5
I only opted for biology because it is compulsory	289	10.8	7.7	5.6	28.6	47.4
There is high demand for careers in fields related to biology	292	37.0	36.6	11.3	8.6	6.5
My career depends on how I will perform in biology in KCSE	293	36.5	36.5	7.8	14.3	4.8
The career I intend to pursue is not related to biology	289	46.0	34.6	6.2	5.9	7.3
My career preference is informed by my talent not performance in biology	275	28.4	30.2	14.9	13.5	13.1
Choice of biology was guided by my career preferences	289	13.8	16.6	8.3	22.8	38.4
A career in biology related field has been my childhood dream	291	30.6	23.4	12.0	15.8	18.2

The results in Table 14 reveal that majority of respondents agreed with the eight positive items except one. For example, about three quarters (74.1%) of the respondents agreed with positive items like “Biology best suits my future career” while more than a half (54%) agreed with “A career in biology related field has been my childhood dream”. The positive item that majority (61.2%) of the respondents disagreed with was “Choice of biology was guided by my career preferences”. The results further indicate that majority of the respondents agreed with three negative items; “The career I intend to pursue is not related to biology” (80.6%), “My career preference is informed by my talent not performance in biology” (61.2%) and “I only opted for biology because it is compulsory (76.0%). The findings suggests that students career preferences are related to biology given that majority agreed with 8 out of the 11 items used to measure the construct.

The students' career preference was established by re-coding the responses to the items that were used to measure it from 5 points (Strongly Disagree, Disagree, Undecided, Agree,

Strongly Agree) to 3 points (Disagree, Undecided, Agree). The re-coding was done to enable the researcher to transform the responses into career preferences. Career preference was classified as “related to biology” when a respondent “Agreed” with majority of the positive items, “Undecided” when Undecided was the majority; and “Not related to Biology” when a respondent “Disagreed” with majority of the positive items. The career preferences were then summarized as shown in Table 15.

Table 15:

Career Preferences Related to Biology (N= 295)

Responses	Frequency	Percentage	Career preference
Disagreed majority	22	7.46	Not related to Biology
Undecided majority	178	60.34	Undecided
Agreed majority	95	32.20	Related to Biology

Table 15 reveals that majority of the respondents (60.34%) were undecided on whether biology is related to their career preferences or not, while about a third (32.20%) agreed that their future careers are related to biology. This is an indication that students are not sure of whether their future careers are related to biology or not. This finding is in harmony with the observations of Vaughan and Roberts (2007) who noted that most secondary school students do not have accurate information about occupational opportunities to help them make appropriate career choices. Asham (2011) also noted that students have challenges in constructing their future careers.

Further analysis was conducted by examining students’ academic performance in biology with regard to their career preferences. Table 16 gives a summary of the performance.

Table 16:

Students' Performance in Biology by Career Preferences (N= 295)

Performance	Not related to biology n=22		Undecided n = 178		Related to biology n= 95	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
19% and below	1	4.55	3	1.69	0	0.00
20 - 39%	8	36.36	46	25.84	9	9.47
40 - 59%	9	40.91	98	55.06	42	44.21
60 - 79%	4	18.18	29	16.29	41	43.16
80% and above	0	0.00	2	1.12	3	3.16

Table 16 shows that nearly a half (46.32%) of students whose career preferences were related to biology scored a mean of 60% and above while only a few who were undecided (17.41%) of those whose career preferences were not related to biology (18.18%) obtained the same marks. This implies that students whose career preferences are related to biology tend to do better in the subject. According to Owie (2003) career preference creates intrinsic interest in a field of study and related subjects. This affects class attendance and learners' performance in the related subjects.

Chi-Square test was used to find out the influence of career preference on students' performance in biology. Students' career preferences were cross tabulated with their academic performance in the subject as shown in Table 17.

Table 17:

Cross Tabulation between Students' Career preference and their Academic Performance Biology (N= 295)

Performance	Not related to biology n = 22	Undecided n = 178	Related to biology n = 95	
	Frequency	Frequency	Frequency	Total
Very poor	1	3	0	4
Poor	8	46	9	63
Average	9	98	42	149
Good	4	29	41	74
Very good	0	2	3	5
Total	22	178	95	295

Table 17 gives the frequency of students' career preferences on their academic performance in the subject. Majority of the students (178) were undecided whether biology is related to their career preferences, while very few (22) felt that their career preferences were not related to biology. The test of significance was then carried out and the results are summarized on Table 18.

Table 18:

Test of Significance of Students' Career Preference and their Academic Performance (N= 295)

Scale	Value	df	p-value
Pearson Chi-Square	35.426	8	.000*
N	295		

*Significant at .05

Table 18 indicates that the relationship between students career preference and academic performance in biology was statistically significant at 0.05 level, $X^2(8, N = 295) = 35.426$, $p < .05$. This is an indication that students whose career preferences are related to biology such as nursing and medicine, tend to perform better in the subject. These results do not support the second hypothesis which states that students' career preference do not significantly affect their academic performance in biology. On the basis of these results, the hypothesis was rejected.

