PREDICTIVE VALIDITY OF KENYA CERTIFICATE OF PRIMARY EDUCATION AMONG PUBLIC SECONDARY SCHOOL STUDENTS IN KISII CENTRAL SUB-COUNTY, KENYA: ANALYSIS OF GENDER AND SCHOOL DIFFERENCES

BY

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DECLARATION

Declaration by the student:
I declare that this is my original work and has not been presented or produced for any degree in any university.

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Dedication

I dedicate this work to my late father, Jorim Agingu, who encouraged me to continue learning, arguing that learning should have no end; my husband, Dr. Peter Owino and my children Audrey, Ibrahim and Christian.

ABSTRACT

In Kenya, one use of public examinations is for selection for further education. The Kenya Certificate of Primary Education (KCPE) is the first public examination used for selecting learners into secondary schools. In 2009, Kisii Central had 8,514 KCPE candidates from 261 schools who scored a mean of 229.34 out of 500 marks. Only 0.36% were selected to join national schools while 35.9% and 39.6% joined provincial and district secondary schools respectively as 24.1% missed secondary school places. When the same cohort sat for Kenya Certificate of Secondary Education (KCSE) in 2013 the district had a mean of 5.1 out of 12 points. It was therefore necessary to determine the effectiveness of using KCPE as a selection tool for secondary school admission. The purpose of this study was to determine the predictive validity of KCPE among public secondary school students in Kisii central Sub-county, Kenya: analysis of gender and school differences. Objectives of the study were to: determine the predictive validity of KCPE scores for KCSE scores; investigate gender differences in the predictive validity of KCPE scores for KCSE scores; investigate school category differences in the KCPE-KCSE scores relationship and to investigate school size differences in the KCPE-KCSE scores relationship. This study was guided by a conceptual framework where KCPE was the independent variable, KCSE the dependent variable while students' gender, school category and size were intervening factors. It adopted Correlational and *Ex-post-facto* research designs. The study population was 3,897 KCSE candidates from 55 public secondary schools. Stratified random sampling based on school type and size was used to select 16 public secondary schools for the study. Saturated sampling was employed to include all KCSE candidates whose KCPE marks were available in each sampled school, yielding a sample of 1,391 students. Data used included 2006 KCPE scores and 2010 KCSE scores of the same students under study. Data was collected using a researcher made pro forma. It was analyzed quantitatively using correlations and regression analyses. Validity of the instrument was established by presenting it to experts in the Department of Educational Psychology, School of Education for verification. Reliability indices were not calculated because data used were scores of standardized national examinations which could not be manipulated further. Results showed a strong positive Pearson's correlation coefficient ($r=0.693$; $n=1391$; $p < 0.05$) between KCPE and KCSE scores. There was no statistically significant difference in correlation of KCSE and KCPE scores based on gender, school category and school size. The study concluded that KCPE scores is a good predictor of KCSE scores regardless of learners' gender, school category and size. It recommended that; KCPE should continue to be used as selection tool for secondary school admission; both male and female learners should be accorded equal encouragement to improve their academic outcomes; learners should be encouraged to join any type of school convenient to them regardless of category or size and school evaluation using KCSE examination scores should be based on students' KCPE scores. Significance of the study may be to serve as a reference for stakeholders interested in finding out more about predictive validity of other selection examinations, to help education stakeholders gauge the effectiveness of use of KCPE as a selection tool for secondary school admission, determine the level of value addition to learners by secondary schools and identify weak learners in advance so as to employ special teaching and learning strategies which help them improve their grades.

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LIST OF ABBREVIATIONS

DAT: Differential Aptitude Test

EFA: Education for all

GPA: Grade Point Average (in the United States of America)

HSGPA: High School Grade Point Average (in the United States of America)

IBTS: Iowa Test of Basic Skills

JCE: Junior Certificate Examination (in Malawi)

KCPE: Kenya Certificate of Primary Education

KCSE: Kenya Certificate of Secondary Education

KNEC: Kenya National Examination Council

MAP: Millers Assessment for Preschoolers (in Israel)

NGO: Non-Governmental Organization

PSLCE: Primary School Leaving Certificate Examination (in Malawi)

SAT: Scholastic Aptitude Test (in the United States of America)

UNESCO: United Nations Educational, Scientific and Cultural Organization

USAID: The United States Agency for International Development

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CHAPTER ONE

INTRODUCTION

In this chapter, the researcher presents an overview of background to the study; statement of the problem; purpose of the study which includes specific objectives and research questions; assumptions, scope and limitations, significance, conceptual framework of the study and definitions of terms used in the study.

1.1 Background to the Study

Success in educational instruction is measured by the performance of students in external examinations. The examinations are used to measure the level of candidates' achievement. For policy makers, examinations are used to evaluate the curriculum implementation. For teachers and students, they are used for promotion to the next level of learning and for certification (Jagero, 2013). Examinations are also used for selection of students to advanced training programs (Masibau & Adigun, 2010)

According to Hall (2015), whether or not past performance can predict future performance has been a highly debated issue, again with sex differences being considered. Hall reports that in a study which examined how home and motivational factors affected high school boys' and girls' academic achievement, researchers found that the best predictor of achievement was previous achievement. This was in agreement with studies conducted by Sacket, Kunal, Arneson, Cooper and Waters (2009, as cited in Hall, 2015) which stated that scores on admission tests were indeed predictive of academic performance as indexed by grades. This study by Hall reported a higher correlation between the predictor and criterion examination for male compared to female

learners. It would therefore be important to investigate learners' gender differences on the relationship between previous achievement (KCPE scores) and future achievement (KCSE scores) in a different setting such as Kisii Central sub-county.

However, while Obioma and Salau, (2007) have shown that high stakes examinations were statistically significant, they were found not to be of much practical importance in predicting the achievement of students. Hall further postulated that allocation to secondary schools based on a one-off examination did not give everyone taking the examination a fair chance to receive maximum results. There were many factors that could prevent exceptional students from performing their best on the examination day such as illness and test anxiety as indicated in the New York State Examination Department, 2004.

It is evident from the report by Hall (2015) as shown above that there are conflicting views on the effectiveness of using past examination scores to predict learners' future scores. A study of the predictive validity of KCPE scores for KCSE scores would therefore make an important contribution to this debate and probably set this matter to rest.

According to Abbott, Joireman and Stroh (2002) in a technical report for Washington School Research Center, new interests in the effect of school size on academic achievement had grown in the recent years. Policy makers and practitioners, according to this report, had suggested new models of schools based on the idea that smaller was better. As these models had gained currency, there was also a call for research to investigate the likely effect of creating smaller schools. The big question was whether smaller schools were needed as a strategy to improve

students' academic achievement. A study of relationship between KCPE scores and KCSE scores for different school sizes would therefore answer the above concern

.

In test validity, any device employed by an individual or an examining body for the purpose of selecting candidates for any training program in a given field should be able to measure as accurately as possible the probability that such candidate will pass or fail (Alonge, 1989 as cited in Ugwuda & Okechukwu, 2013; Masibau & Adigun,2010). This is to say that success or failure is an effect of the method of selection of candidates for such a training program. This is the core of test validity. Since one important use of KCPE scores is to select learners to various cadres of secondary schools, its predictive validity needs to be clearly known. This was the purpose of this study.

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The question of gender differences in academic achievement in secondary schools in Africa is neither conclusive nor unanimous. In some countries such as Kenya, girls have lower academic achievement than boys, while in Mali, there is no difference in performance between boys and girls (Bathes, Nair & Malpade, 2000).

However, according to Mensch and Lloyd (1997), studies in Nigeria and Thailand have shown a higher achievement for girls in single sex schools relative to mixed schools but lower academic achievement for boys when schools with similar resources are compared. Due to the inconclusive findings on gender differences in academic achievement, it was necessary to investigate gender differences in the predictive validity of KCPE scores in Kisii Central sub-county.

In Kenya, public examinations have been used for decades as a selection instrument for further education and training. The Kenya Certificate of Primary Education (KCPE) is the first of such selection examinations (Othuon & Kishor, 1994). At the end of four years in secondary school, students take the Kenya Certificate of Secondary Education (KCSE) examination. In a study carried out by Othuon and Kishor (1994) to determine the extent to which KCPE predicts success in KCSE, a moderate linear relationship of Pearson's correlation coefficient r= .56 $p<0.01$ between KCPE and KCSE was found. It is noteworthy, however, that when this study was carried out, the number of KCPE examination subjects in 1987 was six, giving a possible maximum score of 600 marks or 72 points. The KCSE 1991 which was used in this study was scored out of 120 points as it was mandatory for each candidate to sit for a minimum of 10 subjects. Both primary and secondary school syllabi were later revised such that the number of examinable subjects for KCPE was reduced to five, implying a possible maximum score of 500 marks while for KCSE they were reduced to seven, implying a possible maximum score of 84 points (Education info Center, 2006; Ministry of Education, 2008). This was done with an aim of reducing work load for learners and improving their academic achievement. It was therefore necessary to carry out a study which would determine the relationship between KCPE scores and KCSE scores for learners after the syllabi revision.

It was further reported in the study by Othuon and Kishor (1994) that predictive validity of KCPE did not significantly vary from one school to another. It was therefore important to find out the school category differences on the predictive validity of KCPE for KCSE in Kisii Central Sub-county.

Currently (2015), the Basic Education Amendment Bill (2014) which seeks to scrap the KCPE and KCSE examinations has been tabled in Kenya's Parliament. The amendments in this bill propose end year progress examinations for pupils in primary and students in secondary schools. The yearly progress examination reports should then be computed and averaged to arrive at the learner's final grade which will be used to ensure pupils go to secondary schools and students proceed to university (Murimi, 2015). This state of affairs is a serious pointer that the law makers in Kenya have begun to doubt the role of KCPE and KCSE as selection tools for placement of learners to the next program of education. An investigation into the predictive validity of KCPE scores for KCSE scores would therefore justify whether this national examination should be scrapped or retained.

A study conducted in the neighboring Nyamira sub-county in Nyamira County, Ondima, Nyamasege, Mogwambo and Ochoti (2013) reported that learners' performance in KCPE was very crucial in determining their final grade in KCSE. Depending on the institution learners were admitted to, they would improve, maintain or drop their grade. This study did not investigate the effect of the type of secondary school a learner was admitted to on the relationship between their KCPE and KCSE scores. A study was therefore necessary to determine the school category differences on the nature and strength of the KCSE-KCPE relationship

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The study by Ondima, Nyamasege, Mogwambo and Ochoti (2013) found a Pearson's correlation coefficient of $r= .661$, $p< 0.01$ between KCPE and KCSE scores of students under study. However, they further noted that some students who do not score good marks in KCPE pass in KCSE while some who score good KCPE marks and up getting low KCSE marks. It was

therefore vital to find out the level of predictive validity of KCPE for KCSE among students in Kisii Central Sub-county.

1.2 Statement of the Problem

From the background information it is observed that while some studies report effectiveness of past examination scores in predicting future scores, others differ and suggest that past examination scores are not effective in predicting future scores. On the same note, some separate studies also postulated that some learners score very highly in KCPE but end up failing at KCSE while others improve as yet others maintain.

The fact that there is currently (2015) a bill in the parliament of Kenya seeking to do away with KCPE and KCSE examinations in favour of other examinations clearly indicates that their role as selection tools for further education is being doubted. A study of predictive validity of KCPE examination score could therefore point at its effectiveness as a selection tool and either propose its continued use or support its exclusion from the education system.

On gender differences in academic achievement, there are reports of girls having a lower academic achievement than boys. Other studies however report higher academic achievement for girls than for boys. There is further no conclusive report on how past exam score predict future examination score differently for male and female learners.

Past predictive validity studies have not given a conclusive report on how the type of secondary school a learner is admitted to would affect the predictive validity of KCPE. Some studies found no difference in the level of predictive validity of KCPE for KCSE from one school to another. A separate study suggested that the type of secondary school a student is admitted to may affect the strength of relationship between their KCPE and KCSE scores but did not go ahead to investigate school category differences in the relationship between KCPE and KCSE scores for the study subjects.

Studies on effect of school size on learners' academic achievement reported that while large schools benefited achievement in affluent communities, it was detrimental in impoverished communities. It was observed that policy makers and practitioners in Washington had suggested new models of schools based on the idea that smaller was better. It was therefore imperative to answer the question as to whether small schools or large schools are needed as a strategy to improve students' academic achievement. This was done by investigating school size differences in the prediction of KCSE scores form KCPE scores.

Selection of form one students to various cadres of secondary schools is merit-based in such a way that high achieving learners are placed in national and provincial boarding schools while low achievers are placed in day schools as others fail to secure any place in secondary school at all due to very low KCPE scores. Parents, learners and education stakeholders can always tell whether and where a learner is likely to be admitted for secondary school education based on their KCPE scores. In 2009, Kisii Central had 8,514 KCPE candidates from 261 schools that

scored a mean of 229.34 out of 500 marks. Only 31 (0.36%) were selected to join national schools while 3,060 (35.9%) and 3,375 (39.6%) joined provincial and district secondary schools respectively as 2,048 (24.1%) missed places in secondary schools. When the same cohort sat for Kenya Certificate of Secondary Education (KCSE) in 2013 the district had a mean of 5.1 out of 12 points. Since KCPE examination score is accorded such a central role in selection of learners for secondary school education where it determines their fate with such finality, it was important to verify, through an empirical study, its effectiveness as a selection tool for secondary school education in Kisii Central Sub-County.

1.3 Purpose of the Study

The purpose of this study was to investigate the predictive validity of KCPE among public secondary school students in Kisii Central Sub-county, Kenya, with analysis of gender and school differences based the following specific objectives;

1.4 Objectives of the Study

The objectives of the study were as follows;

1) To determine the predictive validity of KCPE scores for KCSE scores.
2) To investigate gender differences in the predictive validity of KCPE scores for KCSE scores
3) To investigate school category (Day or Boarding) differences in the KCPE-KCSE scores relationship

4) To investigate school size differences in the KCPE-KCSE scores relationship

1.5 Research Questions

The objectives were addressed by the following research questions;

1) What is the predictive validity of KCPE scores for KCSE scores in public secondary schools in Kisii Central Sub-County?
2) What is the gender difference in the predictive validity of KCPE scores for KCSE scores?
3) What is the school category difference in the KCPE-KCSE scores relationship?
4) What is the school size difference in the KCPE-KCSE scores relationship?

1.6 Assumptions of the Study

The study was based on the following assumptions;

1) That KCPE and KCSE, being standardized national examinations, are unbiased and reliable measure of academic performance of learners in primary and secondary schools respectively.
2) That all learners complete their syllabi by the time of seating for KCPE and KCSE examinations.
3) That teachers in all public primary and secondary schools have the required qualifications and teaching skills

1.7 Scope and Limitations of the Study

The following were the scope and limitations of the study;

1.7.1 Scope of the Study

The study was carried out in public secondary schools in Kisii Central Sub-County which comprised Mosocho, Getembe (Township), Kiogoro and Keumbu Divisions. It did not include private secondary schools.

1.7.2 Limitations of the Study

The study used *ex-post facto* and correlational designs. In *ex-post facto* design, data was collected from schools for students who had completed their secondary school course and left. As such, they were not available for interviewing to get more information from them. The correlational design, on the other hand, would not show the causes of the results obtained from the study.

Nevertheless, *ex-post facto* was the most appropriate design for this study since the data required for the study was from scores of examinations which had already been done and could be obtained without the presence of the study subjects. The correlational design was sufficient for the study since the purpose of the study was not to find out the reasons for the examination scores attained but to determine the strength of correlation between scores of two examinations.

1.8 Significance of the Study

The study set out to determine the validity of KCPE scores as a predictor of KCSE scores in public secondary schools in Kisii Central Sub-County, Kenya. The findings of this study may be important to education researchers, parents, teachers and stakeholders in education including the Ministry of Education in the following ways;

a) The findings may act as a source of reference for educationists, researchers and policy makers who are interested in finding out more about predictive validity of other examinations used as selection tools for further education.
b) It may help education stakeholders gauge the effectiveness of KCPE as a selection tool for secondary school admission.
c) It may help education analysts to evaluate secondary schools' KCSE scores based on the KCPE mean score for the candidates rather than the blanket evaluation of schools without regard to the KCPE scores of the learners as they were admitted to Form One in those schools.
d) It may help to identify students and schools with added value at the end of their academic course vis a vis those that stagnate or reduce value based on the relationship between their predictor and criterion examination scores.
e) The study may help identify "weak" learners in advance and special teaching and learning strategies used to help them improve on their grade.

