

VALIDATION OF A SELECTION AND CLASSIFICATION

MODEL:

**A CASE STUDY OF THE FACULTY OF EDUCATION,
KENYATTA UNIVERSITY**

BY

WAMBUA RICHARD MBITHI

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REQUIREMENTS FOR THE DEGREE OF MASTER OF EDUCATION
(EDUCATIONAL PSYCHOLOGY)**

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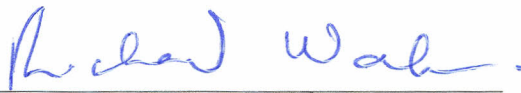


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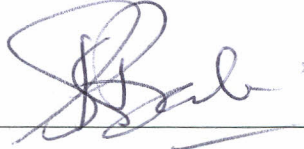
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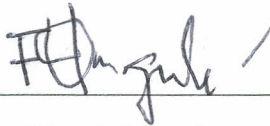
Richard M. Wambua

“This Thesis has been submitted with our approval as University Supervisors”.



Prof. Shashi K. Bali

Department Of Educational Psychology
Kenyatta University



Dr. Frank Ingule

Department Of Educational Psychology
Kenyatta University

DEDICATION

This thesis is dedicated to the memory of Angelo Muasya Wambua.

(1968 – 2001)

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Richard Wambua

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ABSTRACT

This study investigated the efficiency in selection and classification. Selection is a decision making process to determine who gains admission to a course of study. Classification is done to assign applicants to different courses of study. To aid in the decision making strategy a model is used to combine predictor variables. These predictor variables include scores obtained from tests. In this study selection for public university education in Kenya was considered.

Because of the stiff competition for places, the grades obtained in the university selection examination, the Kenya Certificate of Secondary Education (KCSE), were used in a conjunctive model. This model was utilised in two stages, the first is the screening for university admission and the second is classification.

The sample consisted of the Year 2000 graduating cohort of Bachelor of Education Arts and Science students at the Kenyatta University (n=320 and n=206 respectively). The study was carried out retrospectively, where performance in the university was traced back to the selection examination, the Kenya Certificate of Secondary Education (KCSE), done in 1994. The criterion variable was University Performance, which is the average grade obtained after four years of study at the university. The predictors were the KCSE Aggregate Grade, used to set a cut off necessary for admission to university, and the KCSE Cluster Grade used in assigning qualified applicants to different courses.

The question of whether the KCSE English Grade can add to the prediction efficiency was explored. The influences of some non-academic variables, namely

gender and high school background of a student on University Performance were also investigated.

Data was obtained from the offices of the Joint Admission Board (JAB) at the University of Nairobi and at the Kenyatta University. The data for two groups of students, Arts (BEd) and Science (BEd), were independently analyzed. Correlation analyses was carried out to explore inherent relationships between various variables. Multiple Correlation was carried out to determine the degree of relationship between various combinations of predictors with University Performance. One way Analysis of Variance (ANOVA) was used to determine the influence of gender and high school background on University Performance. The significance of results was tested at $\alpha = .05$

For both the Arts (BEd) and Science (BEd) subsamples, it was found that the KCSE Aggregate Grade had low but significant correlations (.22) with University Performance. The combination of the KCSE Aggregate Grade with the KCSE Cluster Grade yielded a multiple correlation coefficient (R) of .23, in both subsamples. Addition of the KCSE English Grade as a predictor raised the value of multiple R to .26 for the Arts (BEd) subsample, but lowered R to .22 for the Science subsample. The most plausible explanation of these modest gains in R was the effects of restriction of range, a problem in any selection study, and the high and significant inter-correlations among the KCSE grades.

The KCSE Aggregate Grade was shown to contribute more to University Performance in comparison to the other predictors. This provided support for its continued use in setting a cut-off score for university admission. The KCSE

Cluster Grade had lower correlations with University Performance. Support for its continued use in classification arose from the fact that, apart from restriction of range, the high rate of inter-faculty transfers could have compromised the selection standards. Therefore the KCSE Cluster Grade remains the best option in classification due to ease of administration at no extra cost in the selection process.

In both subsamples female students performed better at the university than their male counterparts. Further analysis revealed that there were no significant differences in university performance when students were grouped by gender. This implied that affirmative measures put in place by the JAB in an effort to bolster female populations were justified, as lowering of cut-off grade for female students did not compromise standards at the university.

Students with a Provincial Schools backgrounds performed better than their counterparts in the Arts (BEd), while those with a District Schools backgrounds performed better than their counterparts in the Science (BEd) courses respectively, even though not significantly.

It was felt that there was need to provide effective career guidance services in all schools to help students in making career choices, using some of relevant findings of this study. There is also need to improve record keeping at the university so as to keep track of student performance through the whole course of study. There is also need for further investigation on the effect of course choices on university performance.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

This section begins with a short description of Kenya's education system. This will lead to a brief discussion of the university selection examination. The final section deals with the university selection process.