The results in Table 18 reveal that preference to careers that are related to biology influences students' performance in the subject. The findings support those of Harb and El-Shaarawi (2006) who noted that there was a positive relationship between preference of careers related to biology and achievement in the subject. Aminu and Timothy's (2014) study conducted among microbiology students in Nigeria also revealed that there was a statistically significant relationship between preference to career related to biology and students achievement in the subject. The findings also support those of Mettoh and Kitainge (2016) which showed that career preference matters as it motivates students to study related subjects to their careers. The motivation drives students to study extra harder leading to high academic performance.

4.5 Influence of Students' Parental Socio-Economic Status on Academic Performance in Biology

Objective three sought to determine whether students' parental socio-economic status influence academic performance in biology. Parental socio-economic status was measured in terms of indicators such as level of education, residence, occupation, family structure and possessions. The variable was measured using a set of 11 items in the students' questionnaire. A number of scales (3, 4, 5, 8, and 10) were used to rate responses to the items that were used to measure it. The responses to the items were summed and transformed into socio-economic status index (Table 19).

Table 19:

Parental Socio-Economic Status Index

Socio-economic status indicators	N	Mean	SD
House you reside in (family owned, rental/Government maximum = 4)	288	3.09	0.80
Parents have house helps to assist with domestic chores (maximum = 4)	284	0.94	1.39
How often my parents purchase for me biology materials (maximum= 4)	292	1.10	1.04
Average expenditure on biology materials per year (maximum = 5)	293	1.40	1.46
Family possessions (Radio, TV, car (maximum = 10)	294	2.80	2.39
Fathers highest level of education (maximum = 8)	285	4.04	1.88
Mothers highest level of education (maximum = 8)	290	3.72	1.75
Parents assists with my homework (maximum = 3)	291	1.03	1.16
Parents employment status (maximum = 5)	288	3.26	1.41
Family structure (both parents, single parent , orphan maximum = 4)	275	3.62	0.69
Family size (maximum = 6)	289	1.92	1.57
Socio-Economic Status Index (maximum = 61)	295	26.21	8.16

On the basis of valid cases, the results in Table 19 show that the residence ($M = 3.09$, $SD = 0.80$) of the respondents were average while family structure ($M = 3.62$, $SD = 0.69$) of the students were good (had both parents) as indicated by the mean scores. Table 19 also shows that father's level of education ($M = 4.04$, $SD = 1.88$) and mother's level of education ($M = 3.72$, $SD = 1.75$) and parents' employment ($M = 3.26$, $SD = 1.41$) were rated average as they were measured out of 8 and 5 respectively. The table indicates that parents of all the social classes rarely purchase biology materials ($M = 1.10$, $SD = 1.04$) for their children. This is confirmed by the low rating of average expenditure on biology materials per year ($M = 1.40$, $SD = 1.46$). The results further indicate that parents rarely assist their children with their homework ($M = 1.03$, $SD = 1.16$). The parental socio-economic status index ($M = 26.21$, $SD = 8.16$) was rated average in Nandi East Sub County given that it was measured out of a total scale of 61.

The socio-economic status of the parents was determined by transforming the indices into levels using the scale, Low (0 – 20.33), Middle (20.34 – 40.66) and Upper (40.67 – 61.00). The status of the parents was then summarized using frequencies and percentages as indicated in Table 20.

Table 20:

Parental Socio-economic Status (N = 295)

Status	Frequency	Percent
Low class	58	19.66
Middle class	220	74.58
Upper class	17	5.76

The results in Table 20 reveal that nearly three quarters (74.58%) of the students indicated that middle class was the socio-economic status of their parents while below a quarter (19.66%) were of the view that their parents were in the low class. Table 20 also shows that only a few (5.76%) students considered upper class as the economic status of their parents. The results in Table 20 are in harmony with those of Nandegge (2015) who noted that majority of the students from urban informal settlements in Westlands Division, Nairobi County were from not well to do families. Nandi East Sub County and Nairobi County however, are not the same in terms of socio-economic development. The results concur with those of a study conducted in Kiamokama Division Kisii County, Kenya by Okemwa (2014) who noted that most of the pupils in the division were from middle class backgrounds as most of their parents were not well endowed in terms of education, employment and possessions. The results are also in agreement with those of Juma (2016) in Tana River County, Kenya who observed that parents with low socio-economic status rarely assisted students with their assignment/homework impacting negatively on their performance.

Further analysis was done on students' academic performance in biology by examining it with respect to parental socio-economic status. Table 21 presents the distribution of students' achievement in the subject by parental socio-economic status.

Table 21:

Students' Performance in Biology by Parental Socio-Economic Status (N = 295)

Performance	Low Class n = 58		Middle Class n = 220		Upper Class n = 17	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
19% and below	1	1.72	3	1.36	0	0.00
20 - 39%	16	27.59	46	20.91	1	5.88
40 - 59%	28	48.28	111	50.45	10	58.82
60 - 79%	12	20.69	56	25.45	6	35.29
80% and above	1	1.72	4	1.82	0	0.00

The results in Table 21 reveal that nearly all students (94.11%) from upper class families obtained a mean of 40% and above while more than three quarters (77.72%) of students from middle and over two thirds (70.69%) of students from low class families obtained a score of 40% and above. Examination of the results shows that academic performance apparently increases with parental socio-economic status. The findings are in harmony with the observations of Sheldon (2003) who noted that learners from families with low socio-economic status obtain low grades because they often lack the financial, social, and educational support that enhance academic performance. These results support those of Onyancha, Njoroge and Mukolwe (2015), in their study in Keumbu Division, Kisii County who established that the lower a parent's socio-economic status, the lower a student's average grade.