1.9 Conceptual framework of the Study

The conceptual framework of the study is represented in the following figure 1

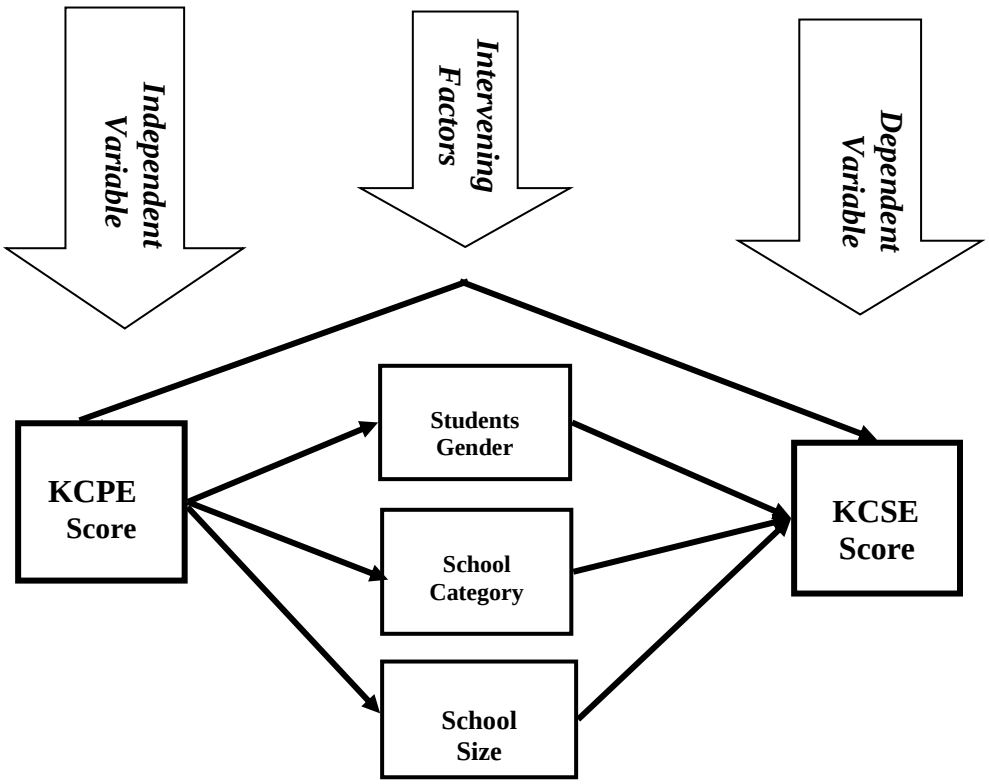

Fig. 1 Conceptual framework of the study showing the interrelationship between KCPE and KCSE scores
Source: researcher

In the conceptual framework (see Fig. 1), KCPE scores is the independent variable while KCSE scores for the same candidates is the dependent variable. The intervening factors that may affect the relationship between the independent and the dependent variables were; student's gender, school category and school size.

It is postulated that the KCSE scores of a learner is primarily dependent on his or her KCPE scores in such a way that the score attained in KCPE directly affects the score attained in KCSE. Other factors such as learner's gender, category of secondary school attended and size of secondary school may however affect the relationship between KCSE and KCPE further. This may result in the relationship between KCPE and KCSE scores being stronger for one gender than the other; or for learners in a day school than their counterparts in boarding schools or vice versa. On the same note the KCPE-KCSE relationship could be strongest for learners in large, medium sized or small schools compared to other school sizes.

The researcher therefore set out to investigate the level of relationship between KCPE and KCSE scores for all the learners selected regardless of the intervening factors; the level of the KCPE-KCSE relationship among female compared to male learners; among boarding compared to day school learners and among learners of large medium and small sized schools.

1.10 Definitions of Terms

The operational definition of terms used in this study are given in this section as follows;

Predictive Validity: The strength of the ability of an independent variable to predict the outcome of another variable, referred to as dependent variable.

Independent Variable: The variable which is manipulated by the experimenter.

Dependent Variable: The subjects' response as caused by the independent variable.

Academic achievement/ Academic performance: The scholastic standing of a learner at a given moment. It refers to how an individual is able to demonstrate his or her intellectual abilities which could be explained as the grades obtained in a course or group of courses taken.

Kenya Certificate of Primary Education (KCPE): This is the first standardized national examination in Kenya, taken by pupils at the end of Grade Eight to determine their admission to public secondary schools.

Kenya Certificate of Secondary Education (KCSE): This is a standardized national examination taken by students in Kenya at the end of their Fourth form (Grade 12) in secondary school to determine their admission to tertiary institutions of learning.

Stakeholders: All interested parties in the education sector including researchers, education planners, parents, teachers, learners and the ministry of education personnel.

School Category: Classification of schools according to whether they are Day or Boarding schools.

Day School: A school in which learners operate from their homes daily.

Boarding School: They are also referred to as residence schools. These are schools which house learners in dormitories and only release them to go home during mid-term breaks and school holidays.

School Size: This is classification of schools according to the number of streams per class in the school.

Large school: this is a school with three or more streams for the form four candidate class.

Medium school: a school with two streams for the form four candidate class.

Small school: a school with one stream for the form four candidate class.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents literature review on use of examinations to predict learners' future scores; gender differences in academic achievement; school category differences in learners' academic achievement; school size differences in learners' academic achievement.

2.2 Use of Examination Scores to Predict Learners' future Scores

According to Hall (2015) whether or not past performance can predict future performance for learners has been a highly debated issue. In a study carried out to examine the validity of secondary school entrance scores in predicting the academic success of secondary school aged students, Hall found a correlation coefficient of $r= 0.54$, $p< 0.0005$ between Barbados Secondary School Entrance Examination (BSSEE) and Caribbean Secondary Education Certificate (CSEC). This study suggested that teachers should use students' performance in BSSEE as a diagnostic tool for remediation whereby it would identify the deficiencies students possess at this stage. This knowledge could be employed to inform the development of remedial programs for students who perform poorly on the BSSEE

.

The study by Hall (2015) was in agreement with an earlier study by Hattie (2012, as cited in Hall, 2015) who found that prior achievement was a significant contributor to future performance. However, many studies and official reports have pointed to the limitation of public examinations. These include a report given by Kellaghan and Maduas (2003, as cited in Hall, 2015) that suggested a heavy reliance on paper and pencil tests limits the knowledge and skills

that can be tested and that exams contain very little reference to the everyday life of the student outside the school. On the same vein, Wu, Huges and Knok (2010) argued that allocation of secondary schools based on a one-off examination does not give everyone taking the exam affair chance to receive maximum results and that there are many factors that prevent exceptional students from performing their best on the examination day. Another study by Obioma and Salau (2007) reported that although high stake examinations were statistically significant, they were found not to be of much practical importance in predicting the achievement of students. The study by Hall (2015) used entry exanimations set by various schools admitting students to secondary schools as the independent variable. It was therefore important to find out the relationship between scores in a standardized past examination (KCPE) and scores in a future examination (KCSE) in Kisii central sub-county in Kenya.

In Nigeria, a study conducted by Ugwuda and Okechukwu (2013) to examine the predictive validity of Nigerian Examination Council (NECO) Junior School Certificate Examination on students' achievement in NECO Senior School Certificate Examination, it was concluded that achievement of students in core subjects at the JSCE could positively predict students' performance at the SSCE. The core subjects in this study were English, Igbo language, Math and Social studies. This study did not include aggregate score of all the subjects offered at each level of examination. Therefore the study conducted in Kisii central sub-county sought to find the predictive validity of aggregate KCPE scores on aggregate KCSE scores.

In Malawi, the problem of limited places in government secondary schools forces the government to use scores in the Primary School Leaving Certificate Examination (PSLCE) to

select learners into the available Form One places in order of merit. With this system, the Ministry of Education ensures that the top performers on the PSLCE are able to attend the top secondary schools (de Hoop, 2010). A study of the 2004 PSLCE candidates admitted in conventional government schools after two years of secondary school in 2006, revealed a strong evidence of the positive impact of selection into a conventional school on the probability of passing the Junior Certificate Examination (JCE). This study however did not give the level of strength of association between PSLCE and JCE examination scores but instead gave the percentages of pupils who passed JCE after being selected to various schools based on their score on PSLCE. It is also noteworthy that in the Malawi study PSLCE and JCE scores were correlated after two years (at the end of Form Two). It would therefore be needful to correlate the scores of learners under study after four years (at the end of Form Four). This would reveal whether the relationship between scores in a past examination would still be strong or weaken if the duration between the two examinations was longer.

In a study conducted in Tanzania to investigate the predictive validity of Form Two Secondary Education Examination (FTSEE) on students' performance in in the Certificate of Secondary Education Examination (CSEE) in Biology Komba, Kafanabo, Tryphone and Kira (2013) found a positive correlation between FTSEE and CSEE. This study did not however include aggregate score of all subjects offered at each level of examination. It covered only one subject, Biology, which could not give a true picture on the predictive validity of the FTSEE examination.

According to Amburo (2011), a study carried out in Nyanza, Rift Valley and Western Kenya found a Pearson's correlation coefficient of $r= 0.452$, $p<.01$ between KCPE raw mark of learners

from public primary schools and KCSE raw marks of learners from public secondary schools. The study used purposive sampling technique where six provincial secondary schools were involved. The outcome of this study could be therefore as a result of the fact that samples were drawn from schools with almost similar characteristics. Could the outcome be therefore different if different levels and types of schools were used in a separate study? The study in Kisii Central sub-county set out to answer this question.

In Kenya, an article carried in the QUEST News in March 2008 reported that top students in Grade Eight examinations are likely to perform just as well in secondary examinations. Despite this trend, it went on, statistics however show that some students who excelled in Grade Eight failed to clinch the top 100 slots in the secondary examinations. In the 2007 KCSE results, some students who five years earlier did not perform well emerged among the top 100 nationally. These claims were not backed by results from any empirical study which could have given a true picture of the status.

Another study of the predictive validity of the Kenya Certificate of Primary Education (KCPE) examination was carried out by Othuon and Kishor (1994) to determine the extent to which KCPE predicts success in KCSE found a moderate linear relationship ($r = .56$; $n=781$; $p<0.01$) between KCPE and KCSE. The predictive validity did not significantly vary from one school to the other. Stratified random sampling technique was used to select 26 secondary schools within a single district, South Nyanza District, in Kenya. The study concluded that KCPE was a moderate predictor of success in secondary school. Since this study was carried out, the KCPE and KCSE syllabi have so far changed in terms of number and content of mandatory examinable subjects.

According to the Kenya National Examination Council, the 1987 KCPE examination comprised six examinable subjects, namely Mathematics, English, Kiswahili, Science & Agriculture, Geography, History, Civics & Religious education, and Art & Craft, Home science & Music. In the 2006 KCPE examination, the number of subjects was reduced to five whereby Art & Craft, Home science & Music was excluded. Besides, Agriculture was removed from science as an examinable subject. In KCSE 1991, learners were graded for 10 mandatory subjects while in 2010 KCSE a learner required only seven mandatory subjects to be graded. It was therefore necessary to re-examine the predictive validity of KCPE for KCSE after the syllabi revision in order to find out whether syllabi revision made KCPE a better or worse predictor of KCSE, hence the Kisii Central sub-county study.

In a study using regression analysis of entry scores (KCPE) and final scores (KCSE), Ondima, Nyamasege, Mogwambo and Ochoti (2013) postulated that some students who do not score good marks in KCPE pass in KCSE while those who score good marks end up scoring low in KCSE as some maintain. Their study which was carried out in Nyamira sub-county of Nyamira county found a strong positive relationship of Pearson's correlation coefficient r= .661 between KCPE and KCSE, scores. Since Kisii Central Sub-county neighbors Nyamira sub-county, it was important to find out if this status was the same or differed especially if a bigger sample size was used given that the Nyamira sub-county study used a sample size of 572 only.

2.3 Gender Differences in Academic Achievement

The question of whether there are gender differences in learners' academic achievement has been given a wide coverage the world over. However fewer correlational studies of past and future

examination scores with consideration of the gender factor have been done. Hall (2015) in a study to examine the validity of secondary school entrance scores in predicting academic success of secondary school aged students, a positive relationship was found between the score on Barbados Secondary School Entrance Examination (BSSEE) and that of Caribbean Secondary Education Certificate (CSEE) for both males and females. In this study Hall further found that there was a higher correlation coefficient between BSSEE and CSEE for males than for females. Given that this study used a sample of 130 male and 122 female students, it was imperative to investigate the outcome of this relationship in Kenya and especially Kisii, using a larger sample size.

According to Dayioglu and Turut (2004), men's average level of schooling far exceeds that of women in Turkey though there seems to be a faster improvement among the later. Using a sample of 10,343 the researchers attempted to determine whether there were significant gender differences in academic performance among undergraduate students at Middle East Technical University (METU). The study established that despite their lower university entrance scores and under-representation in most departments, female undergraduate students outperformed their male counterparts during their college years. The study carried out at METU was simply on academic achievement, done without correlating learners' earlier achievement with latter achievement.

A longitudinal study conducted in Australia on learners from age 8 to age 25 found that there was a pervasive tendency for females to outperform males on measures of educational achievement (Gibb, Fergusson & Horwood, 2011). This tendency was consistent across a variety

measures of educational achievement including standardized tests, attainment of high school qualifications, university attendance and university degree attainment. However, when classroom behavior was improved for both males and females, gender differences were reduced drastically. Once again Gibb, Fergusson and Horwood (2011) in their study simply considered academic achievement of both male and female learners at various levels without considering the relationship between their previous and future examination scores.

The question of gender differences in academic achievement in secondary schools in Africa is neither conclusive nor unanimous. In some countries such as Kenya, girls have lower academic achievement than boys, while in Mali, there is no difference in performance between boys and girls (Bathes, Nair & Malpade, 2000). However, according to Mensch and Lloyd (1997), studies in Nigeria have shown a higher achievement for girls in single sex schools relative to mixed schools but lower achievement for boys when schools with similar resources are compared.

Ugwuda and Okechukwu (2013) carried out a study to examine the predictive validity of Nigerian Junior School Certificate Examination (JSCE) on students' achievement in Senior School Certificate Examination (SSCE) in which male students were found to perform better than female students in Igbo language and Math in JSCE while females performed better than males in social studies. In SSCE males performed better than females in all core subjects under investigation implying that gender was one of the determining factors in students' achievement in SSCE. The study further revealed that the predictive strength of JSCE on SSCE was significantly moderated by gender in all the subjects under investigation. Although this study considered the gender factor in the predictive validity of each core subject, it did not consider the

gender factor in the aggregate JSCE and SSCE scores. This would be very important given that certificates are usually issued and used based on aggregate scores before scores on individual subjects are considered. This is why in the Kisii Central sub-county, the aggregate KCPE and KCSE scores were used when considering gender differences in the relationship between the two examinations.

In Tanzania, Komba, Kafanabo, Tryphone and Kira (2013) investigated the predictive validity of Form Two Secondary Education Examination (FTSEE) on students' performance in the Certificate of Secondary Education Examination (CSEE) in Biology in which a higher relationship was observed for females between the two examinations than for males when the whole sample was considered. In this study the duration between the FTSEE and the CSEE was only two years. Again, both examinations were taken at secondary school level. Given that examinations are used for selection into the next level of learning, a predictive validity study should consider a primary school level examination as an independent variable. This would help preserve the few secondary school places available for only those who are likely to pass the secondary level examination.

According to Agak (1995), in a study carried out among 14 year old learners to find out the relationship between reading literacy and academic achievement in Kenya, the level of reading literacy seemed to interact with gender and location in such a way that urban girls were better than urban boys, whereas rural boys were better than rural girls. In the same study, boys appeared to have higher mean performance for the subjects at KCPE than girls. The performance

of male and female students in this study were no correlated with their earlier achievements in standardized national examinations.

In a separate study conducted by Jagero (2013) in one private school in Western Kenya, using a study sample of 110 students (82 boys and 28 girls) girls performed better in KCSE compared to boys although the girls were admitted to secondary school with a lower KCPE mean score compared to boys. The study further reported a higher predictive validity between KCPE and KCSE for girls than for boys. The sample in this study was not representative and therefore lacked external validity. According to Trochim (2006), external validity is the degree to which the conclusions in a study would hold for other persons in other places at other times. This, according to Trochim depends on the sample model used. If the sample is not representative of the population, the results cannot be generalized back to the population.