1.1.1 Kenyan Education System

The structure of formal education in Kenya (the 8-4-4 system) consists of three levels. The primary level, which takes eight years, is the starting point. At the end of primary education pupils have to sit for the Kenya Certificate of Secondary Education (K.C.P.E) examination. Unfortunately, the completion rate at the primary level is very low. According to Aduda (2001), only about half of the 918,654 appropriate age children who enrolled in standard one in 1993 reached standard eight in the year 2000. Moreover, only about 55 percent of the 481,111 candidates who sat for the K.C.P.E in the year 2000 were admitted to secondary schools, which forms the second level of the Kenyan formal education system.

There are about 3,000 secondary schools in Kenya, with a total population of 658,253 students with the boys to girls ratio of about 1:1. (Kul, 2000). Secondary schools are categorized according to the source of sponsorship...

Public (Government-aided) secondary schools are of three major types namely; national and provincial, and district. The national schools have about one percent of the total secondary school population. They are very selective that is they only accept applicants with high marks in the KCPE. Approximately 14 percent of secondary school students are in the provincial schools. They are fairly selective and have a provincial catchment area. Most of the national and provincial schools are old and well established. They are endowed with vast compounds, extensive built up areas and are also well equipped. The majority of these schools provide boarding facilities because students do not live nearby, as well as decent teachers' housing. These factors have a role in maintaining good performance of these schools in the KCSE. (Muya, 2000). Public schools in the district category have 72 percent of the total student population. In most cases these schools have inadequate learning resources. They accept applicants with average marks in the KCSE, who are mainly from the immediate neighbourhood of the school.

The remaining 13 percent of secondary students are in the private schools. These schools have a very wide variation in quality, ranging from very good to very poor. High fees are charged as there is no government assistance in the running of schools in this category.

The majority of secondary school students aspire for a place in the next level of education, the tertiary level. In 1998 the total enrollment in all the tertiary institutions stood at 119,749. In particular, public universities had a population of 44,501, while chartered private universities had a population of 7,639. (Kul, 2000).

University education is at the highest tier of the 8-4-4 system of education. It is the apex of academic pursuit and the center from which new knowledge radiates. The quintessence of university education is to produce a cadre of highly qualified manpower who form the necessary human resource for economic development. According to the Master Plan for Education and Training (Ministry of Education, 1998), there were five public universities in Kenya. These were Nairobi, Kenyatta, Egerton, Jomo Kenyatta and Moi. In the year 2000 Maseno University College was elevated to full university status, bringing the total to six. The universities have a common Chancellor, who is also the Head of State. The chief executive in each university is the Vice-Chancellor.

There are six private chartered universities, namely Daystar, Scott, African Nazarene, Catholic University of Eastern Africa, University of Eastern Africa at Baraton and the United States International University. These universities admit self-sponsored students from Kenya and other parts of the world.

The majority of secondary school students aim to secure a place in the public universities. This is partly due to the comparatively low cost in studying there. The cost of education for full time undergraduate students admitted through the JAB is partly financed by the state. Another reason is the prestige associated with university education. Those who pass through university may obtain well paying jobs. They will then attain membership of Kenya's political, social, economic and intellectual elite. But as one goes up the education ladder, educational opportunities become more limited. The transition from one level to the next is not automatic. A student must do well in an examination set at the end

of each level, to be assured of a place in the next level. The next sub-section deals with the examination used in the selection of university students.

1.1.2 The Kenya Certificate of Secondary Education Examination

At the end of four years of secondary schooling, students sit for the Kenya Certificate of Secondary Examination (KCSE), a national achievement examination. The examination has two purposes. The first is certification, marking the end of this level of education. The second purpose is selection. This is because of the fact that there are more candidates at one level than can be accommodated in the next level. The examination provides criteria for selecting assumedly academically able students for further studies.

The organization in charge of administering the KCSE is the Kenya National Examination Council (KNEC). The main functions of the council are to conduct examinations and award certificates to successful candidates. The KNEC periodically publishes the Secondary School Regulations and Syllabus. According to the 1999 edition of this publication, the total number of subjects are grouped into five broadly related areas namely:

Group One: Compulsory; English, Kiswahili and Mathematics.

Group Two: Sciences; Physics, Chemistry, Biology, Physical Science, Biological Sciences. Group Three: Humanities; Geography, History and Religious Education. Group Four: Applied and Technical subjects. Group Five: Business subjects and Foreign languages.

A student is required to sit for a minimum of eight and a maximum of ten subjects. This includes the three compulsory subjects and at least two science subjects. (See

Appendix One for details and the complete list of subjects on offer). The combination of subjects a student takes depends on a student's ability, vocational aspirations and facilities available in the school.