Chi-Square was used to determine the influence of parental socio-economic status on students' academic performance in biology. The parental socio-economic status was cross tabulated with students' mean scores in biology academic performance as shown on Table 22.

Table 22:

Cross Tabulation between Parental Socio-economic Status and Students' Academic Performance Biology (N= 295)

Performance	Low Class n = 58	Middle Class n = 220	Upper Class n = 17	
	Frequency	Frequency	Frequency	Total
Very poor	1	3	0	4
Poor	16	46	1	63
Average	28	111	10	149
Good	12	56	6	74
Very good	1	4	0	5
Total	58	220	17	295

Table 22 reveals that majority of students (111) from the middle class recorded an average academic performance, 28 students from low class and 10 from upper class registered a similar average score. The results are in agreement with those of Pedrosa, Norberto, Rafael, Maia, Andrade, and Carvalho (2006). Their study in Brazil on social and educational background pointed out that, students from deprived socio-economic and educational backgrounds performed relatively well or even better than others coming from higher socio-economic backgrounds. The test of significance was then carried out and the results were summarized in Table 23.

Table 23:

Test of Significance of Students' Parental Socio-Economic Status and their Academic Performance (N= 295)

Scale	Value	df	p-value
Pearson Chi-Square	8.343	8	.401
N of Valid Cases	295		

*Significant at .05

The results of the Chi-Square test in Table 23 indicates that socio-economic status has no statistically significant relationship with academic performance in biology at 0.05 level, $X^2(8, N = 295) = 8.343, p > .05$. This means that parents' socio-economic status does not affect academic performance in biology. The results support the third hypothesis which states that

socio-economic status does not influence students' academic performance in biology. The hypothesis was thus accepted.

The results in Table 23 reveal that parental socio-economic status does not significantly influence students' academic performance in biology. This was evident from the results that indicated students from high, middle and low class showed no significant differences in their performances. However, it also emerged that parental SES could not determine the marks that students scored and that middle or low SES may have motivated some students to work extra hard to liberate themselves from their statuses. The results are in agreement with those of a study by Jamila (2009) which revealed that socio-economic status of parents has no significant effect on the educational achievement of students. The results are also in line with those of Ebenuwa-Okon (2010) in Nigeria who found out that socio-economic indicators like family financial status do not significantly influence academic performance. Ebenuwa-Okon was of the view that academic achievement depends on personal determination of the student. These results however, contradict those of Saifi and Mehmood's (2011) study in Gujarat District in India on the effect of socio-economic status of parents on students' achievement. Their study revealed that parental education, occupation and facilities at home affect the student's achievement. These results also contradict those of Abdu-Raheem (2015) who confirmed that there was a significant relationship between parents' socio-economic status and academic performance of secondary school students in Ekiti state, Nigeria. The difference however, is noted in the study area because the study focused on academic achievement in a single subject, biology.

Bala (2011) explored the influence of parental education, parental occupation and family size on science achievement of secondary school students in western Uttar Pradesh in India. The findings indicated that family variables including parental education had significant relationship with the achievement of their children. The result do not agree with those of a study conducted by Mogaka (2012) in Keumbu Division Kisii County which found out that the level of parental income and number of siblings were very vital in determining pupil's academic achievement. The study found out that pupils from families with many children, and uneducated parents scored poorly when compared to pupils from families with few children whose parents were educated. Onyancha, Njoroge and Mukolwe (2015) study concur with Mogaka's as they established that socio-economic status play a significant role in influencing students' academic performance. They noted that the lower the parents socio-

economic status, the lower the students average grade and the higher the parents socio-economic status, the higher the academic performance of the students.

Additional information on parental socio-economic status was gathered using the principals' interview schedule. The interview involved 12 principals and it focused on the link between parental socio-economic status and students' academic performance. Data gathered by the instrument was organized thematically in areas pertinent to the study, and summarized using frequencies and percentages. The principals were first asked whether parents level of education influences students' performance in biology. Their responses are summarized in Table 24.