According to Makworo, Wasanga and Olaly (2014) a report from Kenyenya in Kisii County indicated that girls' academic achievement at KCSE had been far lower than that of boys in the years 2009, 2010 and 2011. Further, no girl had scored a mean grade A or A- in the previous three years in the area. This was attributed to the girls' negative attitude towards their studies and negative academic self-concept. This study did not correlate girls' academic achievement at KCSE with an earlier grade to find out how well the earlier academic achievement of male and female learners predicted their future academic achievement. This would help planners and stake holders predict early enough the learners who were likely to pass or fail at KCSE examination.

In Kisii Central Sub-County, a study by Omenge and Nasongo (2010) in Mosocho Division concluded that though there was no significant gender difference between boys' and girls' academic achievement, the slightly higher mean score in favour of boys was attributed to the girls' frequent engagement in domestic chores compared to boys. This study was carried out in a single division, making the result less generalizable compared to one that would be carried out in the whole sub-county. Further to this, it did not correlate the academic achievement of the students under study with their earlier academic achievements, which would have shed light as to whether the low academic achievement of girls at KCSE was also related to their KCPE scores

2.4 School Category (Day versus Boarding) differences in Learners' Academic Achievement

In a study conducted by Bista and Costick (2005), for UNESCO Asia and Pacific Regional Bureau for Education, it was observed that boarding schools had been used in order to ensure access to education for children who might otherwise be deprived of it. It was reported that feeder hostels (boarding schools) for girls promoted girls enrollment, retention and achievement in education.

In Malawi, a study by de Hoop (2010), reported that the best performers in the Primary School Leaving Certificate Examination (PSLCE) were admitted to conventional national schools, which were boarding schools; the next best performers were selected into conventional sub-County boarding schools while the next group was selected into conventional sub-County day schools. The results presented in the paper suggested that boarding did not significantly influence pupil (academic) performance. The observations by Bista and Costick (2005) and de Hoop

(2010) could be due to the fact that most boarding schools took in students with high primary school scores. They were therefore bound to perform better, academically, than those in day schools. They did not correlate the score of learners at the given stage with their score in an earlier examination score to find out how boarding or day schools differed in the predictive validity of earlier examination scores. This would help parents and learners make informed decision on whether to choose day or boarding school based on how they differed in their prediction of secondary school examination scores from primary school examination scores.

In Uganda, an article by Property International Network (PIN) (n.d), an NGO, reported that children in Uganda almost always preferred to go to boarding schools and not day schools. In Ugandan boarding schools, children were provided with a better education as they got to fully concentrate on their studies and received extra lessons in the evenings. When the day school pupils went home after classes, the teachers were at last able to work on a more individual basis with the boarders. That is why at PIN International, it was preferred that all children in their program to attend boarding schools where they would receive the best education that they could get. This report does not give results of any empirical study that investigates the academic performance of secondary school students in boarding against those in day schools to ascertain the claims made by PIN.

A study conducted in Tanzania by Komba, Kafanabo, Tryphone and Kira (2013) which investigated the predictive validity of Form Two Secondary Education Examination (FTSEE) on students' performance in the Certificate of Secondary Education Examination (CSEE) in Biology reported a higher relationship for females between the two examinations than for males when the

whole sample was considered. However when school category was considered, male students who studied in day schools had a higher correlation coefficient between the two examinations than female students. This study focused on only one subject, Biology. A study which considered learners' aggregate score in all examinable subjects would be more informative.

In Kericho County, Kenya, an analytical study conducted by Ngeno, Simatwa and Soi (2013) to examine the determinants of girl students' academic achievement in mixed day and boarding secondary schools, it was reported that boarding students performed better at KCSE than day school students in the same schools that had both day and boarding options. Teachers interviewed in this study were reported to have the opinion that domestic chores seriously interfered with girls' concentration on school work. This study did not take into account how day or boarding school affected academic achievement of boys as well. This would give a better picture of school category differences in learners' academic achievement. In addition, the study did not correlate the learners' academic achievement at the time of study with an earlier examination score.

Wanjohi and Yara (2011) conducted a study on performance determinants of KCSE in mathematics in schools of Nyamaiya Division, Nyamira Sub-County, which concluded among other findings that the type of school students go to greatly influences their performance in mathematics. The researchers further noted that boarding students performed better in mathematics at KCSE compared to their day school counterparts. In the same vein, Yeya (2002 as cited in Wanjohi & Yara, 2011) observed that students in boarding schools cover the syllabus in time and are exposed to more remedial exercises because they are ever in school as compared

to day schools which are characterized by absenteeism of both teachers and students which lead to non-completion of the syllabus in a given year.… students with impressive marks avoid day schools in favor of boarding schools. The study by Wanjohi and Yara was conducted in one division, Nyamaiya, in Nyamira County, which neighbors Kisii Central sub-county. It employed descriptive survey design of the ex-post facto type with a total student population of 151 and 12 teachers. It did not include a large geographical area, had a small sample and considered only one examinable subject. It was therefore necessary to find out the boarding and day school differences in the relationship between KCPE and KCSE, which included all examinable subjects, in Kisii central sub-county which was a larger geographical area.

As mentioned in the background of this study, Ondima, Nyamasege, Mogwambo and Ochoti (2013) while carrying out a study in Nyamira sub-county postulated that a student admitted in secondary school may end up scoring lower grades, higher grades or maintain their grades at KCSE depending on the type of school the learner was admitted into. They did not however include in their study how the category or type of secondary school a learner is admitted to may affect the relationship between their KCPE and KCSE scores. The current study in Kisii Central Sub-county sought to investigate how the relationship between KCPE and KCSE scores differed for the learners in boarding and day schools.

KCSE outcomes in Kisii Central Sub-County indicate that learners in boarding schools have been performing better than those in day schools. For instance in the 2009 KCSE results, the top five schools in the sub-County were all boarding schools; and in the list of top 10 schools, only one was purely day school. Five were boarding while four were day and boarding schools.

However, given that boarding schools select students with higher KCPE scores than day schools, it can not be concluded that the good academic performance of students in these boarding schools was purely because of the boarding facilities. Only a predictive validity study, such as the one carried out in Kisii Central sub-county, could verify the true facts.

2.5 School Size Differences in Learners' Academic Outcomes

In the United States of America, Slate and Craig (1998) carried out a study which involved summary of literature review on the effects of school size to describe its relationship to economic efficiency, curricular diversity and academic achievement. They reported that although the results of research on effects of school size are often contrary, they are not really contradictory. Different studies of school size often produce contrary results because the effects of school size are complex and vary depending on a number of factors. Slate and Craig concluded that school size per se was not a direct causal factor affecting school quality. Rather school size was indirectly related to academic outcomes through its relationship to a variety of other variables. For example, Haug and Hawley (1993, as cited in Slate & Craig, 1998) found a positive relationship between student achievement and school size in Alaskan schools. Although this tends to contradict the recent trend towards negative relationships, researchers noted that the small Alaskan secondary schools had very high poverty levels. Thus, their results were actually consistent with the general trend in the research that the effects of school size were mediated by social class. The research showed that both very small and very large schools were negatively related to school quality.

The above described study by Slate and Craig (1998) is in tandem with another study by Abbott, Joireman and Stroh (2002), which reported that school size interacted directly with social class to influence academic outcome. Bickel, 1999; Hawley and Bickel, (2000 as cited in Abbott, Joireman & Stroh, 2002) had reported that when all other factors are held constant, larger school size benefits achievement in affluent communities but detrimental in impoverished communities. They also noted however that small size does not necessarily guarantee student success and stated that "small size is a necessary but insufficient condition for school improvement".

While the above described studies (Slate & Craig, 1998; Abbott, Joireman & Stroh, 2002) investigated the effect of school size on academic achievement, they did not investigate the effect of school size on the relationship between a predictor and a criterion examination i.e., how much various school sizes differ in their prediction of learners' academic achievement from an earlier examination score. Therefore the current study in Kisii Central set out to determine the school size differences in the predictive validity of KCPE examination score for KCSE examination score.

A research carried out by Finn and Achilles (1989) analyzed the inter correlations between subtests of the Iowa Test of Basic Skills (IBTS) and attendance rate, class size and course grades for students in grades 4-6 and 7-12. The analysis revealed an effect for class size on student achievement for grades 4-6. Although the effect was small, it was statistically important for all students of the ITBS. Multiple regression analysis revealed no real differences in predicting English or Mathematics achievement based on class size for 4-7 graders. All correlations between class size and measures of academic achievement were positive for grades 7-12. The

positive correlations indicate that students in larger classes tended to have higher achievement test scores. It was therefore concluded from this study that larger classes were beneficial for students in grades 7-12 but had negative influence for 4-6 graders. The current study in Kisii Central Sub-County determined the effect of school size, as measured by the number of candidates taking the KCSE examination in a school, on the relationship between the students' academic achievement at KCSE and KCPE examination scores.

Case and Angus (2000) examined the relationship between education inputs – primarily pupil-teacher ratios and school outcomes in S. Africa immediately before the end of apartheid government. Black households were severely limited in their residential choice under apartheid and attended schools for which funding decisions were made centrally, by white- controlled entities for which they had no control. The allocations resulted in marked disparities in class sizes. Controlling for household variables, the study found strong and significant effects of pupil-teacher ratios on enrollment and educational achievements and on test scores for numeracy.

Namulondo (2008), in a study carried out in Uganda observed that the country had a high pupil-teacher ratio and a high pupil-class size ratio. He further noted that small classes were easy to monitor as they increased pupils' participation and quick responses from the teacher. Pupils in small classes got enough homework and quick feedback from their teachers. The reality in developing countries and Uganda in particular is that class size is large and some teachers teach more than 120 pupils in one class. Uganda is faced with a problem of classrooms and inadequate teachers which make it impossible to have small classes. Increase in enrollment therefore may have compromised the quality of education in Uganda (Namulondo, 2008).

Examination outcomes in Kenya indicate that in 2009, there were 337,404 KCSE candidates from 5600 centers (schools). This gives an average of 60.25 candidates per school countrywide. In 2010, there were 357,488 KCSE candidates spread in 6,004 examination centers, giving an average of 59.54 candidates per center. It is important to note however that some examination centers had as many as over 300 candidates while others had as few as 2 candidates. Looking at the top 100 schools in the 2010 KCSE, 74 schools had an enrollment of 100 or more candidates while out of the remaining 26 schools with below 100 candidates, only eight had below 50 candidates. From these observations, larger schools seem to have outperformed smaller schools. However, this can only point to the fact that there could be other factors apart from school size that affect academic achievement of students in the national examination, KCSE. The current study in Kisii Central Sub-County went further and correlated KCPE and KCSE scores of students from small, medium sized and large schools to establish if there existed school size differences in the predictive validity of KCPE.

In Kisii Central Sub-County, 2009 KCSE results indicate that 4,828 candidates were registered from 64 examination centers, giving an average of 75.39 candidates per school. Out of the top 10 schools in the same year, six had over 100 candidates while only two had bellow 50 candidates. This should in no way suggest that larger schools in the sub-County had a higher academic achievement compared to smaller schools. Other factors, such as KCPE scores of the candidates as determined in a predictive validity study would unveil the facts about the effect of school size on the KCSE-KCPE relationship.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter entails the research design, area and population of study, sampling technique and sample size, instrumentation, validity and reliability of the instrument, procedure of data collection, methods of data analysis and ethical considerations.

3.2 Research Design

The study adopted *ex-post facto* and correlational designs. The *ex-post facto* design is a non-experimental research technique in which pre existing groups are compared on some dependent variable. The assignment of participants to the levels of independent variables is based on events that occurred in the past (Lammers & Badia, 2005). According to Carroll (n.d), this research design attempts to explore cause and effect relationships where causes already exist and cannot be manipulated. It uses what already exists and goes back to explain why. In this study *ex-post facto* research design was used to get data from the data banks in the Sub-County Education offices, Kisii Central Sub-County on school category, school size and general data on 2010 KCSE examinations in the sub-County. It was also used to retrieve data on 2010 KCSE scores and the corresponding 2006 KCPE scores of the students from the data banks of the sampled schools.

Correlational research design shows relationship between two variables thereby showing a cause and effect relationship (Rippy, 2012). It also shows predictions of future event or outcome from

a variable. The advantage, according to Rippy (2012), is that it allows the researcher to analyze the relationship among a large number of variables. In addition, correlation co-efficient can provide for the degree and direction of relationships. In this study, Correlational design was used to correlate KCPE and KCSE scores for the students under study where the dependent variable was the KCSE scores and the independent variable was the KCPE scores of the same students sampled for the study.

3.3 Area of Study

The area of study, Kisii Central Sub-County, is a sub-County in the Kisii County in south western Kenya. Its capital town is Kisii. The sub-County comprises four divisions namely, Keumbu, Kiogoro, Getembe and Mosocho (see Appendix B). The most predominant inhabitants are the Abagusii community. The area lies on latitude 0.5 south of the Equator and longitude 37.0 to the east. The sub-County has an approximate population of 1.0 million of which 48% are male and 52% are female. Population density is 874.7 people per km^2 with annual growth rate of 2.75% (2009). The surrounding sub-Counties are Nyamira to the north, Gucha to the south, Masaba to the East and Suneka to the west.

The main physical features in the sub-County are Nyanchwa Hills and River Kuja (Gucha) which supplies water for use in the municipality. The sub-County generally has a hilly terrain. Road network includes 73km of bitumen and 409km of gravel and earth surface. The main roads serving the sub-County are Kisii-Kisumu road, Kisii-Migori, Kisii-Kilgoris, Kisii-Nyamira and Kisii-Sotik roads.

According to Omari, (April 21 2011), 51% of the population lives below poverty line. The main economic activities include subsistence agriculture, vegetable farming, small scale trade, dairy farming, tea and coffee growing. Pressure on land and overpopulation has helped transform the people of this sub-County into one of Kenya's most enterprising communities. Their large number has put a strain on food production pushing residents into business and farming elsewhere in Kenya and the world. A good number of the natives have relocated to the USA and other countries from where they send money back home that is mostly invested in rental houses in Kisii town and its environs. The Abagusii are hardworking people, and coupled with good climate and fertile land, rarely have food shortages

The sub-County had 189 primary schools (126 public and 63 private) registered for KCPE examinations and 55 public secondary schools registered for KCSE by October 2010 (DEO's Office Kisii, 2010). Teacher-pupil ratio in primary schools is 1:41 and in secondary schools 1:27.7. Average adult literacy level is 56%, with majority illiteracy in rural areas compared to urban areas. In KCPE examinations of 2006, the sub-County was ranked among the 11 poorest out of the 140 sub-Counties in the country. In 2008, Kisii Central produced the best KCPE candidate in Nyanza province. In the 2010 KCSE examinations, the sub-County only managed a mean score of 4.99 out of the possible 12 points. Given the position of Kisii central sub-county in relation to other sub-counties, the good road network, the fertile soils, good climate and the hard working nature of the population, it is expected that the scores of learners in KCPE should be closely related to their score in KCSE examinations. This is due to the fact that the sub-county has no peculiar problems that would adversely affect learners' academic achievement. A

predictive validity study was therefore necessary in this sub-County to determine the extent to which the KCPE predicts outcomes in KCSE.

3.4 Study Population

The study comprised 3,897 (2,114 boys and 1,783 girls) KCSE candidates of the year 2010 from 55 public secondary schools in Kisii Central Sub-County.

3.5 Sampling Technique and Sample Size

3.5.1 Sampling Technique

Two sampling techniques were used in this study. The first was stratified random sampling technique which was used to select 16 public secondary schools for the study and thereafter saturated sampling technique was used to select learners from each sampled school.

According to Fraekel and Wallen (2009), a simple random sample is one in which each member of the population has an equal and independent chance of being selected. However, when a population consists of sub-groups which should be represented in the sample, stratified random sampling is used. This is a process in which certain sub-groups or strata are selected for the sample in the same proportion as they exist in the population. In this study, the stratification was based on school category and school size whereby the researcher first listed all the 55 schools according to their strata, and selected the required number from each stratum randomly. There were two separate lists based on school category whereby day schools were listed separately from boarding schools. Nine day schools were randomly selected from the list of day schools and six boarding schools were randomly selected from the list of boarding schools for the study.