The KCSE examination is conducted at the end of each calendar year, starting from October to November. The examination is marked and released by the KNEC. Performance in subjects is reported using letter grades on a 12 point scale; where the A plain is equivalent to 12 points, A minus is equivalent to 11 points, downwards to E which is the lowest, and is equivalent to one point. From the best eight subjects a student can score a maximum of 96 points equivalent to a mean grade A. The mean grade E is the weakest, corresponding to eight points. (Details of grade conversions in Chapter 3 section 3.3.1). According to the Career Information Booklet (Ministry of Education, 1999), the mean grade C+ of 56 points is the minimum requirement for admission to both public and chartered private universities. This is the base rate in selection for university admissions, yet attaining the grade equal to or above the C+ does not assure an applicant a place in the university. This is because some degree courses are more popular than others, and applicants, must compete for the few places available. Classification to various faculties is based on a cluster of four subjects. These subjects are assumed to be closely related to the curriculum of the particular degree programs. Therefore applicants attaining a mean grade C+ and the highest sum of cluster grades stand a good chance of being selected to the degree course applied for.

This section has highlighted the KCSE examination regulations that are related to university admissions. The following section deals with the process of selecting students for admission to public universities.

1.1.3 The Joint Admissions Board

The six Kenyan Public Universities rely on one common organization for making admission decisions. This is the Joint Admissions Board (JAB). It operates under the legal framework of the Commission for Higher Education, in the Universities Act, 1985, of the Laws of Kenya. Its membership comprises the six Vice-Chancellors of the public universities. Also included in the board are Deans of Faculties. Their main function is to advise the Vice-Chancellors of the course requirements and admission criteria to be used in a given year.

Every year secondary school students complete university admission forms. The application forms are forwarded to the candidates before they sit for the KCSE. The applicants have to supply information concerning their age, sex, home district and the KCSE index number in an official application form. (See appendix C for a sample application form). They are also expected to indicate four choices of degree course given in order of preference. An applicant is also able to choose the university in which to study the courses of choice. The head-teacher is required to give an evaluation of the character of the applicant. Those candidates with a good chance of doing well in the KCSE examination and are interested in studying in Kenya's public universities are usually the ones who apply. The selection process starts after the results of the KCSE examinations are released to

the JAB by the KNEC. The number of qualified applicants is always greater than the number of places available.

According to Mutunga (2001), the cut-off point for admission depends on three main factors. The first one is performance in the KCSE examination, which fluctuates from one year to another. The second one is the number of applicants whereby a high number raises the cut off point. The third factor is the number of places in the university, which are dependent on the teaching facilities and teaching personnel available. The cut-off point is established according to the mechanisms of supply and demand. The applicants are ranked in descending order of performance (aggregate grade obtained) in the KCSE, and a line is drawn above which the number of applicants equals the number of places available in the university.

Universities with similar degree programs set uniform standards for admissions. Factors considered for admission to the particular course include interest, aggregate grade and cluster grades. First choice applicants to popular degree programs have a better chance of being selected than second and third choice applicants. Some popular courses such as Medicine always have an excess of applicants. This means that an applicant must have very high cluster grades to be assured of a place in such courses.

Education is a professional course and is usually selected as a second or third choice by applicants. First choice applicants to Education courses and those who fail to gain a place in the competitive first and second choice courses, are ranked in order of descending performance in the KCSE (cluster grade). The cut-

off point is placed where number of applicants equals the number of places. Those who fail to gain admission in the first three choices applied for will be assured of places in the fourth choice. This slot is reserved for non-professional courses such as the B.A. or B.Sc. because admission to these courses is the least competitive.

Individual universities take up the task of informing their prospective students of the admission decision. Admissions take place at the beginning of a new academic year. In the case of Kenyatta University the first year students are allowed to register for different Education courses only if they have done well in a related KCSE subject. For example, for admission to the Music (BEd). degree course one must have done well in Music at the KCSE.

The following section deals with some issues that arise in relation to the selection process.

1.1.4 Non-academic factors in the performance of the KCSE.

The first issue to consider is gender differences in performance of achievement. The proportion of women in the university is lower at the university than at other levels of education. This has been attributed to poor performance at the KCSE examination. Reasons given for this are the disadvantaged educational, cultural and social background of female students. An attempt was made to increase the female population in the university by lowering the cut-off score for admission. (Daily Nation, 1992). Further on, in a report of the 1999 KCSE, Muya, (2000) commented that analysis performance showed gender disparities. Girls continued to perform poorly in comparison to their male counterparts. Exceptions

to this trend are some girls in highly rated national and provincial schools situated mainly in Kenya's urban areas

The second issue to consider is the differences in the educational background of university students. Applicants from the District schools are at a disadvantage. This is because they have to compete for places with other applicants from the National and Provincial schools that perform better in the KCSE. . Some studies carried out in American universities have shown that there exists gender and high school background sub-group differences in the grade point average of university students (Andrés, 1996, Luthy, 1996). It was therefore necessary to investigate if gender and high school background factors contribute to differences in performance at the university.