Table 24:

Reasons advanced by Principals why Parents' level of Education Influence Students' Academic Performance (N = 18)

Reason	Frequency	Percentage
Parents with high levels of education are keen that their children are provided with quality education	3	16.67
Avails learning materials as they are aware of the importance of providing their children with facilities	3	16.67
Are able to make informed decisions with regards to their children's education	2	11.11
Educated parents tend to support their children (encourage, provide facilities) leading to good/better performance	4	22.22
Advises their children to concentrate on science related subjects to enable them to be admitted to quality courses	4	22.22
Have a better understanding of biology and are able to guide their children	2	11.11

The results in Table 24 reveal that the major reasons advanced by principals why parents' level of education influence academic performance of students in biology were as follows; advises their children to concentrate on science related subjects to enable them be admitted to quality courses (22.22%) and, educated parents tend to support their children leading to good/better performance (22.22%). These results are in harmony with those of Mallam

(2009) and Ngorosho (2010). Mallam noted that parents' level of education is important to schooling as they tend to have confidence in their children, advice and motivate them to do well at school. Ngorosho identified four key variables as significant indicators of home environment that is conducive for learning in rural eastern Tanzania. These variables are: Father's and mother's education, source of light, household materials and the academic materials like books for school subjects in homes. Ngorosho concluded that these variables play a pivotal role in children's education.

The principals were also asked whether parents' occupation affect students' academic performance. The principals gave several reasons why they thought it did as indicated in Table 25.

Table 25:

Reasons why Parents' Occupation affect Students' Academic Performance (N = 10)

Reason	Frequency	Percentage
Those in occupations related to biology act as role models	3	30.00
Influence attitudes and what their children intend to do as a career	3	30.00
Those in stable occupations can provide for academic needs for their children leading to good performance	2	20.00
Parents in busy occupations have no time for their children leading to poor performance	2	20.00

Table 25 reveals that the main reasons why the principals were of the view that parents' occupation affect students' academic performance were that, those in occupations related to biology are role models to their children (30.00%); parent's occupation influence attitudes and what their children intend to do as a career (30.00%); those in stable occupations can provide for academic needs for their children leading to good performance (20.00%) and parents in busy occupations have no time for their children leading to poor performance (20.00%). The reasons advanced by the principals are in line with the findings of a study conducted in Malaysia by Mudassir and Abubakar (2015) among secondary school students. The findings showed that students from parents with formal occupation perform better than those from parents with informal education.

The principals were further asked the reasons why they thought that parents' economic status affect performance of students. Table 26 gives a summary of their reasons.

Table 26:

Principals' reasons why parents' Socio-Economic Status affect Academic Performance of Students (N = 12)

Reason	Frequency	Percentage
Children of parents who are economically well off tend to do better since they are in school all the times as their parents pay fees on time	4	33.33
Children from well to do families perform better since their parents are able to cater for the required learning materials	8	66.67

The results in Table 26 reveal that two thirds (66.67%) of the principals were of the view that parents' economic status affects academic performance of students because their parents are able to cater for the required learning materials. The results support those of Eamon (2005 and Hochschild (2003) who examined the influence of family income on African-American students' academic achievements. They found that children from high and middle socio-economic families were exposed to a better learning environment at home due to availability of extra learning facilities like computers, televisions, radios, different types of reading materials among others. They noted that students in low socio-economic status families were not exposed to these learning facilities and this negatively affects their academic performance. Nadenge, Ngesu, Muasya, Maonga and Mukhungulu (2016) noted that parental economic status matters as it affects their ability to pay school fees on time to avoid disruption of students' learning.

Lastly, the principals were asked to provide reason why family structure affects students' academic performance. The principals gave several reasons why they were of the opinion that it affects students' academic performance which is indicated in Table 27.

Table 27:

Reasons Advanced by Principals why Family Structure affects Academic Performance of Students (N = 11)

Reason	Frequency	Percentage
Single parents tend to have social problems which negatively affects their children's performance	4	36.36
Complete (mother and father) stable families enhance performance as home environment is conducive to learning	5	45.45
Students from unstable families do poorly as their parents rarely attend to their needs	2	18.18

Table 27 indicates that two main reasons, that is, complete (mother and father) stable families enhance performance as home environment is conducive to learning (45.45%) and, single parents tend to have social problems which negatively affects their children's performance (36.36%) were advanced by the principals. The reasons advanced by the principals are in harmony with the observations of Asikhia (2010) who observed that the family structure plays a pivotal role in the learning process of a child as it is the first, smallest and the most important unit of a child's social organization. Asikhia noted that the structure of family such as the child's position influences his/her performance. Eamon (2005) and Jeynes (2002) confirmed that family type, size and parental socio-economic status play important role in children's educational attainment and social integration

Additional qualitative data was sought from the principals by requesting them to suggest what can be done to address parental factors that affect students' academic performance. Their suggestions are summarized in Table 28

Table 28 :

How to Address Parental Factors that affect Students' Academic Performance (N = 14)

Suggestion	Frequency	Percentage
Counsel the parents	4	28.57
Involve parents in their children's academic matters	3	21.43
Provide affected students with guidance and counseling services	5	35.71
Government should provide support to learners from families faced with financial challenges	2	14.29

Table 28 shows that slightly more than a third (35.71%) of principals suggested that students affected by parental factors be provided with guidance and counseling services. More than a quarter (28.57%) of principals suggested that parents whose characteristics negatively affect their children’s performance in biology need counseling. Slightly more than a fifth (21.43%) recommended that parents be involved in their children’s academic matters.

4.6 Influence of Students’ Gender on Academic Performance in Biology

The fourth objective sought to establish the relationship between students’ gender and academic performance. Data on the students’ gender was collected using students’ questionnaire. The data was summarized using frequencies and percentages as shown in Table 29.