Based on school size three lists were made to include one for large schools, another for medium sized schools and the third for small sized schools. To determine whether a school was to be considered small, medium or large in size, the number of streams per candidate class per school was used. Schools with a single stream candidate class were categorized as small, those with double streams categorized as medium and those with three streams and more categorized as large. Out of the three lists, four large, five medium sized and seven small schools were randomly selected for the study. It should be noted that school characteristics overlapped in such a way that there were boarding schools that were large, small or medium sized. There were also day schools that were medium or small sized. Table 3.1 gives a summary of the sample size obtained from each school type and from each gender.

The main advantage of stratified sampling is that it captures key population characteristics in the sample that are in the same proportion as in the whole population to the overall population (Fraekel & Wallen, 2009). According to Stat Trek (2012), a stratified sample can provide greater precision than a simple random sample of the same size. Because it provides greater precision, a stratified sample often requires a smaller sample compared to a simple random sample.

From the 16 selected schools, saturated sampling technique was used whereby scores for all KCSE graduates whose KCPE marks were available in each sampled school was used in the study. The sample yielded a total of 1,391 students from 16 secondary schools.

3.5.2 Sample Summary

The sample used in this study comprised 1,391 students from 16 public secondary schools, distributed according to the sample stratification shown in the following Table 3.1:

Table 1: Study Sample Stratification

STRATIFICATION		NO. OF SCHOOLS	SAMPLE SIZE	SAMPLE %
GENDER	Male	-	607	43.64
	Female	-	784	56.36
SCHOOL CATEGORY	Boarding	6	1039	74.69
	Day	9	352	25.31
SCHOOL SIZE	Small	7	221	15.89
	Medium	5	332	23.87
	Large	4	838	60.24

Source: Field data

The disparities in numbers in each group were taken in proportion to the disparities of numbers in the total population from which the sample was drawn.

The number of schools where male and female study subjects were drawn from is not provided for in table 3.1 because there were mixed schools which had both male and female learners, single-sex boys' and single-sex girls' schools. Female students sampled were 784, constituting 56.36% while male were 607, constituting 43.64% of the sample. This is due to the fact that saturated sampling technique was used at school level and since single sex girls' schools sampled had more learners than single sex boys' schools, this led to the gender disparity in the sample.

From the sample, it can be observed that 25.31% of the learners were from day schools while 74.69% were from boarding schools. In Kisii Central Sub-County, boarding schools have more learners compared to day schools. This is because parents prefer boarding schools to day schools for their children and only opt for the latter due to financial constraints.

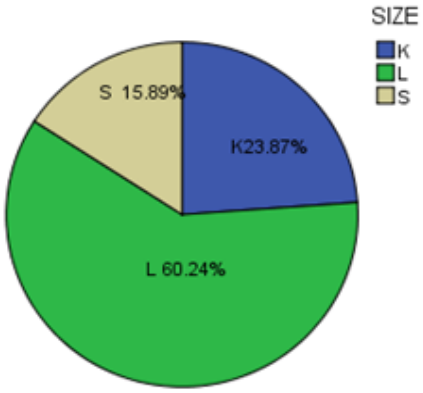

Fig. 2: Pie Chart by School Size. Key: K=Medium L=Large S=Small
Source: Field Data

The sample from large schools had 838 learners which constituted 60.24% of the whole sample whereas the sample from medium sized schools was 332, making up 23.87% of the whole sample. Small sized schools contributed 221 learners, making up 15.89% of the sample. This resulted from the fact that large schools had a larger population than medium and small sized schools. Since saturated sampling technique was used at school level, the sample from large schools had to be large and vice versa for small sized schools. It was further noted that large schools had KCPE scores for all their KCSE candidates while in medium and small sized schools the KCPE scores were missing for some, thereby reducing the sample size further.

3.6 Instrumentation

Data was collected from the sampled schools using a researcher-made Pro forma (Appendix D). This contained information on the school name, category and size. The pro forma, which was in form of a table, also included columns of students KCSE index number, gender, KCPE scores and KCSE scores. It was used to record the 2006 KCPE scores and the 2010 KCSE scores of students in the sampled schools.

There were some schools that had analyzed their results on computer and had included a column for the KCPE scores for their students. For such schools, the researcher simply collected a copy of the analyzed result but with the column for students' names excluded for the purpose of confidentiality. The data was then transferred directly to the pro forma. Some schools on the other hand, had only the computer-generated result from the Kenya National Examination Council (See Appendix C). In such cases the researcher requested for a separate list which had been used during admission of the students in order to obtain their KCPE scores. The information from the computer generated result and the admission list was then transferred to the pro forma. It was often impossible to obtain KCPE scores for students who joined their schools at other levels other than Form One. In such incidences, students whose KCPE marks were missing were not included in the study.

3.7 Validity and Reliability of the Instruments

3.7.1 Validity

In this study, the two types of validity that were vital were predictive validity and content validity (also called face validity). Predictive validity was determined as the main purpose of the

study using KCPE examination scores as the independent variable and KCSE examination scores as the criterion variable.

Content validity has to do with items seeming to measure what they claim to (Garson, 2009). In content validity one is also concerned with whether the items measure the full domain implied by their label. Use of surveys of panels of content experts or focus groups of representative subjects are ways in which content validity may be established (Garson, 2009). According to Fraekel and Wallen (2009), validity refers to the appropriateness, meaningfulness, correctness and usefulness of any references a researcher draws based on data obtained through the use of an instrument. In this study, therefore, validity was established by presenting the data collecting pro forma to experts in the department of Educational Psychology, School of Education for verification.

3.7.2 Reliability

According to Fraekel and Wallen (2009), a reliable instrument is one that gives constant results. When such an instrument is administered to study subjects at different times, the outcomes should be similar or almost similar. In this study, the researcher used a pro forma to collect data on the KCPE and KCSE scores of the learners under study. Given the ex-post-facto nature of the study, the scores had already been recorded earlier for the learners. These scores were therefore constant and not subjected to change from time to time. A reliability test was not carried out in this case. Further to this, as stated under the assumptions of this study (p.7), the KCPE and KCSE results were from standardized national examinations which were viewed as unbiased and reliable examinations and so did not warrant a further reliability test.

3.8 Data Collection Procedure

The researcher obtained a permit to carry out the research from the National Council of Social Sciences through Maseno University Ethics Review Committee (MUERC) (see appendix A). Data was collected from the examination office of each sampled school using the researcher-made Pro forma (See Appendix D). A list of the 2010 KCSE results for each sampled school was used to obtain the students' index numbers and mean scores which were then recorded in the pro forma. Part of the index number was concealed to avoid revealing the identity of the study subjects (see Appendix D). Another list used for admission of students in Form One was used to obtain the students' KCPE marks which were also entered in the pro forma. Some sampled schools did not have the KCPE scores data for some of their candidates, especially those admitted in Form, Two, Three and Four. In such cases, candidates with missing KCPE scores were not included in this study. There were some schools that had analyzed their results on computer and had included a column for the KCPE scores for their students. For such schools, the researcher simply collected a copy of the analyzed result but with the column for students' names excluded for the purpose of confidentiality. The data was then transferred directly to the pro forma.

3.9 Methods of Data Analysis

In this study, data analysis was quantitative. The collected data was analyzed using descriptive statistics namely scatter plots and pie charts. Scatterplots indicated whether KCPE and KCSE were positively or negatively related. Inferential statistics including correlation and regression analyses were also used. Pearson's product moment correlation coefficients were determined to show the strength of relationship between KCPE and KCSE scores for various sub-groups in the study. Linear regression analyses were preceded by the necessary regression diagnostics such as

violation of normality assumption for the dependent variable, checking outliers and extreme values. Data was analyzed at student level for all the objectives.

Simple linear regression analysis with KCSE scores as the dependent variable and KCPE scores, as the independent variables were conducted for different gender, school category, and school size. A linear regression equation was determined in each case which could be used to predict mean KCSE scores from the independent variable (KCPE scores) in the regression model. Regression analysis helped to determine how much of the variance in KCSE scores could be explained by KCPE scores for the various sub-groups used in this study.

3.10 Ethical Considerations

According to Jamison (2007), confidentiality is an explicit or implied guarantee by a researcher to a respondent in social science research whereby the respondent is confident that any information provided to the researcher cannot be attributed to the respondent. It is thus an active attempt by the researchers to remove any trace of the respondent identities from the records.

Privacy is considered a basic human right and maintaining confidentiality a professional obligation.

In order to uphold confidentiality in the study, the researcher excluded the names of sampled students and instead used their index numbers only, when recording data. Part of the index number was further concealed to avoid revealing the identity of the study subjects. Since this study was *ex-post-facto* in design, the respondents were not available for consent as they had already done their examinations and left school. Written consent to use the data was therefore

obtained from the custodians of the data on behalf of the respondents. The custodians gave the data on condition that utmost confidentiality would be observed. The collected data was further kept under lock and key and made accessible only to the researcher. After data analysis, the raw data was kept safely, out of reach of unauthorized persons. In the same vein, data included in the appendices C and D also had the school identity and part of the index numbers concealed for the purpose of confidentiality.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

In this chapter, the researcher presents a summary of diagnostics of the study sample, the findings of the study and a discussion of the findings. For each of the four specific objectives, the results were presented in form of scatterplots, Pearson's correlation coefficients and simple linear regression. This was followed by a discussion of the results based on the three levels of findings.

In this study, the interpretation of the strength of Pearson's Correlation coefficients was given according to general guidelines provided by Cohen (1988). The guideline was given for a sample size ≥ 30 and significance level of < 0.05 as follows:

$0.1 < |r| < 0.3 \rightarrow$ small/weak correlation

$0.3 < |r| < 0.5 \rightarrow$ medium/moderate correlation

$|r| > 0.5 \rightarrow$ large/strong correlation, where $|r|$ is the absolute value of the Pearson's correlation coefficient *r*, regardless of whether it is positive or negative.

For the values of the correlation coefficient *r* to be considered statistically significant and not due to chance, the sample size guideline given by Fraekel and Wallen (2009) was used (see table 2).

Table 2: Sample size required for *r* values to be considered significant

Value of sample *r*	.05	.10	.15	.20	.25	.30	.40	.50
Required sample size	1,539	400	177	100	64	49	25	16

4.2 Diagnostics of the study sample

Before using the data collected in this study for correlation and regression analyses, it was important to carry out the necessary diagnostics on the data in order to ascertain it linearity and presence of outliers as shown below.

4.2.1 Test for Linearity between the Dependent and the Independent variables

When analyzing relationship between two variables, it is important to determine the strength of a relationship (correlation) and also use linear regression, which utilizes the presence of an association between variables to predict the values of a dependent variable from an independent variable (Njuguna, 2006).

In this study, linear regression analysis, scatterplots and Pearson's correlation coefficients were used to determine the relationship between KCPE and KCSE examination scores for the study sample. According to Lund and Lund (2014), when one chooses to analyze data using linear regression, part of the process involves checking to make sure the data one wants to analyze meets the required assumptions in order to give a valid result.

One of the assumptions of this model is that of linearity, meaning that the variables in the study are related linearly, hence the name. Linearity means that two variables "x" and "y" are related by a mathematical equation $y = mx + c$ where m is the slope of the line and c is the y intercept. According to Lund and Lund (2014) one of the ways to check whether a linear relationship exists between two variables is by creating a scatterplot using SPSS® statistics where the independent variable is plotted against the dependent variable. The scatterplot is then inspected visually to check for linearity. The relationship is deemed to be linear if most of the plotting points are on or

around a diagonal line of fit. Through scatterplot testing method, SPSS® was employed to arrive at the result shown in the fig. 4.1.

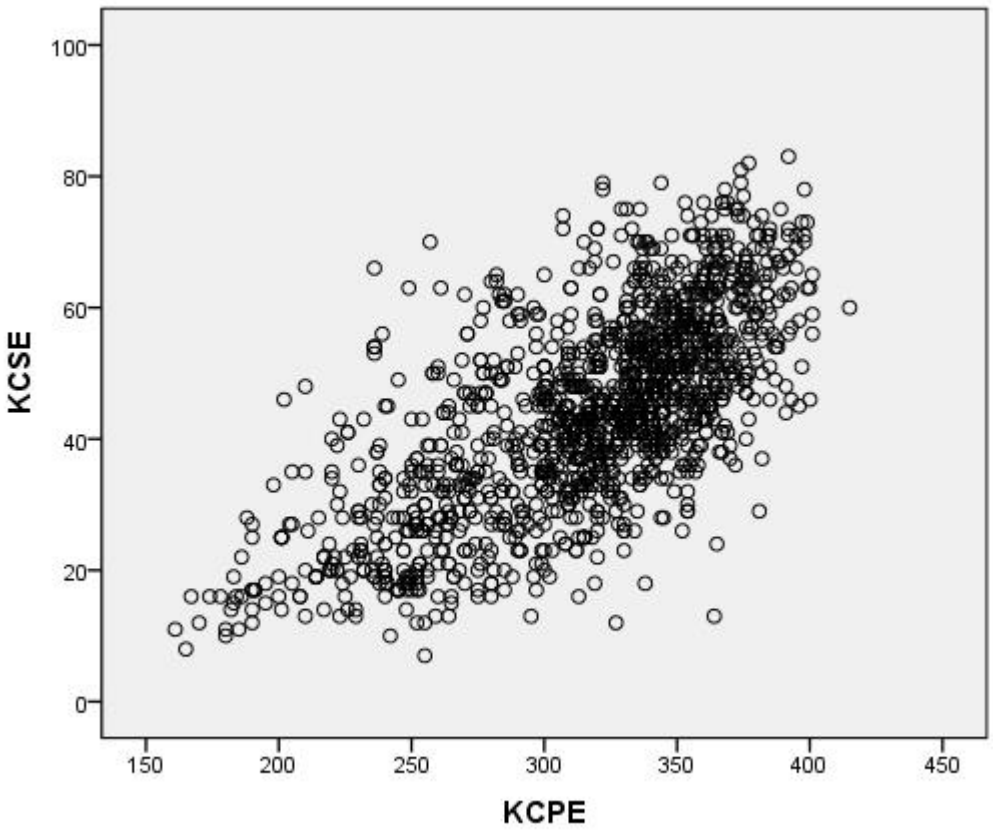

Fig.3: Scatterplot showing Linearity test of KCSE against KCPE scores

From Fig. 3, it can be observed that the data points are concentrated along the diagonal, indicating that KCSE scores was linearly related to KCPE scores.

4.2.2 Test for Normality Assumption of the Variables

Another important assumption in linear regression is that of normality. According to Hart and Hart (2002), the normal distribution yields values that range from minus infinity to plus infinity, which never reflects real life. Instead, it is only necessary for the data to be "near-normal",

defined here as having no detrimental effect on the control chart. This means that the data is not full of anomalies that can create inaccurate results. This can be tested in several ways. A good and easy test needed for the near-normality is the normal probability plot. This is a graph of the relative cumulative frequencies of the data, using a specific plotting convention (Hart & Hart, 2002).

This study used a normal probability plot to test for normality. Using SPSS®, normality was ascertained by plotting a probability-probability plot for KCPE and KCSE (see fig 4 and 5).