The third issue to consider is English language ability. English is the language of instruction in the university, and fluency in this language may imply good performance. This is why American universities require university applicants whose mother tongue is not English to pass an English language proficiency examination (Vanderberg, 1999). Anderson (1977) pointed out that any discussion on testing and selection that ignores language ability was not going to get very far. Previous researchers, especially at the primary level have shown the importance of language ability in predicting educational performance (Gatumu, 1989; Lunalo, 1983; Owigar, 1980). If the managers of the selection process are keen on increasing efficiency in the selection of students then the issue of English language ability needs to be looked into.

1.2 Statement of the Problem

An outstanding feature of the education system is the competitive achievement examinations students sit for at the end the secondary level. The results of the secondary examination are used in the selection of university students. A small proportion of any secondary school cohort survives to university education. There is need to conduct research to investigate selection efficiency in the education system.

Selection is done to determine who will be given a place in an institution of learning. To aid in the decision making process models of selection are used. Selection managers will have a choice of models to use, and the type of tests that could be used in the model. Where the selection process is severe, managers of the selection process need to show evidence of efficiency in the selection process to justify further use of the selection model in place. (Guion, 1986)

Due to limited number of places in Kenyan universities, a conjunctive model is used to screen the applicants using scores derived from the KCSE, an achievement examination. The first stage in the selection process is concerned with setting a cut-off score on the aggregate grade, necessary for admission to university. The second involves use of a second cut-off on a cluster grade for classification purposes, that is, to determine who will be assigned to which course. This study will therefore address efficiency of the selection of Kenyan public university students at each stage of the selection process.

It is necessary to explore the possibility of including additional variables for efficiency in selection. The English language is the primary medium of instruction at the university. It has been found to be a strong predictor of performance at the secondary school level, where it is also the main language of instruction. There is therefore need to find out if inclusion of the English grade can increase efficacy of the university selection model.

The examination used in selection puts students from poor educational background and girls at a disadvantage. There is need to find out if these differences in performance continue to persist at the university level of education.

1.3 Purpose of the Study

This study investigated the efficiency of the selection of university students using an achievement examination in a conjunctive model. This study also investigated whether there were differences in academic performance at the university when subjects were grouped by gender and by high school background.

1.4 Objectives of the study

The objectives of the study are as follows

1. To find out the efficiency of the selection process using achievement examinations in a conjunctive model.
2. To find out if there are gender and high school background differences on academic performance at the university.

1.5 Significance of the Study

Education is costly and as such a lot of effort is put into the selection.. Unfortunately little research has been done on selection in Kenya, especially at the university level. This may be due to a naïve belief in the objectivity of the selection process and possibly reluctance in seeing value of research in this field. This study was therefore designed to provide empirical evidence of the efficiency of the selection protocol in current use for the selection of university students.

The findings of the study will determine the efficacy of the selection model in use, or suggest improvements. The recommendations will imply savings in the cost of university education. This is because only those students likely to succeed will be admitted. The results of this study could also be used in academic counseling at the secondary school level. They will provide a scientific basis for the counselor's efforts in helping the secondary student plan for their academic future. The research results will therefore be of benefit to secondary school counselors, university admission managers, test developers at the KNEC and curriculum developers at the Kenya Institute of Education. The results of the study will also form the springboard for future research on university selection.

1.6 Limitations of the Study

The sample selected had a severe restriction of range. As it was mentioned previously, university students are those who had done very well in the selection examination. The restriction of range therefore was a cause of very low values in the correlation coefficients calculated in the study.

An important aspect of selection studies is a proper definition of success or the criterion (Cronbach, 1984; Hurley 1984; Hills, 1971). The criterion used in this study was university performance, which was a person's cumulative average score in units done over the four years of study. The university performance of students in this sample was obtained in the records available. The first limitation in the use of scores arises from the use of different marking standards by different lecturers. Some are more generous than others, yet they teach and examine the same unit. The second is that some administration practices such as counting the second score when a course is repeated further reduce the comparability of achievement across the units. Thirdly, university performance represented a narrow definition of cognitive skills, and in cognitive-intensive skills such as teaching, high academic achievement does not necessarily translate to professional competence. (Judge, Cable, Bodreau & Bretz, 1995; Ngaruiya, 2001).

Nevertheless, university performance was considered as a criterion because it is used in awarding the class of degree for graduands, and is also the basis for decision-making on admissions for masters programs and subsequent staff development. (Kenyatta University Calendar 1998).

The time lapse between the criterion and the predictor is another important limitation. The researcher collected criterion data available six years after the selection examination, thereby raising questions about internal validity of the study.