Table 29:
Gender Distribution of the Study Sample (N = 295)

Gender	Frequency	Percent
Male	160	54.24
Female	135	45.76

Gender has been associated with academic performance by several scholars. Dania’s (2014) study showed that gender has a significant effect on students’ academic performance in Social Studies. Kashu (2014) also noted that gender affects students’ academic performance especially in science subjects. Table 29 shows that more than half (54.24%) of the sample were boys while the girls (45.76%) were slightly less than the boys. This is in line with the finding of Eddy, Brownell and Wenderoth’s (2014) study which showed that science subjects like physics, chemistry and biology attract more male learners. Amedu (2015) attributed this to socio-cultural background which brands science subjects and mathematics as masculine, while others like home economics and secretarial studies are branded as feminine.

Further analysis was conducted using the data on gender by examining academic performance with respect to it. Table 30 gives a summary of achievement in the subject by gender.

Table 30:

Academic Performance by Gender (N = 295)

Marks	Male n= 160		Female n = 135	
	Frequency	Percentage	Frequency	Percentage
19% and below	3	1.88	1	0.74
20 - 39%	34	21.25	29	21.48
40 - 59%	79	49.38	70	51.85
60 - 79%	42	26.25	32	23.70
80% and above	2	1.25	3	2.22

Table 30 shows that slightly more than a half (51.85%) of the female students obtained mean scores ranging between 40 – 59% while slightly less than a half (49.38%) of the male students had similar scores. Table 30 also shows that over a quarter of the male (27.50%) and female (25.92%) students had mean scores of 60% and above. The results indicate that the academic performance in biology in both male and female students were relatively comparative. The results are in agreement with those of a study by Kashu (2014) which compared the academic performance between boys and girls in the Kenya Certificate of Secondary Education (KCSE) across a period of five years (2007-2011). The results showed that there was no significant difference in overall performance between boys and girls in private schools.

The influence of gender on academic performance in biology was determined using the chi-square test of independence. The gender of the students who participated in the study was cross tabulated with their mean scores in the achievement test. The results of the cross tabulation is given in Table 31.

Table 31:

Cross Tabulation between Students' Gender and their Academic Performance in Biology (N= 295)

Performance	Male n= 160	Female n = 135	
	Frequency	Frequency	Total
Very poor	3	1	4
Poor	34	29	63
Average	79	70	149
Good	42	32	74
Very good	2	3	5
Total	160	135	295

Table 31 reveals that the frequency of male and female students at different levels of performance differed. For example, slightly above a quarter of male (44) and female (35) students were rated good and very good in their performance while those who were rated poor and very poor in male (37) and female (30) were slightly below a quarter. The test of significance was then carried out and the results were summarized in Table 32.

Table 32:

Chi-square test results between Students' Gender and Academic Performance in Biology (N= 295)

Scale	Value	df	p-value
Pearson Chi-Square	1.383	4	.847
N of Valid Cases	295		

*Significant at .05

The results of the Chi-Square test in Table 32 indicate that gender was not statistically related to academic performance in biology at the .05 level, $X^2(4, N = 295) = 1.383, p > .05$. This is an indication that gender did not influence academic performance in biology in this study. The results in Table 32 reveal that the relationship between students' gender and academic performance in biology was not statistically significant. The results support the

fourth hypothesis which states that gender does not affect students' academic performance in biology. The hypothesis was thus accepted.

The results are in agreement with those of Owoeye and Agbaje (2016) who observed that the relationship between students' gender and academic performance in biology was not statistically significant. The results are also in agreement with those of Chukwunyeremunwa (2013) which showed that the interaction between both genders on students mean scores in biology was not statistically significant. The results are in line with those of Muraya and Kimamo's (2011) study conducted in Machakos District, Kenya which revealed that gender had no significant influence on achievement in biology. The present study contradicts those of Eddy, Brownell and Wenderoth (2014) who established that females consistently underperform in introductory biology examinations compared to their male counterparts. The results also contradict those of Amedu (2015) who examined the effect of gender on the achievement of students in biology using jigsaw method and established that there was a significant difference between the mean scores in favour of the males. The effect of culture may need to be investigated on the achievement of girls. If girls go to school with the cultural image that boys are superior to them, it may affect their zeal to learn.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter presents the summary, conclusions and recommendations of this study on the relationship between selected students' background characteristics and academic performance of secondary school biology in Nandi East Sub County, Nandi County, Kenya.

5.2. Summary of the Findings

This study examined the relationship selected students' background characteristics and academic performance in biology in Nandi East Sub County, Kenya. The characteristics were examined with respect to students' attitudes towards biology, career preference, parental socio-economic status and gender. Four hypotheses were developed and tested using the Chi-Square test for independence. The test results showed that:

- i. There was a statistically significant relationship between students' attitudes towards biology and academic performance in the subject.
- ii. The relationship between students' career preference and academic performance in biology was statistically significant.
- iii. Parental socio-economic status has no statistically significant relationship with academic performance in biology.
- iv. There was no statistically significant relationship between gender and academic performance in biology.