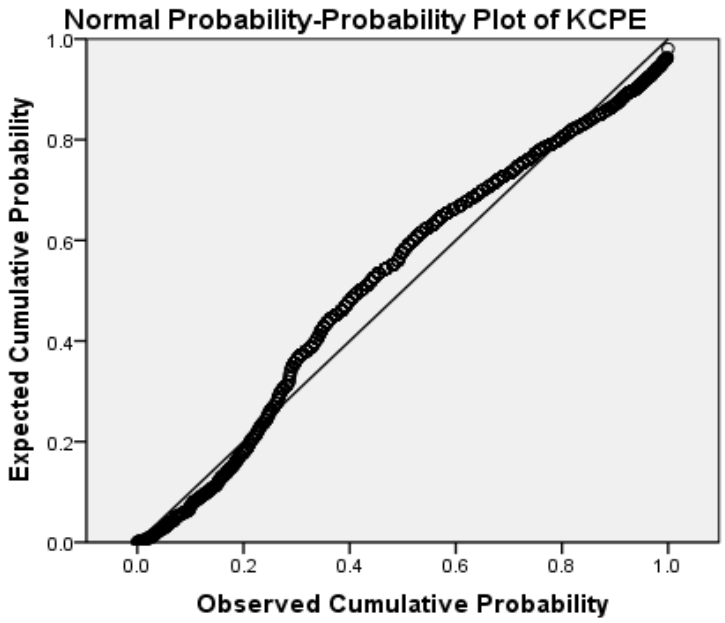

Fig 4: Expected Cumulative Probability against observed Cumulative Probability of Regression Standardized residuals for KCPE

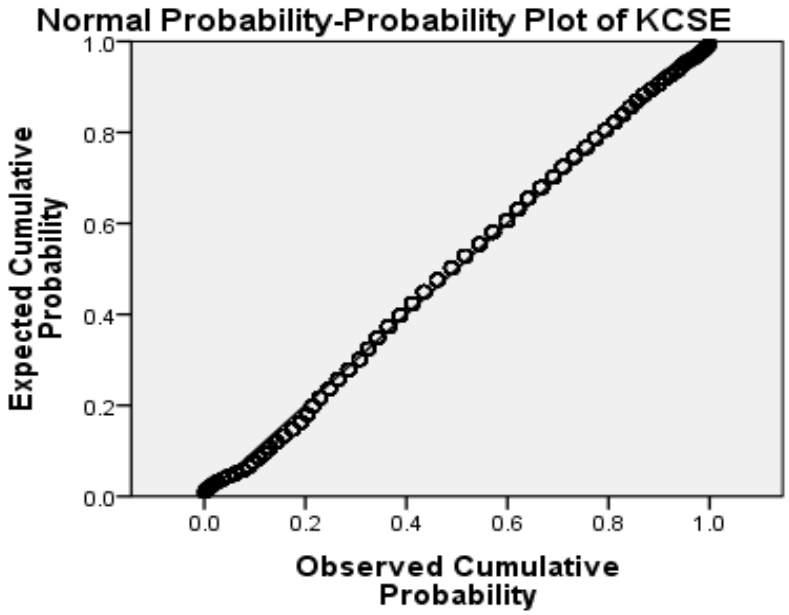

Fig 5: Expected Cumulative Probability against observed Cumulative Probability of Regression Standardized residuals for KCSE

Source: Field data

According to Shapino (1990), if the model is appropriate then the plotted points will tend to fall on a straight line. If it is not appropriate then the plots will deviate from a straight line, generally in some systematic manner. If the distribution is normal, the points on such a plot should fall close to the diagonal reference line. The probability plots in Figures 4 and 5 showed all points fairly distributed along the diagonal, indicating that the observations were normally distributed.

4.2.3 Test for Outliers in the Data

An outlier is an observation point that is distant from other observations. Outliers in the data were detected using SPSS® upon which seven outliers were detected as shown in table 4.2.

Table 3: Detected Outliers in the Data

Case wise Diagnostics					
Case Number	Std. Residual	KCPE	KCSE	Predicted Value	Residual
103	3.094	322	79	45.49	33.510
136	3.595	257	70	31.07	38.934
385	3.002	322	78	45.49	32.510
978	**-3.195**	**327**	**12**	**46.60**	**-34.600**
1027	3.656	236	66	26.41	39.594
1052	3.113	249	63	29.29	33.709
1279	**-3.861**	**364**	**13**	**54.81**	**-41.811**

Note. The residual column shows how far KCSE scores was above or below the predicted value. Negative values are those below while positive values are those above predicted values

a. Dependent Variable: KCSE

Source: Field data

From Table 3 it can be observed that case numbers 978 and 1279 scored very low KCSE points compared to their predicted scores while the other five cases scored KCSE points higher than their predicted scores. However, when a regression analysis was run on the data excluding the seven outliers, a Pearson's correlation coefficient of 0.695 was obtained, which did not differ much from the 0.693 value obtained when all the cases were analyzed (see Table 3). The researcher therefore decided to retain all the cases for all subsequent analyses.

4.3 Relationship between Learners' KCSE and KCPE scores

In order to determine the relationship between KCPE and KCSE scores for the learners, a scatterplot for KCSE against KCPE was generated as shown in Fig. 6.

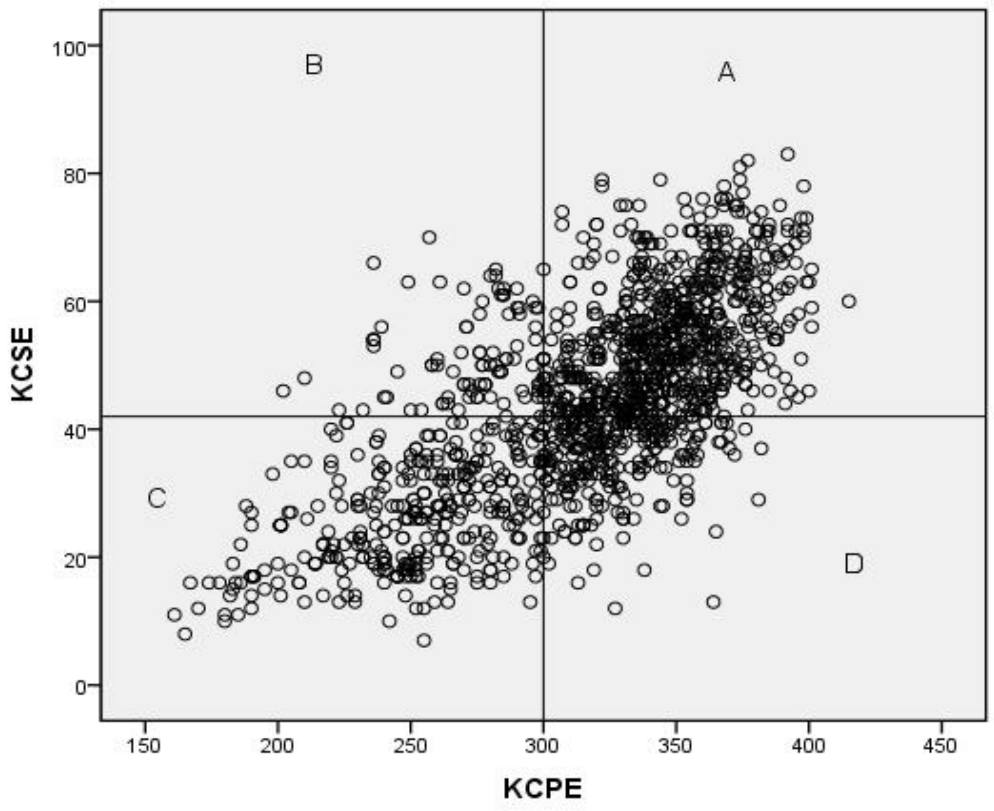

Fig 6: Bivariate Scatterplot of KCSE against KCPE scores

Note. Independent variable: KCPE

Dependent variable: KCSE

Source: Field data

The scatterplot illustrated in Fig. 6 shows the scatter points concentrated along the diagonal towards the right indicating that there was a positive linear relationship between KCPE and KCSE scores for the sampled learners. The scatterplot was further divided into four quadrants, A, B, C and D. Quadrant A represents learners who had high KCPE scores (300 marks and

above) and also ended up getting high KCSE scores (42 points and above). Quadrant B represents learners who had low KCPE scores but ended up scoring highly in KCSE. Data points in quadrant C represent learners who had low KCPE scores and also ended up getting low KCSE scores. Quadrant D represents learners admitted to secondary schools with high KCPE scores but ended up recording low KCSE scores.

In order to get more details on the relationship between the KCSE and KCPE scores, Pearson's correlation coefficient test was carried out on the sample and the result given in Table 4.

Table 4: Pearson's Correlations Coefficient between KCSE and KCPE scores

		KCPE	KCSE
KCPE	Pearson Correlation	1	**.693****
	Sig. (2-tailed)		.000
	N	1391	1391
KCSE	Pearson Correlation	**.693****	1
	Sig. (2-tailed)	.000	
	N	1391	1391

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Field data

As can be observed from Table 4, the correlation between KCPE and KCSE scores yielded a Pearson's correlation coefficient r=.693; n=1391; $p<0.05$ between the two variables in a two-tailed test. According to Lund and Lund (2014), the magnitude of the Pearson's Correlation Coefficient determines the strength of the correlation. Although there are no hard- and-fast rules

for assigning strength of association to particular values, general guidelines provided by Cohen (1988) were used (see Appendix F). Therefore, in this study, the Pearson's correlation coefficient of r=.693 observed in Table 4 can be described as a strong positive relationship. This means there is a strong positive correlation between KCSE and KCPE scores, suggesting that students who score highly at KCPE are also likely to score highly at KCSE and vice versa.

Further investigation on the relationship between KCSE and KCPE scores for the sample was done using regression analysis and the result given in Table 5.

Table 5: Regression Analysis of KCSE scores on KCPE scores

Model	R	R^2	Adjusted R^2	Standard Error estimated	F	
1	[a].693	.481	.480	10.964	1286.341	
Model	Unstandardized beta		Coefficient Standard error	Standardized beta	t	Sig
1(constant)	-24.616		1.934	.693	-12.732	.000
KCPE	.218		0.006		35.866	.000

Confidence interval (CI) = 95%
N = 1391
Total df. = 1390
a. predictor KCPE
Source: Field data

Table 5 displays the result of simple linear regression of KCSE scores on KCPE scores. The regression result was $R^2 = .481$, $F(1, 1390) = 1286.34$, $p < 0.05$. This implied that 48.1% of the variance in KCSE scores could be explained by the score in KCPE. This is a high percentage which explains that KCSE scores has a high correlation with KCPE scores. The remaining 51.9% variance in KCSE scores can be explained by other factors other than KCPE scores.

From the regression analysis shown in Table 5, the unstandardized beta when KCSE scores was regressed against KCPE scores was 0.218. The *t* value was 35.866 and its significance was .000 (less than the critical .05 level). This shows that KCPE scores had a major impact on KCSE scores. The unstandardized beta value of 0.218 was interpreted to mean that one unit increase in the students' KCPE scores would improve their KCSE scores by 0.218 units. The constant -24.619 was used to formulate a regression equation given as $y = .218x - 24.619$, where y is the KCSE scores and x is the KCPE scores, which may be used to predict the KCSE scores of learners from their KCPE scores if the circumstances are similar to those found in the area of this study.

The finding of this study was in agreement with a similar study carried out by Othuon and Kishor (1994) which found a moderate positive correlation ($r=.56$; $n=781$; $p<0.01$) between KCPE and KCSE scores of the learners sampled in South Nyanza District. A similar study conducted by Ondima, Nyamasege, Mogwambo and Ochoti (2013) in Nyamira Sub-County of Nyamira County found a strong positive correlation ($r=0.661$; $n=572$; $p<0.001$) between KCPE and KCSE scores for the learners under study. Jagero (2013) in a study conducted in a private school in Western Kenya similarly found a positive correlation ($r=0.599$; $n=110$; $p<0.01$)

between KCPE and KCSE in a two tailed test. Another study conducted by Amburo (2011) found a slightly lower but positive relationship ($r=0.452$; $n= 240$; $p<0.01$) between KCPE and KCSE scores of learners from public primary schools admitted to provincial public secondary schools. Therefore learners who attain high scores in KCPE examinations are also likely to attain high scores in KCSE examinations and those who score low marks on KCPE are also likely to score low marks on KCSE.

The Correlation Coefficient of $r= 0.693$; $n=1391$; $p<0.05$ in the Kisii Central study was higher than 0.56, 0.661 and 0.599 quoted in the previous studies (Amburo, 2011; Jagero, 2013; Ondima, Nyamasege, Mogwambo & Ochoti. 2013; Othuon & Kishor, 1994). Given that the three studies reported above all had smaller sample sizes, the study in Kisii Central sub-County showed a stronger relationship between KCPE and KCSE scores compared to the earlier studies. This suggests that, to some extent, other factors apart from KCPE scores that may affect KCSE scores were fewer in the study area compared to the previously stated studies. This could be due to the fact that in Kisii Central sub-County, there are fewer cases of learners getting involved in distracting activities which may interfere with their learning, making their examination scores more consistent from primary to secondary school and hence the stronger relationship between their KCPE and KCSE scores.

The strong correlation between KCSE and KCPE scores for learners in this study pointed to the fact that learning in primary school impacts on learning in secondary school. As reported by Wanjohi and Yara (2011), some of the learning problems experienced by students in secondary schools have their origin in primary schools.

4.4 Relationship between KCSE and KCPE scores for male and female learners

In order to determine the gender differences in the KCPE-KCSE relationship, a scatterplot for KCSE scores against KCPE scores disaggregated by gender was constructed (see Fig. 7).

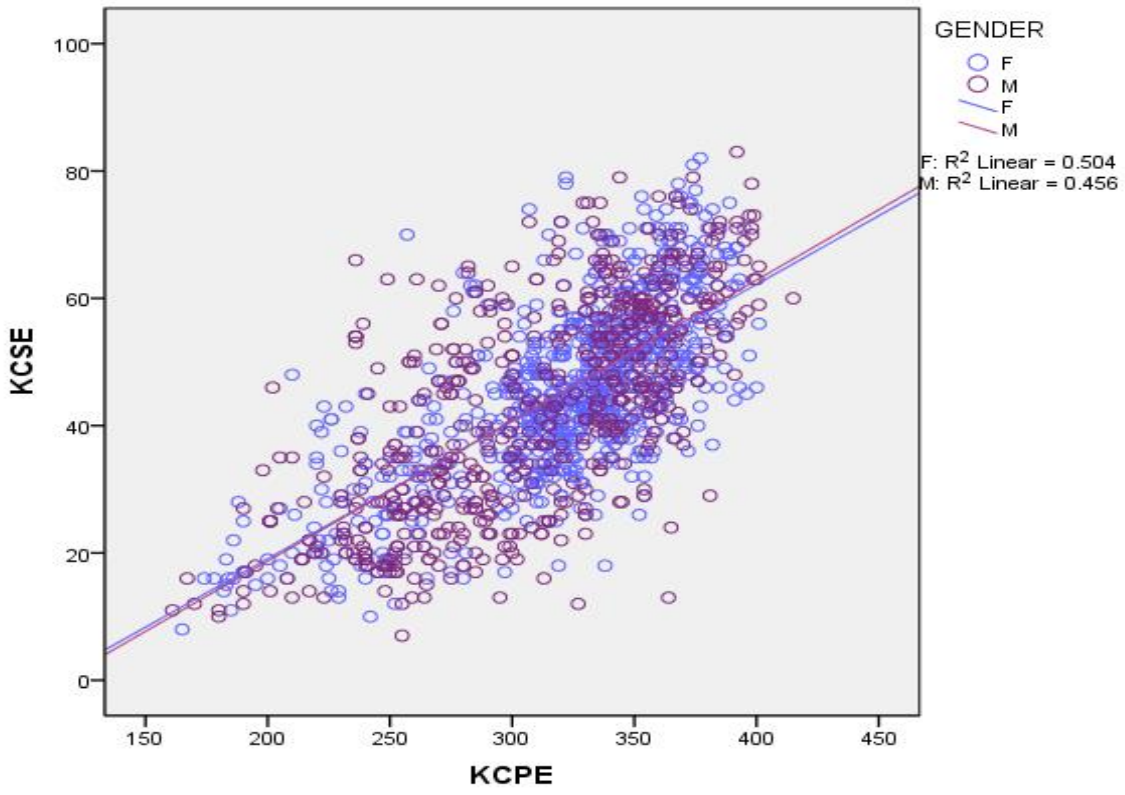

Fig. 7: Bivariate Scatter plots of KCSE against KCPE scores for Male and Female students

Key: Gender F=Female M=Male

Source: Field Data

The scatter plot in Fig.7 shows the relationship between KCSE and KCPE scores for both male and female learners. The slopes of the scatterplots for females and males were very close, indicating that KCPE scores could predict KCSE scores almost equally for both females and males. In order to obtain more information on the KCSE-KCPE relationship between male and

female learners, Pearson's correlation coefficients for both gender were computed as shown in Table 6.