A study completed thus refers to events in the past and may not indicate the shape of events at the time of completion of the study. This places a limit on the extent to which the results of the study can be generalized.

Another limitation is that in a retrospective study, is the extent and nature of data available. It is therefore not possible to consider intervening variables that are pertinent in this study. These are the factors that could affect academic performance, such as study habits, attitudes toward the teaching profession, lecturer rating of student ability and student participation in extracurricular activities.

And finally, due to a shortage of funds and time, the study was carried out at the Faculty of Education, Kenyatta University, among the Education Arts and Science students. Even for this sample, the university administration was very slow in responding to queries related to this study. This was on one part due to red tape in normal use in its procedures

1.7 Definition of Terms

Achievement test is a test designed to measure a students grasp of some body of knowledge or proficiency in certain skills.

Aggregate Grade is the overall average grade obtained in the KCSE examination.

Cluster Aggregate Grade is the sum of grades obtained in a prescribed group of four subjects of the KCSE examination.

Criterion is a standard of judging. In test development it usually refers to a characteristic or combination of characteristics used as a basis for judging the validity of a test. In this study it is referred to as university performance.

Cut-off score is the score used to screen people into two dichotomous categories. This is by placing people who obtain a score equal to or higher than the cut-off score in one category and all other people in the other category.

High School Background refers to the type of high school attended by a university student.

KCSE The Kenya Certificate of Secondary Education examination is a national achievement test battery done at the end of four years of secondary school.

Predictor is an instrument used to estimate some form of behavior external to the measuring instrument itself.

Predictive validity of a test gives evidence of how accurately some earlier measure of the ability can forecast some later measures of performance. It is expressed in the form of a correlation coefficient.

Selection model a simplified description of a strategy used in decision making in the selection process.

University performance is the cumulative average score obtained in all the units taken in four years of study by a university student.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The first section of this chapter deals with the theoretical rationale. Various selection models are discussed. The second section contains a review of relevant studies. In the final section are the research hypotheses.

2.1 Theoretical Rationale

Selection is the decision to accept or reject an applicant for a place in an institution of learning. In the selection decision-making process the basic strategy is to make optimal use of institutional capacity. Therefore an institution must identify characteristics that portend good performance, and this requires the use of tests (Guion, 1986). Information obtained from tests is combined to make selection decisions. A closely related term is classification. This term describes a decision to determine what kind of treatment an individual should receive. In educational institutions classification decisions are taken when assigning persons to different courses or faculties. An example of a classification decision at the university is in the assigning of successful applicants to courses such as Medicine, Engineering and Education. (Thorndike, 1997). In addition, when persons are assigned to different levels of a course, we have to make a placement decision. An example of

placement is when assigning mature age university applicants to the second year of study in a course already done at diploma level.

There are three major statistical models for combining scores, namely the multiple regression, the cut-off score and the conjunctive models. Each of these models and their applications are discussed next. (Anastasia & Urbina, 1997; Cronbach & Gleser, 1965; Hills, 1971; Nunnally & Bernstein, 1994; Riggio, 1996).

2.1.1 The Cut-off Score Model

This model involves setting a cut-off point on a predictor measure score, below which an applicant will not be admitted. This model is used when it is vital to reject an individual lacking in essential skills for a program of study. A high score in other predictors cannot compensate for deficiency in these vital skills. For example a cutting score on a test for finger dexterity may be set for dentist school applicants. Scores on other tests like Mathematics cannot compensate for the important manual manipulation skills. This model is particularly useful where there is a large number of applicants for very limited places available. This is because of its simplicity and transparency in administration.

There are two methods or ways of arriving at a cut-off score. The first method is applicable when there is a definite number of vacancies. The applicants are ranked in order of performance and those on top of the list fill the vacancies. This method is used in Kenya's education system, in the selection of secondary school students. It offers transparency and simplicity in administration.

The second procedure used in setting the cut-off score is graphical in nature. The cutting score is derived from a scatter diagram of a validation study. These applicants are tested on a selection variable. The scores in this selection variable are collected, but are not used in any form of decision making. All the applicants are selected. After the program of instruction, criterion score is collected, and correlated with the selection variable, and a scatter plot is drawn. From this follow up study one is able to see the number of predicted failures and success. The decision-maker estimates what amount of risk he is willing to take in terms of the failure/success ratio, and fixes the cutting score accordingly. This procedure is used when there are unlimited places available.

The cut-off score model is much simpler in administration. It does not need elaborate calculations to make accept/reject decisions. However, this simplicity may bring up a disadvantage. This is in setting a cutting score without adequate evidence of the validity of the selection variable/test. Another disadvantage is that some variables crucial in contributing to success in a criterion may be left out in the decision making process. This model contrasts with the regression model. It is used in situations where it may not be appropriate to use the regression model. The following section describes another basic model.