5.3. Conclusions

The results of the study revealed that students' attitudes towards biology and career preference were significantly related to performance in the subject. The results also revealed that parental socio-economic status and students' gender were not significantly related to academic performance in biology. On the basis of these results, the following conclusions were made:

- i. Students' attitudes towards biology influence their academic performance in the subject. Students with positive attitudes towards biology tend to perform well in the subject.
- ii. Students' career preference influences academic performance in biology. Students' whose career preferences are related to biology such as nursing and medicine tend to perform better in the subject.

- iii. Parental socio-economic status does not influence academic performance in biology. It emerged however, that parental socio-economic status could not determine the marks that students scored and that middle or low socio-economic status may have motivated some students to work extra hard to liberate themselves from their statuses.
- iv. Gender does not influence students' performance in biology. Boys and girls displayed similar performance in academic achievement in the subject.

5.4. Recommendations for Improvement

Based on the findings, the following recommendations were made:

- i. Students' attitudes towards biology to be enhanced through use of appropriate instructional methods and motivation to boost their performance in the subject.
- ii. Teachers to make students aware of biology related careers and benefits associated with them through vocational counseling as a way of enhancing their interest and performance in the subject.
- iii. The Ministry of Education, school administrators and the local authorities need to come up with frequent community based forums that are specifically structured towards enhancing parental participation in their children's education.
- iv. There is also need for policy formulation and implementation that encourage all learners to be treated equally irrespective of gender. Other factors such as availability of teaching/learning resources, motivation and school characteristics that enhance performance in biology should be strengthened so as to improve the students' achievement in the subject.

5.5. Suggestions for Further Research

A study like this generates many questions and issues, some of which find answers within while others may require further research. This study examined the relationship between selected students' background characteristics and academic performance in biology with respect to students' attitudes towards the subject, career preference, parental socio-economic status and gender only. In relation to this study further research can be done on the following:

- i. A similar research should be done in other categories of secondary schools for example the national and extra county schools since this one only covered the county and sub county secondary schools in Nandi East Sub County.
- ii. A related study should be carried out on the relationship between the school background characteristics and academic performance of secondary school students, in order to complete the circle of academic performance determinants.

- iii. A study should be carried out to investigate the socio-economic factors affecting the academic performance of students in secondary schools in Nandi County.

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APPENDIX A: PRINCIPALS' INTERVIEW SCHEDULE (PIS)

Section I

Introduction

The researcher introduces himself to the principal and explains the purpose of the visit and seeks consent of the interviewee.

The principal is assured that relevant ethical considerations will be observed throughout the interview

School Profile

Principals requested to provide data on school characteristics:

Type

.....

Category

Section II: Socio- Economic Status of parents and academic performance

1. How does the education level of parents influence the academic performance of students in biology?

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2. To what extent does parents' occupation affect the academic performance of students in KCSE biology?

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3. How does the economic status of parents affect the performance of students in biology?

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.....

4. How does the family structure (composition) affect the performance of biology in your school?

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.....
.....

5. What can be done to address the parental related factors affecting students' academic performance?

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

**APPENDIX B: STUDENTS' BACKGROUND CHARACTERISTICS
QUESTIONNAIRE (SBCQ)**

Dear Student,

I am carrying out a study on the influence of selected students' characteristics on academic performance in biology among secondary school students in Nandi East Sub County. Being a student in one of the selected school, I am glad to inform you that you have been selected to participate in the study. You are kindly requested to sincerely respond to the items in the questionnaire. I would like to assure you that all the information provided will be used only for purposes of this study and your identity will be kept confidential.

Thank you.

Baraiywo, S.

Instructions

- i. Do not write your name or that of your school on the questionnaire.
- ii. Indicate the selected responses by placing a tick (✓) in the appropriate cell/box/provide the answer to a question in the given space

Section A: Student's Profile and Background

1. School status Boarding Day
2. Type of school: (a) Boys boarding (b) Girls boarding (c) Mixed boarding
(d) Mixed Day (e) Mixed Day and Boarding
3. Category of school: a) County (b) Sub County
4. What is your age?
5. What is your Gender? Male Female
6. Marks obtained in the Sub County evaluation test in biology
0-19% 20-39% 40-59% 60-79% 80% or above

Section B: Student's Attitude towards Biology

Put a tick (✓) on the option which best fit your choice following the key below: -

S.A (Strongly Agree), A (Agree), U (Undecided) D (Disagree), and S.D (Strongly Disagree)

Statement	S.A	A	U	D	S.D
1. Biology is very interesting.					
2. I don't like biology because it scares me.					
3. I am always under a lot of strain during biology lessons.					
4. Biology is enjoyable as it is fun to learn.					
5. I am comfortable learning biology because of its stimulating experiences.					
6. Biology makes me uncomfortable.					
7. I generally have good feelings about biology.					
8. I generally dislike the word biology.					
9. I approach biology with a feeling of hesitation.					
10. I really like biology.					
11. I have always enjoyed learning biology.					
12. Think about doing biology experiments makes me nervous.					
13. I like biology very much because am at ease during lessons.					
14. I like biology because I react positively to it.					