Table 6: Pearson's correlation coefficients between KCSE and KCPE for male and female students

GENDER			KCPE	KCSE
Female	KCPE	Pearson Correlation	1	**.710****
		Sig. (2-tailed)		.000
	KCSE	Pearson Correlation	**.710****	1
		Sig. (2-tailed)	.000	
		N	784	784
Male	KCPE	Pearson Correlation	1	**.675****
		Sig. (2-tailed)		.000
	KCSE	Pearson Correlation	**.675****	1
		Sig. (2-tailed)	.000	
		N	607	607

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Field Data

Pearson's product moment correlation found a strong correlation between KCPE and KCSE for both male and female students. However the correlation was slightly stronger for females ($r=.710$; $n=784$; $p<0.05$) than for males ($r=.675$; $n=607$; $p<0.05$) as shown in Table 6. This implied that KCPE scores was a better predictor of KCSE scores for females than for males.

The preliminary results on correlation however needed further scrutiny to ascertain whether the difference between *r* values for females and that of males was statistically significant. This was done by first converting the *r* values into *z* values using a standardized table (see appendix E), after which the following formula given by Pallant (2007) was used to calculate the observed z value (z_{obs});

$$z_{obs} = \frac{z_1 - z_2}{\sqrt{\frac{1}{N_1 - 3} + \frac{1}{N_2 - 3}}} = \frac{.887 - .820}{\sqrt{\frac{1}{784 - 3} + \frac{1}{607 - 3}}} = \mathbf{1.2365}$$

Where z_{obs} = the observed z value

z_1 = the z value for female correlation coefficient

z_2 = the z value for male correlation coefficient

N_1= sample size for females

N_1= sample size for males

The decision rule: if $-1.96 < z_{obs} < 1.96$, correlation coefficients are not significantly different (Pallant, 2007).

From the above calculation z_{obs} value of 1.2365 falls within the range of -1.96 and 1.96 meaning that the difference between correlation coefficients between KCSE and KCPE for male and female students were not statistically significant. Further scrutiny of the difference in the relationship between KCSE and KCPE was done using regression analysis as shown in Table 7.

Table 7: Regression Analysis of KCSE scores on KCPE scores for Male and Female students

Gender	Model	R	R^2	Adjusted R^2	Standard Error estimated	F	Sig
Female	1	.710	.504	.503	9.912	793.441	.000
Male	1	.675	.456	.455	12.203	194.843	.000
	Model	Unstandardized Beta		Coefficient Standard error	Standardized Beta	t	Sig
Female	1(constant)	-23.971		2.464	.710	-9.728	.000
	KCPE	.215		.008		28.168	.000
Male	1(constant)	-25.422		3.073	.675	-8.273	.000
	KCPE	.221		.010		22.529	

CI = 95%
N (females) = 784 N (males) = 607

Total df (females) = 783 Total df (males) = 606

Source: Field Data

Simple linear regression was used to assess the ability of KCPE scores to predict KCSE scores for male and female learners. Preliminary analyses were conducted to ensure no violation of the assumptions of normality and linearity as reported in section 4.2 of this study. From the outcome shown on Table 7, R^2 for females = .504, F (1, 783) = 793.44, $p< 0.05$. On the other hand, R^2 for males = .456, F (1, 606) = 507.57, $p< 0.05$. This implied that for females 50.4% of the variance in KCSE scores could be explained by the KCPE scores while for males, 45.6% of the variance in KCSE scores could be explained by the KCPE scores. The remaining 49.6% of the variance in KCSE scores for females and 54.4% for males could be explained by other factors other than

KCPE scores. These preliminary results therefore indicate that the KCPE scores for females had slightly more effect on their KCSE scores compared to males.

The Univariate regression analysis results shown on Table 7 further indicates unstandardized coefficients of .215 for KCPE for females and .221 for males. The *t* values of 28.168 for females and 22.529 for males and their significance of 0.000 (less than 0.05 level) showed that the score for both male and female in KCPE had a major impact on their KCSE scores. The values of the unstandardized coefficients imply that one unit increase in the female students KCPE scores results in a corresponding increase in their KCSE scores by 0.215 units. Similarly, one unit increase in KCPE scores for males results in a corresponding increase in KCSE scores by 0.221 units.

Using the unstandardized beta values and constants for KCPE, regression equations were drawn for both females and males as follows; $y = 0.215x - 23.971$ for females and $y = 0.221x - 25.422$ for males where y is the KCSE scores and x is the KCPE scores of the learners. This implies that given circumstances similar to those in Kisii Central, the above equations can be used to predict learners' KCSE scores early from their KCPE scores.

The findings illustrated in Fig. 7, Tables 6 and 7 are consistent with that of Othuon and Kishor (1994) in South Nyanza region which revealed that the examinee's sex did not significantly influence KCPE-KCSE relationship, although boys generally showed higher mean achievement levels in KCSE than girls.

On the other hand, a study by Jagero (2013) found girls to exhibit a higher correlation coefficient between KCPE and KCSE performance in one private school in Western Kenya, although the study sample was only 110 learners from a single school. The study by Jagero (2013) may therefore not be generalized due to the purposive sampling procedure used, making the sample less representative of the population. Another study done by Komba, Kafanabo, Tryphone and Kira (2013) in Tanzania found girls to exhibit a higher relationship (r=0.726) between form two examination scores and form four certificate examination scores than for boys (r=0.613). When school category was considered, however, boys in day school showed a higher correlation (r=0.65) between the two examinations than girls in day schools (r=0.442).

Hall (2015) in a study to examine the validity of secondary school entrance scores in predicting academic success of secondary school aged students, found a stronger relationship between the scores on Barbados Secondary School Entrance Examination (BSSEE) and that of Caribbean Secondary Education Certificate (CSEE) for males than for females. This concurs with a study in Mosocho division of Kisii Central sub-county by Omenge and Nasongo (2010) that found girls to have a slightly lower academic achievement than boys. This was attributed to involvement in domestic chores by girls which impacted negatively on their academic achievement.

The studies by Jagero (2013) and Komba, Kafanabo, Tryphone and Kira (2013) simply gave the *r* values for the relationship between KCSE and KCPE scores without testing whether the differences in the correlation coefficients given were statistically significant. This may point to some weakness in the two studies.

The findings of the study in Kisii Central sub-county point to the fact that the small difference in the relationship between KCSE and KCPE scores for male and female learners was not statistically significant. This implies that the predictive validity of KCPE scores for KCSE scores did not differ for male and female learners. While earlier studies depict boys as superior to girls in academic achievement, this trend may be changing. This could be probably due to the society becoming more enlightened about the importance of education for both boys and girls. Besides, the current parents having a higher level of education than parents of a few decades ago, may have contributed to this current state by giving equal chances to their children in education regardless of their gender. KCPE is therefore a good predictor of KCSE scores regardless of whether the learner is male or female.

4.5 Relationship between KCSE and KCPE scores for Boarding and Day school Students

Descriptive statistics was used to investigate differences in the level of relationship between KCSE and KCPE scores for learners in boarding and those in day schools. Scatterplots generated, yielding the result displayed in Fig. 8.

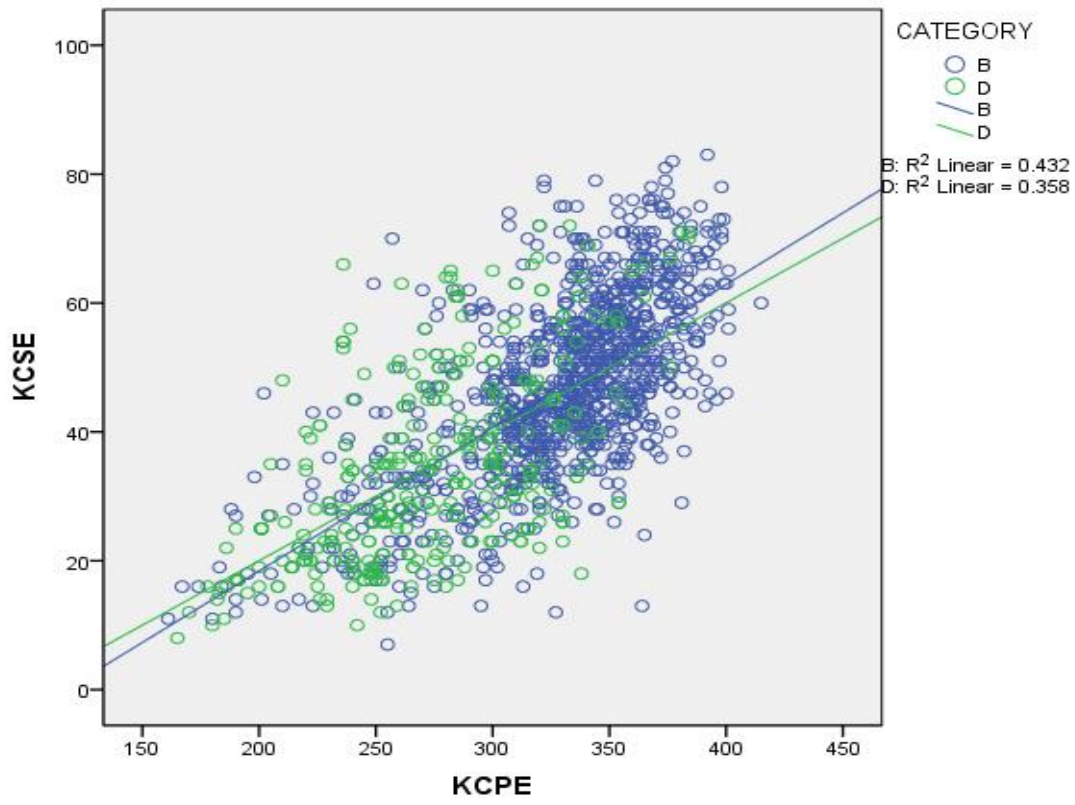

Fig 8: Bivariate Scatter plots of KCSE against KCPE for Boarding and Day school students

Key: B=Boarding Students D= Day School Students

Source: Field Data

From Fig. 8, it is noted that there was a positive relationship between KCPE and KCSE scores for learners in both boarding and day schools. There was however a slight difference in KCPE-KCSE relationship between boarding and day school students as observed in the regression lines. The graph for school category was disordinal as shown by the KCSE-KCPE relationship being slightly higher for day school learners at lower levels of KCPE score but it was higher for boarding school students at higher levels of KCPE score.

This suggests that learners who score low KCPE marks tend to perform better at KCSE in day schools while those scoring high KCPE marks tend to perform better when admitted to boarding schools for their secondary school education. For more details, data was further analyzed using Pearson's correlation coefficient as shown in Table 8.

Table 8: Pearson's correlation coefficients between KCSE and KCPE for Boarding and Day school students

CATEGORY			KCPE	KCSE
Boarding	KCPE	Pearson Correlation	1	**.657****
		Sig. (2-tailed)		.000
	KCSE	Pearson Correlation	**.657****	1
		Sig. (2-tailed)	.000	
		N	1039	1039
Day	KCPE	Pearson Correlation	1	**.598****
		Sig. (2-tailed)		.000
	KCSE	Pearson Correlation	**.598****	1
		Sig. (2-tailed)	.000	
		N	352	352

**. Correlation is significant at the 0.01 level (2-tailed).
Source: Field data

Preliminary results of this study revealed that boarding school students showed a higher correlation coefficient between KCPE and KCSE scores ($r=.657$; $n=1039$; $p<0.05$) compared to

their day school counterparts (r=.598; n=352; p<0.05) as shown in Table 8. The impact of KCPE scores on KCSE scores was stronger for those in boarding schools than for those in day schools. It was necessary to test whether the differences in the correlation coefficients between KCPE and KCSE scores for day and boarding students was statistically significant. The *r* values were first converted into *z* values and the observed *z* value calculated as shown below (see also section 4.4);

$$z_{obs} = \frac{z_1 - z_2}{\sqrt{\frac{1}{N_1 - 3} + \frac{1}{N_2 - 3}}} = \frac{.784 - .658}{\sqrt{\frac{1}{1039 - 3} + \frac{1}{352 - 3}}} = \mathbf{1.5996}$$

Where z_{obs} = the observed z value

z_1 = the z value for boarding students correlation coefficient

z_2 = the z value for day school students correlation coefficient

N_1= sample size for boarding students

N_2= sample size for day students

The decision rule: if $-1.96 < z_{obs} < 1.96$, correlation coefficients are not significantly different (Pallant, 2007).

From the above calculation z_{obs} value of 1.5996 fell within the range of -1.96 and 1.96 meaning that the difference in correlation coefficients between KCSE and KCPE for boarding and day school students were not statistically significant. Therefore the predictive validity of KCPE scores for KCSE scores for boarding and day school students had no statistically significant difference. To investigate the difference in prediction of KCSE from KCPE scores between boarding and day school students further, regression analysis was run on the data and the result presented in Table 9.

Table 9: Regression Analysis of KCSE scores on KCPE scores for Boarding and Day School Students

School Category	Model	R	R^2	Adjusted R^2	Standard Error estimated	F	Sig
Boarding	1	.657	.432	.432	10.596	788.986	.000
Day	1	.598	.356	.356	11.984	194.843	.000
	Model	Unstandardized Beta		Coefficient Standard error	Standardized Beta	t	Sig
Boarding	1(constant)	-26.009		2.619		-9.930	.000
	KCPE	.222		.008	.657	28.089	.000
Day	1(constant)	-19.996		3.985		-5.018	.000
	KCPE	.200		.014	.598	13.959	.000

CI = 95%

N (boarding) = 1039 N (day) = 352

Total df (boarding) = 1038 Total df (day) = 351

Source: Field Data

Linear regression was used to assess the difference in the ability of KCPE scores to predict KCSE scores for boarding and day school learners. Preliminary analyses were conducted to ensure no violation of the assumptions of normality and linearity as reported in section 4.2. From the outcome shown on Table 9, R^2 for boarding learners = .432, F (1, 1038) = 788.97, $p< 0.05$. On the other hand, R^2 for day school learners = .358, F (1, 351) = 194.84, $p< 0.05$. This implied that for boarding learners 43.2% of the variance in KCSE scores could be explained by the KCPE scores while for day school learners, 35.8% of the variance in KCSE scores could be

explained by the KCPE scores. The remaining 56.8% of the variance in KCSE scores for boarding learners and 64.2% for day scholars could be explained by other factors other than KCPE scores. These results indicate that the KCPE scores for boarding learners had slightly more impact on their KCSE scores compared to day school learners.

The Univariate regression analysis results shown on Table 9 further indicates unstandardized coefficients of .222 for KCPE for boarding learners and .200 for day scholars. Both the *t* values of 28.089 for boarding learners and 13.959 for day scholars were greater the critical 2.00 value and their significance was 0.000 (less than .05) indicating that KCPE had a major impact on their KCSE scores. The values of the unstandardized beta coefficients imply that one unit increase in the boarding learners' KCPE scores results in a corresponding increase in their KCSE scores by 0.222 units. Similarly, one unit increase in KCPE scores for day school learners results in a corresponding increase in KCSE scores by 0.200 units.

Using the unstandardized beta values and constants for KCPE, regression equations were drawn from table 9 for both boarding and day school learners. The regression equation for boarding school students was $y=0.222x - 26.009$ while that for day school students was $y= 0.200x - 19.996$ where y was the KCSE scores while x was the KCPE scores. This implies that given circumstances similar to those in Kisii Central, the above equations can be used to predict learners' KCSE scores early from their KCPE scores.

The finding of this study is consistent with the findings of de Hoop (2010) who reported that although boarding schools in sub-Saharan Africa were considered to be top notch schools, they

did not significantly influence pupil academic performance. Othuon and Kishor (1994) also concluded that the predictive validity of KCPE did not significantly vary from one school to another.

Komba, Kafanabo, Tryphone and Kira (2013) in their study reported that in day schools, boys exhibited a stronger relationship (r=0.65) between form two examination scores and form four certificate examination scores in Biology subject than girls (r=0.442), suggesting that day schools favour boys than girls in academic achievement. A further test was not conducted on the calculated *r* values to find out whether the reported differences were statistically significant. This is a weakness in the findings of Komba, Kafanabo, Tryphone and Kira.

Bista and Costick (2005) however reported that feeder hostels (boarding schools) for girls promoted enrolment, retention and achievement in education. Wanjohi and Yara (2011) concluded in a separate study among other findings that the type of school students go to greatly affects their performance in mathematics and that boarding learners attained better scores compared to their counterparts in day schools.