2.1.2 The Multiple Regression Model

Multiple regression is a multivariate technique for determining the correlation between a criterion variable and some combination of two or more predictor

variables. In the model a single criterion is related to a number of predictors in an equation of the form

$$Y = a + b_1 x_1 + b_2 x_2 + \dots + b_n x_n$$

b is a regression weight, a is an intercept constant, Y is the criterion and x is a predictor score. This model is used in selective American colleges (Vanderberg, 1999). Applicants for undergraduate courses are required to provide different types of information. One of these is scores from aptitude test batteries. The most widely used aptitude tests are the Scholastic Aptitude Test (SAT), the Graduate Record Examination (GRE) and the American College Test (ACT). Aptitude tests give an indication of the scholastic potential of an applicant. University admission officers also require high school grade point average (GPA). It gives an indication of the mastery of high school curriculum. Different high schools may not have similar awarding standards.

The universities may therefore require additional information of high school achievement. This will be in the form of the Rank-In-Class index. This is the student's rank in the graduating class. Foreign students for whom English is not a first language are required to pass the test of English as a foreign language (TOEFL) examination. English is the main language of instruction and applicants must demonstrate proficiency in its use. Each of the measures mentioned above contributes to a facet of the criterion. The most favored criterion is the graduating grade point average (GGPA). This is the average point grade for the duration of the degree course.

The main advantage of this model is in its compensatory nature. A low score in one predictor may be compensated for by a high score in another predictor. For example a student from a relatively poor educational background may have a low high school GPA. If the student scores high in an aptitude test he will still have a good chance of admission to college. Another advantage is that a higher percentage of correct decisions can be arrived at with this model. This is because all applicants for admission are evaluated using the same regression equation. This model is also useful for guidance purposes. A counselor may advise a student on his chances of success in various degree courses, based on predicted scores from the relevant regression equations.

There are some disadvantages associated with this model. The first arises from the difficulty in obtaining a reliable and valid criterion. One needs to adequately define success, and obtain valid and reliable assessments of the aspects of success that one has obtained. The second disadvantage arises when a regression equation obtained from a given sample predicts lower criterion scores for a new and incoming sample. This is shrinkage. A cross-validation study is therefore required to determine the appropriateness of the equation for the new sample. The multiple regression model is useful when a number of predictors are available. Each of these contributes in forecasting the performance of the applicant. The following is another model that combines the strengths of the two basic models.

2.1.3 The Conjunctive Model.

In order to improve efficiency in the selection process, the major strengths of the Cut-off Score and the Multiple Regression models are combined to produce the Conjunctive model. This model is applied in a two stage process that is also sequential.

In the first stage, applicants who fall below the required standard for admission are pre-rejected using a cut-off score. This cut-off is arrived at by ranking applicants in descending order of performance. A decision is then made to place the cut-off score such that the number of applicants above the score are equal to the number of places in the institution of learning. Within the group of applicants who satisfy the minimum standards further differentiation of who goes to which course is made. This is done on the basis of a cut-off score applied to a sum of grades of a combination or cluster of subjects. The cluster of subjects is chosen on the basis of a close relationship with the curriculum of the course of study applied to.

This model is useful when there are a large number of applicants for places that are too few. Selection in Kenyan public universities by the JAB is done using this model. Here the selection process takes place in two stages. In the first stage, a cut-off score applied to the aggregate grade of the selection examination determines if an applicant will get a place in the university. In the second stage, it is necessary to make a classification decision to determine who will take up places in the different courses of study available. Therefore a cut-off score is arrived at

the second selection criteria, the cluster grade. The cluster grade is the sum of grades attained in the four subjects that are closely related to the curriculum of the course applied for. The more popular courses will therefore have a higher cut-off score on the related cluster grades than the less popular ones. For admission to BEd. courses, a student should do well in the following corresponding clusters, one for Arts (BEd) and two for Science courses described in the following paragraph.

For Arts (BEd) the following are the subjects in the required cluster; 1. English or Kiswahili 2. Mathematics or a Science subject 3. Any Humanity subject and 4. Any Applied, Technical, Business or a Foreign Language.

For Science (BEd) the cluster subjects to consider are;

Alternative A 1. Mathematics 2. Physics 3. Chemistry 4. Biology;

Alternative B 1 Mathematics 2. Physical Science 3. Biological Science, 4. Geography or English or any Applied / Technical Subject.

This requirement of a second selection criteria motivates secondary students to put extra effort in subjects related to courses they wish to pursue in the university. This in turn may raise standards in performance at the university as the students will have a firm foundation to build on the new knowledge. A major drawback of this model is that no further consideration is made of the students who are rejected on the basis of the first cut-off score. Some of those left out of the university may have more superior cluster aggregates than some of those actually admitted.