Section C: Student's Career Preference and Biology

Read carefully the following statements and tick against the appropriate option

S.A (Strongly Agree), A (Agree), U (Undecided) D (Disagree), and S.D (Strongly Disagree)

Statement	SA	A	U	D	SD
1. Biology will assist me pass examination the national examination.					
2. My parents/guardians encouraged me to take biology for my future career.					
3. Biology is the easiest option.					
4. Biology best suits my future career.					
5. I only opted for the biology because it is compulsory.					
6. There is a high demand for careers in fields related to biology,					
7. My career depends on how I will perform in biology in KCSE.					
8. The career I intend to pursue is not related to biology.					
9. My career preference is informed by my talent not performance in biology.					
10. Choice of biology was guided by my career preferences.					
11. A career in biology related field has been my childhood dream					

12. Suppose the decision about your future career was left entirely upon you, what would you like to do? (Tick only one)

i) Nursing [] ii) Engineering [] iii) Law [] iv) Journalism [] v) B.Com. []

vi) Medicine []vii) Sales and Marketing [] viii) Pharmacy ix) Agriculture []

13. When studying biology, are you aware of the career it would lead to? Yes/No

.....

Section D: Parental Socio-Economic Status

Put a tick (✓) on the option which best fit your choice on your parental socio-economic status: -

Q1. The house in which you live/reside with your parents/Guardians is

- | | | |
|-----|--|---|
| a). | Own permanent house with 5 or more rooms | 4 |
| b). | Rented/Govt. house with 5 or more rooms | 3 |
| c). | Own permanent/ Rented/Govt. house with 3-4 rooms | 3 |
| d). | Own permanent house with 1-2 rooms | 2 |
| d). | Rented/Govt. house with 1-2 rooms | 2 |
| e). | Own semi-permanent house with 1-5 rooms | 1 |

Q2. Do your parents/Guardians' employ house helps/house boys to assist in the household chores and family business?

- | | | |
|-----|---|---|
| a). | Employed >2 full time servants on salary for domestic work | 4 |
| b). | Employed only 1 full time servant on salary for domestic work | 3 |
| c). | Employed > 3 part time servants on salary for domestic work | 2 |
| d). | Employed 1-2 part time servants on salary for domestic work | 1 |
| e). | Employed no servants for domestic work | 0 |

Q3. How often do your parents purchase Biology reading materials for you?

- | | | |
|-----|---------|---|
| a). | Monthly | 4 |
| b). | Termly | 3 |
| c). | Yearly | 2 |
| d). | Rarely | 1 |
| e). | Never | 0 |

Q4. What is the average expenditure on Biology literature materials per year in your home?

- | | | |
|-----|--------------------|---|
| a). | Above Ksh 2500 | 5 |
| b). | Ksh 2500 | 4 |
| c). | Ksh 2000 | 3 |
| d). | Ksh 1500 | 2 |
| e). | Less than Ksh 1000 | 1 |

Q5. Family possessions (presence of each item given below will carry score of 1 each)

- | | |
|-----|-------------------------------|
| a). | Refrigerator |
| b). | TV |
| c). | Radio/Transistor/Music system |
| d). | Washing Machine |
| e). | Credit card |
| f). | Mobile Telephone |
| g). | Car /Tractor/Truck |

- h). Microwave
- i). Cookers
- j). Any newspaper bought throughout the month

Information on parental Education level

Q6. Indicate your father's highest level of Educational attainment

- a). Ph.D. Level 7
- b). Masters Level 6
- c). Bachelor's Degree Level 5
- d). Certificate level 4
- e). Secondary School level 3
- f). Primary school level 2
- g). Primary school drop-out 1
- h). Never attended school 0

Q7. Indicate your mother's highest level of Educational attainment

- a). Ph.D. Level 7
- b). Masters Level 6
- c). Bachelor's Degree Level 5
- d). Certificate level 4
- e). Secondary School level 3
- f). Primary school level 2
- g). Primary school drop-out 1
- h). Never attended school 0

Q8. How often do your parents assist you in your homework?

- a). Daily 3
- b). Weekly 2
- c). Once in a while 1
- d). Never at all 0

Information on parental occupation

Q09. Which of the following applies to your parents/ Guardian?

- | | | |
|-----|-------------------|---|
| a). | Both employed | 5 |
| b). | One employed | 4 |
| c). | Bothself-employed | 3 |
| d). | One self-employed | 2 |
| e). | Casual labourers | 1 |
| f). | Both unemployed | 0 |

Information on family structure

Q10.What type of family do you come from?