The studies which reported superior academic scores for boarding school learners (Bista & Costick, 2005; Ngeno, Simatwa & Soi, 2013; Wanjohi & Yara, 2011) could have emanated from the fact that boarding schools especially in Africa usually select high achieving learners from primary schools while the lower academic achievers are left to attend day schools as reported by de Hoop (2010). There are however a few learners with high KCPE scores who end up in day schools, which only forms a small fraction compared to the majority of day scholars with lower

KCPE scores. This then makes boarding school learners to achieve higher scores than day scholars when they sit for their secondary school examinations. When the relationship between primary school and secondary school examination score is established however there is no significant difference in this relationship between boarding and day school students. It can therefore be concluded that the main predictor of success in secondary school examination is the KCPE scores and not school category. A learner who scores highly in primary school examination can score highly in secondary school examination whether admitted to a day or boarding school. Similarly, a learner who scores low grades in primary school will equally score low grades in secondary school regardless of whether he or she is admitted to a day or boarding secondary school.

4.6 Relationship between KCSE and KCPE scores for different school sizes.

In order to investigate school size differences in the relationship between KCSE and KCPE scores of the learners, scatterplots were used followed by Pearson's product moment correlation analysis and regression analysis for large, medium and small sized schools. The scatterplot result was as shown in Fig.9.

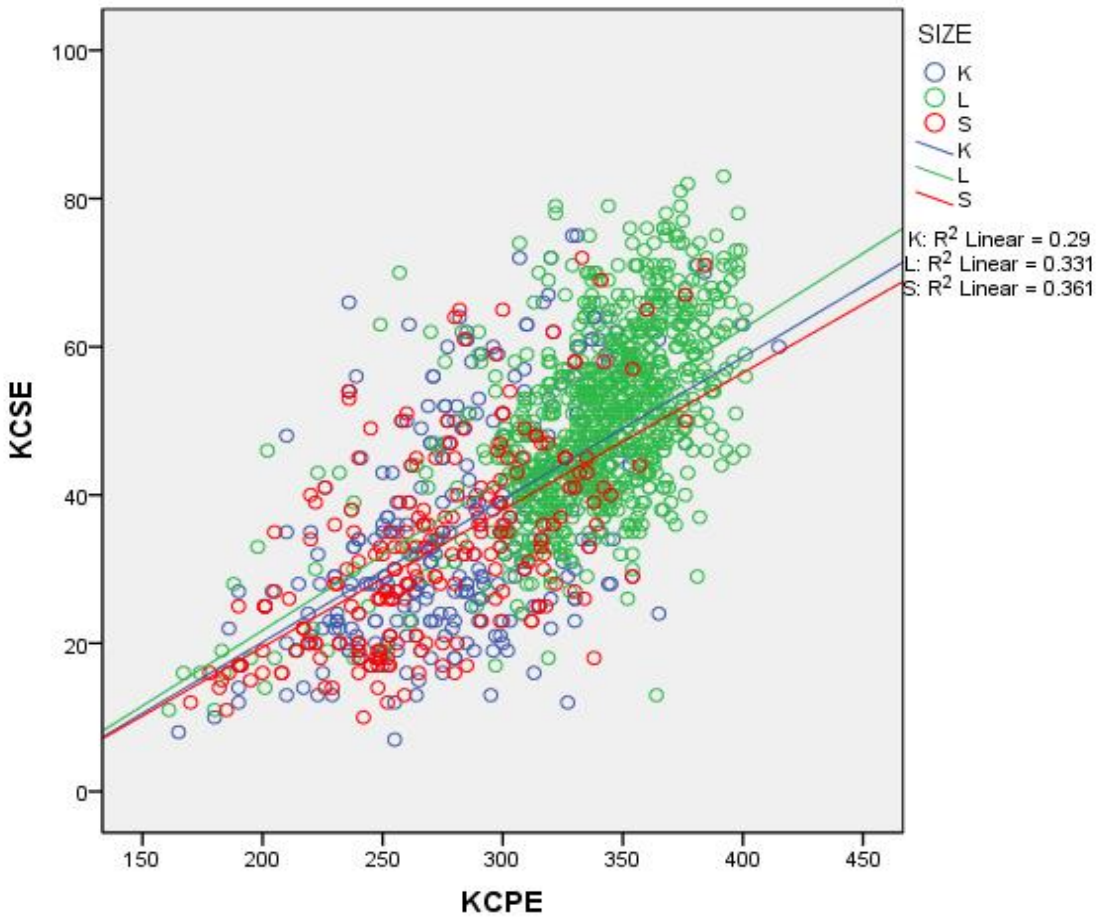

Fig 9: Bivariate Scatter plots of KCSE against KCPE scores for different school sizes
Key: L=Large S=Small K= Medium
Source: field data

Observation on the scatterplots in Fig. 9 indicate that there was a positive relationship between KCSE and KCPE scores for learners in large, medium and small schools. The positions of the regression lines on the scatterplots showed a difference in the relationship between KCSE and KCPE scores for large, medium and small sized schools. Therefore further investigation on these differences was done using Pearson's product moment correlation coefficient as shown in Table 10.

Table 10: Pearson's correlation coefficients between KCSE and KCPE scores for different school sizes

SIZE			KCPE	KCSE
Medium	KCPE	Pearson Correlation	1	**.538****
		Sig. (2-tailed)		.000
	KCSE	Pearson Correlation	**.538****	1
		Sig. (2-tailed)	.000	
		N	332	332
Large	KCPE	Pearson Correlation	1	**.575****
		Sig. (2-tailed)		.000
	KCSE	Pearson Correlation	**.575****	1
		Sig. (2-tailed)	.000	
		N	838	838
Small	KCPE	Pearson Correlation	1	**.601****
		Sig. (2-tailed)		.000
	KCSE	Pearson Correlation	**.601****	1
		Sig. (2-tailed)	.000	
		N	221	221

Source: field data

**. Correlation is significant at the 0.01 level (2-tailed).

Pearson's product moment correlation coefficients were determined according to school size where the relationship between KCPE and KCSE scores was found to as r= .575; n= 838; $p<0.05$ for large schools, r=.538; n=332; $p<0.05$ for medium sized schools and r=.601; n=221; $p<0.05$ for small schools as presented in Table 10. Results showed that small schools had the strongest relationship between KCPE and KCSE examination score followed by large schools and finally medium sized schools. From the face value, KCPE scores was therefore a more accurate predictor of KCSE scores in small schools compared to large and medium sized schools. The big question however was whether these differences in *r* values for the different school sizes were statistically significant or they occurred by chance.

The differences in *r* values for the various school sizes were therefore subjected to further test to find out whether they were statistically significant. It was done by investigating the statistical significance of the difference in the *r* values between small and large schools, between small and medium sized schools and finally between medium and large schools. This was achieved by first converting the *r* values into *z* values using the conversion table in appendix E. The *z* values were then used to calculate the observed *z* value (z_{obs}) using the following formula;

$$z_{obs} = \frac{z_1 - z_2}{\sqrt{\frac{1}{N_1 - 3} + \frac{1}{N_2 - 3}}}$$

z_{obs} between small and large schools $= \frac{z_1 - z_2}{\sqrt{\frac{1}{N_1 - 3} + \frac{1}{N_2 - 3}}} = \frac{.693 - .655}{\sqrt{\frac{1}{221 - 3} + \frac{1}{838 - 3}}} =$ **0.4996**

Where z_{obs} = the observed z value

z_1 = the z value for small schools correlation coefficient

z_2 = the z value for large schools correlation coefficient

N_1= sample size from small schools

N_2= sample size from large schools

z_{obs} between small and medium schools = $\frac{z_1 - z_2}{\sqrt{\frac{1}{N_1 - 3} + \frac{1}{N_2 - 3}}} = \frac{.693 - .597}{\sqrt{\frac{1}{221 - 3} + \frac{1}{332 - 3}}} =$ **1.0993**

Where z_{obs} = the observed z value

z_1 = the z value for small schools correlation coefficient

z_2 = the z value for medium schools correlation coefficient

N_1= sample size from small schools

N_2= sample size from medium schools

z_{obs} between large and medium schools = $\frac{z_1 - z_2}{\sqrt{\frac{1}{N_1 - 3} + \frac{1}{N_2 - 3}}} = \frac{.655 - .597}{\sqrt{\frac{1}{838 - 3} + \frac{1}{332 - 3}}} =$ **0.8910**

Where z_{obs} = the observed z value

z_1 = the z value for large schools correlation coefficient

z_2 = the z value for medium schools correlation coefficient

N_1= sample size from large schools

N_2= sample size from medium schools

The decision rule: if $-1.96 < z_{obs} < 1.96$, correlation coefficients are not significantly different (Pallant, 2007).

From the above calculations, z_{obs} values of 0.4996, 1.0993 and 0.8910 all fall within the range of -1.96 and 1.96 meaning that the correlation coefficients, *r* between KCSE and KCPE had no statistically significant difference when compared between small and large schools, between small and medium sized schools and between large and medium sized schools.

Further investigation on the ability of KCPE scores to predict KCSE scores for the learners in the different school sizes was done using regression analysis as presented in Table 11.

Table 11: Regression Analysis of KCSE scores on KCPE scores for different school sizes.

School Size	Model	R	R^2	Adjusted R^2	Standard Error estimated	F	Sig.
Medium	1	[a].538	.290	.288	12.671	134.662	.000
Large	1	[a].575	.331	.330	10.140	413.772	.000
Small	1	[a].601	361	.358	10.778	123.574	.000
	Model	Unstandardized Beta		Coefficient Standard error	Standardized Beta	t	Sig.
Medium	1(constant)	-18.282				-3.855	.000
	KCPE	.192			.538	11.604	.000
Large	1(constant)	-18.964		3.407		-5.566	.000
	KCPE	.204		.010	.575	20.341	.000
Small	1(constant)	-17.545		4.575		-3.835	.000
	KCPE	.185		.017	.601	11.116	.000

Confidence interval (CI) = 95%

N (large) = 838 N (medium) = 332 N (small) = 221

Total df.(large) = 837 Total df.(medium) = 331 Total df.(small) = 220

a. predictor KCPE

Source: Field data

When linear regression was used to assess the difference in the ability of KCPE scores to predict KCSE scores for learners in large, medium and small schools, the outcomes were as shown on

Table 11. The R^2 for large school learners = .331, F (1, 837) = 413.77, p< 0.05. The R^2 for medium learners in medium schools = .290, F (1, 331) = 134.66, p< 0.05. On the other hand, R^2 for small learners in small schools = .361, F (1, 220) = 123.57, p< 0.05. The R^2 values from the regression analyses represent the slopes of the regression lines and indicate a value of 0.361 for small schools, 0.331 for large schools and 0.29 for medium sized schools. This can be interpreted to imply that 36.1%, 33.1% and 29% of the variance in KCSE scores for small, large and medium sized schools respectively, can be attributed to the differences in KCPE scores. The differences are however, relatively small. These preliminary results therefore indicate that the KCPE scores for learners in small schools had slightly more effect on their KCSE scores compared to learners in large schools in which KCPE scores had more effect on the KCSE scores compared to learners in medium sized schools.

The regression analysis results shown on Table 11 further indicate unstandardized beta coefficients of .204, .192 and .185 for learners in large, medium and small schools respectively. This implies that for learners in large schools, one unit increase in their KCPE scores results in an increase in KCSE scores by .204 units. In medium sized schools, one unit increase in KCPE scores results in an increase in KCSE scores by .192 units and in small schools, one unit increase in the learners' KCPE scores results in an increase in their KCSE scores by .185 units.

The *t* values of 20.341, 11.604 and 11.116 for learners in large, medium and small schools respectively were all greater than the critical 2.00 value, and their significance were all .000 (less than the 0.05 level). These indicate that the KCPE scores for learners in large, medium and small schools had had major effects on their KCSE scores.

From the KCPE constants and the unstandardized beta values given in Table 11 the regression equations for the various school sizes could be given as*: y= 0.204x -18.964* for large schools, *y= 0.192x -18.282* for medium sized schools and *y=0.185x -17.545* for small schools where *y* was the KCSE scores and *x* was the KCPE scores. These could be used to predict KCSE scores for learners early as soon as their KCPE scores are obtained given conditions similar to those found in Kisii Central sub-county.

As shown earlier in this section, the observed *z* values confirm however that the differences in correlation coefficients for the different school sizes were not statistically significant. The finding of this study therefore indicates that although there was a high positive relationship between the KCSE and KCPE scores for learners in large, medium and small schools separately, there was no statistically significant difference on the correlation between KCSE and KCPE scores for the learners from different school sizes.

This finding as displayed in Fig. 9 and Tables 10 and 11 is consistent with the observation made by Slate and Craig (1998) who reported that effect of school size on academic achievement was mediated by other factors such as social class, implying that school size alone had no effect on academic achievement of learners. In a separate study, Abbott, Joirema and Stroh (2002) reported that contrary to common belief, small sized school does not necessarily guarantee student success.

Namulondo (2008) however noted that small classes are easy to monitor as they increase pupils' participation and quick responses from the teachers, which can be translated to better academic

achievement. Another study by Finn and Chilles (1989) in Iowa found a positive correlation between class size and academic achievement for learners in grade 7-12 and a negative correlation for those in grades 4-6. This implied that for learners in grade 7-12, the larger the class size, the higher the academic achievement while the opposite applied to learners on grades 4-6.

In Kenya, and therefore Kisii Central sub-county, expansion of school size is usually based on availability of learning and other related resources required by learners in the schools. This means that most large schools have the necessary capacities to accommodate the number of learners they admit while small schools on the other hand admit a few learners based on the few learning facilities available. As such school size therefore has no effect on the relationship between KCSE and KCPE scores. Learners who achieve high KCPE scores therefore achieve high KCSE scores and those who achieve low KCPE scores attain low KCSE scores regardless of whether they are admitted to small, medium sized or large sized secondary schools.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter contains a summary of the study findings, conclusions and recommendations for further studies.

5.2 Summary of the findings

This study set out to investigate the predictive validity of KCPE among public secondary school students in Kisii Central Sub-County, focusing on gender and school differences. This was achieved by use of three main statistical analyses namely; scatterplots, Pearson's correlation and regression analyses. These were determined first for the whole sample and then in consideration of the intervening factors based on the specific objectives. The three intervening factors used in this study were student's gender, school category (boarding or day) and school size. A summary of the results is given below;

1) For the whole sample, a positive Pearson's correlation coefficient of r=.693; n=1391; $p<0.05$ between KCPE and KCSE scores for the learners was exhibited when the intervening factors were not factored in. Regression analysis revealed that R^2 was .481, $F(1, 1390) = 1286.34$, $p< 0.05$.
2) On gender differences, female learners exhibited a Pearson's correlation coefficient between KCPE and KCSE of r=.710; n=784; $p<0.05$ compared to the males that exhibited a correlation coefficient of r=.675; n=607; $p<0.05$. The differences in these r values for female and male students were tested and found not to be statistically

significant. Regression analysis revealed R^2 values of .504, F (1, 783) = 793.44, p< 0.05 for females and R^2= .456, F (1, 606) = 507.57, p< 0.05 for male students.

3) Based on school category, learners in boarding schools exhibited a Pearson's correlation coefficient of *r*=.657; n=1039; p<0.05 between KCSE and KCPE compared to their day school counterparts who exhibited a Pearson's correlation coefficient of *r*=.598; n=352; p<0.05 between KCSE and KCPE. The differences in these two *r* values were tested and found not to be statistically significant. Regression analysis revealed R^2 values of .432, F (1, 1038) = 788.97, p< 0.05 for boarding students and R^2= .358, F (1, 351) = 194.84, p< 0.05 for day school students.

4) School size differences in the KCPE-KCSE relationship indicated that small schools had a Pearson's correlation coefficient of *r*=.601; n=221; p<0.05 followed by large schools *r*=.575; n=838; p<0.05 and finally medium sized schools *r*=.538; n=332; p<0.05. Further tests revealed that the differences in *r* values exhibited in the three types of school sizes were not statistically significant. Regression analysis indicated R^2 values of .361, F (1, 220) = 123.57, p< 0.05 for students in small schools, R^2= .331, F (1, 837) = 413.77, p< 0.05 for students in large schools and R^2= .290, F (1, 331) = 134.66 for students in medium sized schools.