2.2 Summary of the Theoretical Rationale

The Multiple Regression Model involves a linear combination of scores. It is compensatory in nature. The Cut-Off Score Model involves setting a cutting score on the predictor measure. It is non-compensatory in nature. The Conjunctive Model is a combination of two other models. It is currently utilized in the selection of university students. It is assumed to be efficient, but a validation study needs to be done to confirm this.

To validate this model, analysis was carried out using standardized multiple regression equations. Variables will be entered into the equation using the forward method. In the first place will be the aggregate grade, followed by the cluster grade and. Increments in the value of the multiple correlation coefficient were computed in order to find out the relative contribution of each predictor. The following section is a review of studies that deal with validation.

2.3 Related Studies

This section of related studies contains sixteen reviews of past research. The earliest one is dated 1976, and the latest 2000. Most of the studies have been carried out in the United States, the rest in Kenya and other parts of Africa. The studies are grouped according to the type of selection variable studied. In the first group, two studies on aptitude tests are considered, followed by six studies on achievement selection tests. In the third group there are four studies on the aptitude

and achievement combination. In the fourth group two studies on achievement tests combined with other measures will be reviewed.

2.3.1 Aptitude Tests

Oldfield and Hutchingson (1996) used a context analysis of how well the three components of the Graduate Record Examination (G.R.E.), the Verbal, (GRE V) Quantitative (GRE Q) and Analytical (GRE A) predict performance for 62 Master of Public Administration (MPA) students. They were enrolled in a two-course Analytic Methods subject. The term context analysis means that the criterion was a core course taught in one university by a single instructor. This was to hold constant various intervening variables (noisy data) namely; faculty grading standards, graduation requirements and student background. The study also examined whether three Graduate Grade Point Average (GGPA) can predict grades in the two core courses. Since this MPA program has no minimum GRE requirements, the input variable range was unrestricted.

The results showed that all relationships were significant at $\alpha = .05$, but only once does a GRE component account for more than .10 of variance in course grades. GGPA was not useful in predicting grades for the two core courses. The researchers suggested that unless GRE validity coefficients of determination (R^2) exceed .50, this test should not be used in selection from among MPA course applicants. Using this logic, it was suggested that the program should consider dropping its GRE requirements, as the GRE scores may risk assuming self-fulfilling prophecies rather than offering true prediction. The small sample

necessitates further research. The design of this study was meant to eliminate unwanted variables termed as noisy data. This is an important consideration in validating a selection test.

Luthy (1996) investigated the validity and prediction bias of grade performance from Graduate Record Examination (GRE) scores for graduate students at Northern Illinois University in nine academic programs. Two research questions guided this study. First, are GRE scores valid predictors of graduate school success? Second, do GRE scores predict school success similarly for different groups of students? Scores from the GRE were used as predictor variables. Cumulative Graduate Grade Point Average (GGPA) was used as the criterion variable. The subjects were 3,135 students grouped by gender and age. Correlation coefficients were used to examine predictive validity, differential validity analysis and analysis of mean error of prediction was used to examine gender bias and age bias.

Significant validity coefficients were found for 95 of the 129 correlation composed, and ranged from .09 to .42. Differential Validity Analysis indicated that GRE scores did not predict GGPA similarly for age and gender groups. GRE scores over-predicted grade performance for male students and for younger students. This study shows there is bias in using the GRE in selection. It is important to consider non-academic factors in validation studies of selection tests.

The GRE is an aptitude test used in the selection of graduate students in American universities. In the studies reviewed, use of the GRE has been found inadequate in selection. There is therefore need to combine it with some other

measures. This aptitude test is also biased in the prediction of university performance for different subgroups, especially the gender subgroup. In the following section the achievement tests are considered.

2.3.2 Achievement Tests

In a study to investigate the academic performance of engineering students at the Ibadan Polytechnic, Owigar (1980) used a sample of 225 students in the departments of Mechanical, Civil and Electrical Engineering. The criterion variables were performance in the Ordinary National Diploma (OND) and Higher National Diploma (HND) courses. The West African School Certificate (WASC) was the college selection examination, whose grades were obtained from records. All subjects had been admitted in the year 1971, 1972 and 1973, and completed in 1976, 1977 and 1978 with awards in OND and HND certificates. In the Mechanical Engineering department, English correlated strongly with OND ($r = -.49$) followed by Physics and Mathematics ($r = .19$ & $.15$ respectively). When the three were considered in combination they yielded a multiple $R = .33$.

Overall the study did not confirm the general view that the best predictor of success at OND and HND was Mathematics and Physics. English turned out to be the best followed by Chemistry, Mathematics and Physics in that order. The researcher failed to explain the discrepancies. In any case they could be attributed to non-academic factors, that were not investigated.