- | | | |
|-----|---------------|---|
| a). | Both parents | 4 |
| b). | Single parent | 3 |
| c). | Widower | 2 |
| d). | Widow | 2 |
| e). | Guardian | 1 |

Q11. Number of members in your family/siblings (yourself included)

- | | | |
|-----|------------|---|
| a). | 1 | 6 |
| b). | 2 | 5 |
| c). | 3 | 4 |
| d). | 4 | 3 |
| e). | 5 | 2 |
| f). | 6 | 1 |
| g). | 7 and more | 0 |

Thank You for your Cooperation

**APPENDIX C: KREJCIE AND MORGAN (1970) SAMPLE SIZES FOR DIFFERENT
POPULATION SIZES**

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	241	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

APPENDIX D: ACADEMIC PERFORMANCE EVALUATION SCALE IN BIOLOGY

Marks (Mean score)	Evaluation	Grade
19% and below	Very poor	E
20 - 39%	Poor	D
40 - 59%	Average	C
60 - 79%	Good	B
80% and above	Very good	A

(KNEC, 2016)

APPENDIX E: LOCATION OF NANDI COUNTY IN KENYA



Source: Kenya National Bureau of Statistics, 2013

APPENDIX F: RESEARCH AUTHORIZATION LETTER



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: 020 400 7000.
0713 788787,0735404245
Fax: +254-20-318245,318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/17/70257/19315**

Date: **21st September, 2017**

Stanley Kiprotich Baraiywo
Egerton University
P.O. Box 536-20115
EGERTON.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Influence of selected students characteristics on academic performance in biology among secondary school students in Nandi Hills Sub County, Nandi County, Kenya,”* I am pleased to inform you that you have been authorized to undertake research in **Nandi County** for the period ending **21st September, 2018.**

You are advised to report to **the County Commissioner and the County Director of Education, Nandi County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

**GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO**

Copy to:

The County Commissioner
Nandi County.

APPENDIX G: RESEARCH PERMIT

THIS IS TO CERTIFY THAT:
MR. STANLEY KIPROTICH BARAIYWO
of EGERTON UNIVERSITY, 0-30100
ELDORET, has been permitted to conduct
research in *Nandi County*


Permit No : NACOSTI/P/17/70257/19315
Date Of Issue : 21st September, 2017
Fee Received : Ksh 1000

on the topic: *INFLUENCE OF SELECTED
STUDENTS CHARACTERISTICS ON
ACADEMIC PERFORMANCE IN BIOLOGY
AMONG SECONDARY-SCHOOL STUDENTS
IN NANDI HILLS SUB COUNTY, NANDI
COUNTY, KENYA*



for the period ending:
21st September, 2018


Applicant's
Signature


Director General
National Commission for Science,
Technology & Innovation

CONDITIONS

1. The License is valid for the proposed research, research site specified period.
2. Both the Licence and any rights thereunder are non-transferable.
3. Upon request of the Commission, the Licensee shall submit a progress report.
4. The Licensee shall report to the County Director of Education and County Governor in the area of research before commencement of the research.
5. Excavation, filming and collection of specimens are subject to further permissions from relevant Government agencies.
6. This Licence does not give authority to transfer research materials.
7. The Licensee shall submit two (2) hard copies and upload a soft copy of their final report.
8. The Commission reserves the right to modify the conditions of this Licence including its cancellation without prior notice.



REPUBLIC OF KENYA



National Commission for Science,
Technology and Innovation

RESEARCH CLEARANCE
PERMIT

Serial No.A 15873

CONDITIONS: see back page

APPENDIX H: COUNTY COMMISSIONER'S RESEARCH AUTHORIZATION LETTER

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

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



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

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

25th September, 2017

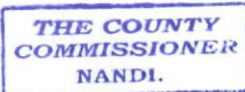
Stanley Kiprotich Baraiywo
Egerton University,
P.O. Box 536 - 20115
EGERTON

RE: RESEARCH AUTHORIZATION

This is in reference to letter No. NACOSTI/P/17/70257/19315 dated 21st September, 2017 from the Director General/CEO, National Commission for Science, Technology and Innovation on the above subject matter.

You are hereby authorized to conduct a research on **“Influence of selected students’ characteristics on academic performance in biology among secondary school students in Nandi East Sub County”** in Nandi County for the period ending **21st September, 2018.**

Wishing you all the best.



JACINTAH K. MUKHULA,
For: COUNTY COMMISSIONER,
NANDI.

Copy to:

The Deputy County Commissioner,
NANDI EAST

**APPENDIX I: COUNTY DIRECTOR OF EDUCATION'S RESEARCH
AUTHORIZATION LETTER**

REPUBLIC OF KENYA



MINISTRY OF EDUCATION
STATE DEPARTMENT FOR BASIC EDUCATION

Email: cdenandicounty@yahoo.com
Telephone: 0773044624
When replying please quote

COUNTY DIRECTOR OF EDUCATION,
NANDI
P.O BOX 36 – 30300,
KAPSABET.

Ref:NDI/CDE/RESEARCH/1/VOL.II/48

DATE: 27th September, 2017

Stanley Kiprotich Baraiyo,
Egerton University,
P.O Box 536-20115,
EGERTON

RE: RESEARCH AUTHORISATION

The above named person has been granted permission by the CDE to carry out research on *'influence of students characteristics on academic performance in biology among secondary school students in Nandi hills sub county, Nandi county Kenya* for the period ending 21st September, 2018

Kindly provide him all necessary support he requires

A handwritten signature in blue ink is written over a blue rectangular official stamp. The stamp contains the text: "For: County Director of Education NANDI COUNTY".

Clare Kusa
For: County Director of Education
NANDI COUNTY