5.3 Conclusions

This study ended up with the following conclusions based on the findings summarized in section 5.2;

i) KCPE examination score is a good predictor of KCSE examination scores. It is possible to predict the future KCSE scores from learners' KCPE scores in public secondary schools in Kisii Central Sub-County.

ii) KCPE scores is a strong predictor of KCSE scores for both female and male students and there is no significant gender difference in the predictive validity of KCPE for KCSE scores in public secondary schools in Kisii Central Sub-County.

iii) KCPE scores is a strong predictor of KCSE scores for learners in both boarding and day schools and there is no significant difference in the predictive validity of KCPE for KCSE scores between learners in boarding and in day public secondary schools in Kisii Central Sub-County.

iv) KCPE scores is a strong predictor of KCSE scores for learners in large, medium sized and small schools and there is no significant school size differences in the predictive validity of KCPE for KCSE scores in public secondary schools in Kisii Central Sub-County.

5.4 Recommendations of the Study

From the findings of this study summarized in section 5.2 and conclusions made in section 5.3, the researcher has made the following recommendations;

i) The KCPE examination score should continue to be used as a selection tool for enrolment of learners into secondary schools as those who score highly in the KCPE examination are also likely to score highly in the KCSE examination.

ii) Male and female learners should be equally encouraged to improve in their studies as they showed no significant difference in the relationship between their KCPE and KCSE scores. Appropriate actions by the government and other stakeholders aimed at improving academic achievement for girls should therefore be applied to boys as well, to avoid gender disparity in academic achievement.

iii) Learners who are unable to join boarding secondary schools for any reason should be encouraged to join day schools as the main determinant of secondary school achievement is KCPE and not school category.

iv) Learners should be encouraged to join secondary schools of any size as long as these schools have the basic learning facilities because there is no significant difference in the predictive validity of KCPE for KCSE scores in different school sizes.

v) Evaluation of schools based on KCSE scores should take into account the mean KCPE scores of learners in those schools. This can be achieved by comparing a school's actual mean KCSE scores with the predicted KCSE scores computed from the learners' mean KCPE scores, rather than the current blanket evaluation of schools which is unfair to schools admitting learners with low KCPE marks.

5.5 Suggestions for further research

i) This study found a correlation coefficient of .693 with an R^2 value of .481 between KCPE and KCSE scores, meaning that only 48.1% of the variance in KCSE scores of the sampled learners can be explained by their KCPE scores. The remaining 51.9% of the variance is due to other possible variables which should each be investigated.

ii) This study, while considering school category, involved only purely day and purely boarding schools. A further study should be conducted to include schools with both day and boarding facilities for their learners.

iii) This study involved only public secondary schools in Kisii Central Sub-county. A further study should be carried out on the predictive validity of KCPE for KCSE in private secondary schools.

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APPENDIX A

Research Approval from Maseno University Ethics Review Committee

MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3050
Fax: +254 057 351 221
Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariate@maseno.ac.ke

FROM: SECRETARY - MUERC

DATE: 31st March, 2014

TO: Eunice Atieno Agingu,
PG/MED/00020/2009,
Department of Education Psychology,
School of Education, Maseno University,
Private Bag, Maseno, Kenya

REF: MSU/DRPC/MUERC/000061/14

RE: Validity of Certificate of Primary Education Examination Score as a Predictor of Certificate of Secondary Education Examination Score in Public Secondary Schools in Kisii Central District, Kenya. PROPOSAL REFERENCE NO: MSU/DRPC/MUERC/000061/14

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics were adequately addressed in the submitted proposal. Consequently, the study is granted approval for implementation effective this 31st day of March, 2014 for a period of one (1) year.

Please note that authorization to conduct this study will automatically expire on 30th March, 2015. If you plan to continue with the study beyond this date, please submit an application for continuation approval to MUERC Secretariat by 28th February, 2015.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach MUERC Secretariat by 28th February, 2015.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advice MUERC when the study is completed or discontinued.

Thank you.

Yours faithfully,

Dr. Bonuke Anyona,
Secretary,
Maseno University Ethics Review Committee

DIRECTORATE OF RESEARCH PUBLICATION & CONSULTANCIES 31 MAR 2014 MASENO UNIVERSITY

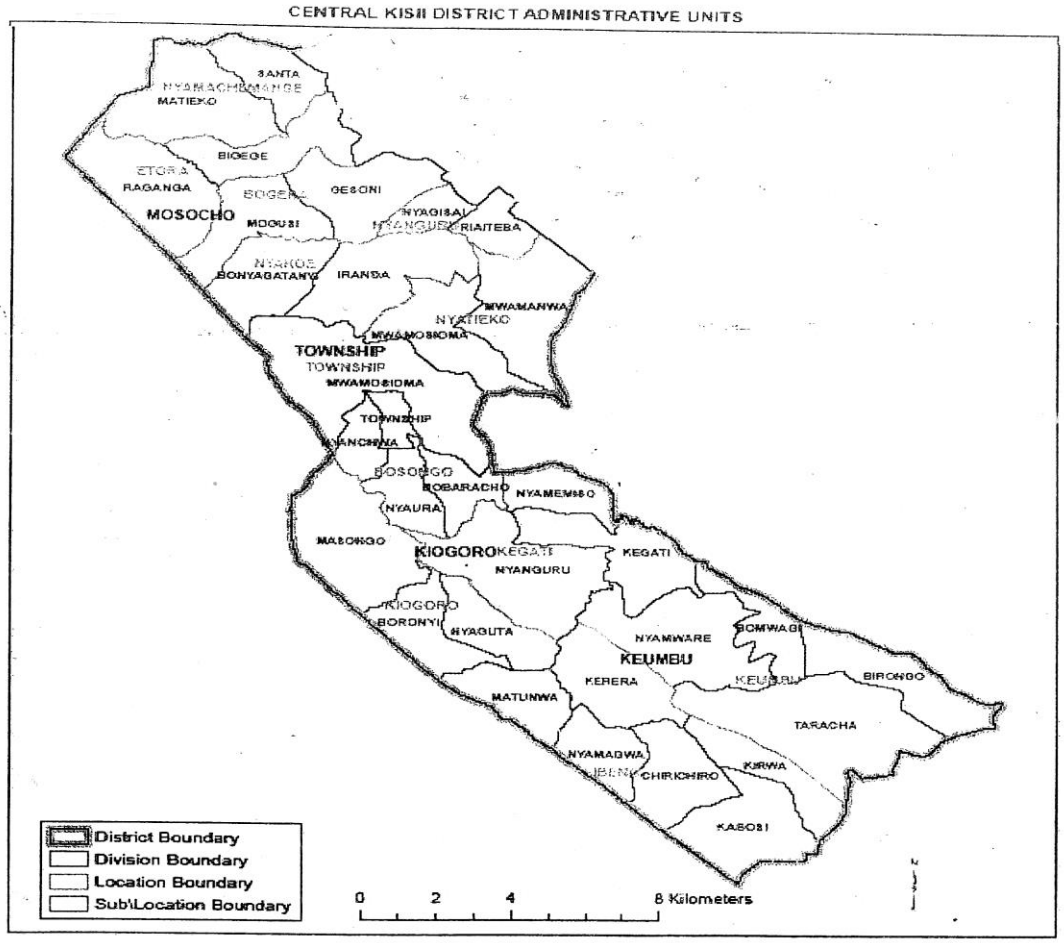
Cc: Chairman,
Maseno University Ethics Review Committee.

MASENO UNIVERSITY IS ISO 9001:2008 CERTIFIED

APPENDIX B

Map of Kisii Central Sub-County

Map 2: Kisii Central District Administrative Boundaries



Kisii Central District Development Plan 2008-2012

APPENDIX C

Computer generated KCSE Result

2010 KENYA CERTIFICATE OF SECONDARY EDUCATION EXAMINATION RESULTS (K. C.

703 [redacted] (163655) [redacted]

CNO	S	MG	AGP	CANDIDATE'S NAMES	101	102	121	231	232	233	311	312	313	443	565
001	M	B+	69		B+	B	A	=	B+	B	=	B	=	B+	=
002	M	B	61		B	B+	B+	C+	C+	B+	=	C+	B-	=	=
003	M	B+	70		A-	B+	C+	A	=	A-	=	B	=	B+	=
004	M	B	61		B	B	B-	B	B	B	=	B-	=	=	=
005	M	B-	58		C+	C-	B+	B	=	B-	B	=	=	B+	=
006	M	B+	69		A-	B	B+	B+	=	B	B+	=	B+	=	=
007	M	B	64		B	B+	C+	B+	=	C+	A-	=	B+	=	=
008	M	B	63		B	B-	A	B	B-	B	B-	=	=	=	=
009	M	B-	58		B	C+	B+	=	B-	B	=	C+	=	=	B-
010	M	B-	53		B-	C	C+	B-	C-	B	=	C+	=	=	B-
011	M	B-	57		B	C	B	B	=	C	=	=	B+	=	B-
012	F	C+	48		B+	B-	D+	C	=	D+	=	=	B	C+	=
013	F	B-	56		B	B	C-	B	C	C+	=	=	C+	=	B+
014	F	C+	48		B-	C+	C	C	C+	C+	=	=	C	=	C+
015	F	C+	46		B-	B	D+	D+	=	D+	=	=	B	B-	=
016	M	C	44		C-	C-	D	C-	=	C+	B+	=	=	B	=
017	F	C	44		B	C+	D+	C	=	D	C	=	B	=	=
018	M	C	45		C	C+	C-	=	C-	C-	B	=	C+	=	B-
019	F	C+	47		B-	B-	D+	C	=	C	C+	=	B-	=	=
020	M	C	40		C+	C+	C	C-	=	D	=	=	C	C	=
021	M	C-	33		C-	C-	D	D	=	C-	C-	=	=	=	C+
022	M	C	40		B-	C	D+	C+	=	D	=	=	C+	=	C-
023	F	C-	35		B-	C-	D-	D	=	C-	C+	=	=	=	C-
024	F	C	39		B-	C+	D	C-	=	D	=	=	B-	=	C-
025	M	C-	33		B-	C+	D	D	=	D	=	=	C-	=	D+
026	F	C-	34		C-	C+	D-	C	=	D	=	=	C+	=	D+
027	M	C+	51		B-	B-	B	=	C-	C	=	C+	=	=	B-
028	M	D+	29		C-	D+	D-	D-	=	D	=	=	C+	=	C
029	F	C-	37		B-	C	D+	D+	D+	D+	=	D	C+	=	=
030	M	C-	37		C+	C+	D	=	D	D	C+	=	C+	=	=
031	M	C-	33		C	C-	D-	D+	=	D-	=	=	C+	C+	=
032	F	C-	33		C+	C-	E	D	=	D-	=	=	B-	C+	=
033	F	C-	34		B-	C-	D-	D	=	D	=	=	B-	C-	=
034	F	C	39		B+	B	D-	D	=	D	C	=	C	=	=
035	M	C	41		B-	C	C-	D	=	D	B	=	C+	=	=
036	M	C-	33		C+	C	D	D	=	D	=	C-	=	C	=
037	F	C-	36		C+	C+	D	D	=	D	=	=	C	C+	=
038	M	C-	37		B-	C-	D-	D+	=	D-	B	=	=	C+	=
039	M	C-	34		C-	C+	D-	D+	=	D	C	=	=	C+	=
040	M	D	24		D	D	D-	D	=	D	=	=	D+	C	=
041	M	C-	33		C-	C	D-	D+	=	D	=	=	C	C+	=
042	M	D+	29		C+	D+	D	=	D	D	=	=	C	=	D
043	M	D	21		D	D	D-	D-	=	D-	=	=	D	C	=
044	F	D+	27		D	B-	D+	D	=	D	=	D-	D+	=	=
045	F	D	24		D	C	D-	D	=	D-	=	=	C-	=	D

APPENDIX D

Manual Data Collecting Pro forma

NAME OF SCHOOL.[redacted].....	CATEGORY: (Day, Boarding, Day & Boarding)
	LOCATION: (Urban, Rural)
NO. OF 2010 KCSE CANDIDATES.....28.....	SIZE: (Small, Medium, Large)

KCSE INDEX NO.	GENDER	KCPE SCORE	KCSE SCORE
703 xxx 001	1	300	C- 36
703 xxx 002	2	257	C 44
003	2	341	B+ 69
004	2	291	D 23
005	1	255	D+ 30
006	2	217	D 22
007	2	261	C+ 39
008	2	201	D+ 25
009	2	238	C- 35
010	2	254	D+ 26
011	2	252	D+ 26
012	2	249	D 18
013	1	224	D 18
014	1	232	D 20
015	2	222	D 20
016	1	219	D 20
017	1	265	D- 16
018	1	186	D- 16
019	2	253	D- 17
020	2	252	D- 17
021	1	200	D- 16
022	1	183	D- 15
023	1	248	D- 17
024	1	190	D- 17
025	1	226	D- 14
026	—	—	—
027	1	240	D- 16
028	1	208	D- 16

APPENDIX E

Table of Transformation of Pearson's Correlation Coefficient r to z values

Table 11.1
Transformation of r to z

r	z_r	r	z_r	r	z_r	r	z_r	r	z_r
.000	.000	.200	.203	.400	.424	.600	.693	.800	1.099
.005	.005	.205	.208	.405	.430	.605	.701	.805	1.113
.010	.010	.210	.213	.410	.436	.610	.709	.810	1.127
.015	.015	.215	.218	.415	.442	.615	.717	.815	1.142
.020	.020	.220	.224	.420	.448	.620	.725	.820	1.157
.025	.025	.225	.229	.425	.454	.625	.733	.825	1.172
.030	.030	.230	.234	.430	.460	.630	.741	.830	1.188
.035	.035	.235	.239	.435	.466	.636	.750	.835	1.204
.040	.040	.240	.245	.440	.472	.640	.758	.840	1.221
.045	.045	.245	.250	.445	.478	.645	.767	.845	1.238
.050	.050	.250	.255	.450	.485	.650	.775	.850	1.256
.055	.055	.255	.261	.455	.491	.655	.784	.855	1.274
.060	.060	.260	.266	.460	.497	.660	.793	.860	1.293
.065	.065	.265	.271	.465	.504	.665	.802	.865	1.313
.070	.070	.270	.277	.470	.510	.670	.811	.870	1.333
.075	.075	.275	.282	.475	.517	.675	.820	.875	1.354
.080	.080	.280	.288	.460	.523	.680	.829	.880	1.376
.085	.085	.285	.293	.485	.530	.685	.838	.885	1.398
.090	.090	.290	.299	.490	.536	.690	.848	.890	1.422
.095	.095	.295	.304	.495	.543	.695	.858	.895	1.447
.100	.100	.300	.310	.500	.549	.700	.867	.900	1.472
.105	.105	.305	.315	.505	.556	.705	.877	.905	1.499
.110	.110	.310	.321	.510	.563	.710	.887	.910	1.528
.115	.116	.315	.326	.515	.570	.715	.897	.915	1.557
.120	.121	.320	.332	.520	.576	.720	.908	.920	1.589
.125	.126	.325	.337	.525	.583	.725	.918	.925	1.623
.130	.131	.330	.343	.530	.590	.730	.929	.930	1.658
.135	.136	.335	.348	.535	.597	.735	.940	.935	1.697
.140	.141	.340	.354	.540	.604	.740	.950	.940	1.738
.145	.146	.345	.360	.545	.611	.745	.962	.945	1.783
.150	.151	.350	.365	.550	.618	.750	.973	.950	1.832
.155	.156	.355	.371	.555	.626	.755	.984	.955	1.886
.160	.161	.360	.377	.560	.633	.760	.996	.960	1.946
.165	.167	.365	.383	.565	.640	.765	1.008	.965	2.014
.170	.172	.370	.388	.570	.648	.770	1.020	.970	2.092
.175	.177	.375	.394	.575	.655	.775	1.033	.975	2.185
.180	.182	.380	.400	.580	.662	.780	1.045	.980	2.298
.185	.187	.385	.406	.585	.670	.785	1.058	.985	2.443
.190	.192	.390	.412	.590	.678	.790	1.071	.990	2.647
.195	.198	.395	.418	.595	.685	.795	1.085	.995	2.994

Source: McCall (1990); originally from Edwards, A. L. (1967). *Statistical methods* (2nd edition). Holt, Rinehart & Winston

APPENDIX F

Cohen's Scale of Strength of Association for the Pearson's Correlation Coefficients

$0.1 < |r| < 0.3 \rightarrow$ small/weak correlation

$0.3 < |r| < 0.5 \rightarrow$ medium/moderate correlation

$|r| > 0.5 \rightarrow$ large/strong correlation, where $|r|$ is the absolute value of Pearson's correlation coefficient.

Note. The scale was given for sample size ≤ 30 and alpha level of $p < 0.05$.