Lunalo (1983) sought to find out the extent to which efficiency in the prediction of the East African Certificate of Secondary Education (EACE) is

affected by performance in the Certificate of Primary Education (CPE) examination, secondary school quality, range restriction and gender. The sample consisted of 165 students who had sat the EACE in 1979 in ten Western Province schools in Kenya. Their CPE performance was traced back to 1975. Scatter diagrams, Pearson product moment correlation coefficients, the analysis of variance and multiple regressions were used to examine the relationship between EACE and CPE. The significance of the relationships was tested at the 0.05 level.

Results showed that the nature of relationships of the two examinations was linear, ($r = .41$). There were also differences in prediction and performance between girls and boys ($n = 34$ and 131 respectively). CPE English had the highest correlation with the EACE aggregate at $r = .31$. The multiple regression analysis results revealed that the three CPE tests provided a multiple R of $.48$. Removal of the CPE General Paper test scores from equation did not alter the value of multiple R. Removal of General Paper from the test battery would not affect the prediction efficiency of the CPE as it may have been measuring similar skills as the CPE English test. Although the sample used in this study was small, a similar methodology can be utilized for considering university selection.

A study by Gatumu (1989) attempted to answer the following question, firstly how well do Ordinary level (O-level) grades predict performance in Primary Teacher Training Colleges (TTC's). The sample consisted of 1,622 subjects from five post-secondary TTCs in Kenya. Data was first analyzed using selected predictor variables (O-level Aggregate, Mathematics and English) in an intercorrelation matrix. The criterion variables considered here were all the ten

subjects done at the final college examination. O-level aggregate was the best overall predictor by having the highest number of significant correlation coefficients ranging from .19 to .38. The reason for this may have been that the Aggregate score had all the academic components found in the criterions.

Multiple regression analysis using composite criterions of languages, humanities, physical sciences and professional studies were done with the three independent variables. Mathematics was the best predictor of Physical Sciences, while English accounted for the largest proportion of variance in the language and professional studies composites. The O-level Aggregate grade was the best predictor for only the humanity composite.

In conclusion, the researcher remarked that the results agreed with the common belief that previous performance reveals qualities within the learner that are needed in the next level of learning. This is why there was a higher correlation between the dependent and the independent variables where the abilities and skills tested were similar. There was justification for use of O-level grades in the selection of primary school teachers, however English comes on as an important predictor, even when in combination with other grades. A drawback of the study is that non-academic factors were not considered in this study.

Walker (1995) investigated the predictive validity of high school GPA and college GPA in relation to success in the National Licensure Examination (NCLEX) for 350 student nurses in an associate degree program. Results indicated that the indicators of course achievement in high school had weak ability in forecasting which nurse will obtain a passing score in NCLEX. College GPA

offered greatest promise identifying students most likely to succeed in the NCLEX. This study provided results similar to those of Mbeche (1979) and Gatumu (1979), showing that high school academic performance is highly predictive of college performance.

Andres (1996) assessed the importance of achievement tests as predictors of graduation GPA and freshman GPA in major fields at the University of Puerto Rico. The predictors were scores from the College Board Tests and high school GPA. The university required applicants for admission to take three achievement tests, but had never used these for selection. Other variables considered were sex, type of high school attended and socio-economic status.

The findings were that the achievement tests were the best predictors in most institutional units and fields of study. Often prediction was stronger for females and students from private high schools whose parents were college educated, in agreement with findings by Mbeche (1979).

It was recommended that universities require use of achievement tests for admission, as only aptitude tests were being utilized. The study further supported the view that prediction is usually stronger for females (Anastasia & Urbina, 1997).

Tambo, (2000) investigated the predictive validity of the General Certificate of Education (GCE) in relation to performance in the University of Buea, Cameroon. The GCE is a national achievement examination in Cameroon. It is used in the selection of university students, and therefore the researcher set out to answer questions related to fairness in its use. The sample was 90 students who

graduated in the 1999/2000 academic year. The criterion used was two fold, freshman grade point average (GPA1) and graduating grade point average (GPA2). Correlations between the GCE and GPA were calculated. There were comparisons of sex and type of high school attended.

Most of the correlations obtained were high and positive. The correlation between GPA2 and GCE was higher than for GPA1 and GCE. ($r = .48$ and $r = .44$ respectively). The GCE was a better predictor for males than for females ($r = .59$ and $r = .37$ respectively). The GCE also predicted better for students from public high schools than private high schools ($r = .63$ & $r = .24$ respectively). This showed that the performance of female students and candidates from private high schools was not strongly influenced by their performance in the GCE.

The GCE is the only selection tool used in this university. This study has shown that though it is highly correlated with the criterion, it is nevertheless biased in the gender and high school quality subgroups. The sample is too small for generalization of the results.

In the achievement test studies reviewed, there is a general agreement that achievement tests are useful in selection. There is also agreement in the role played by English language ability. Gatumu (1989) Lunalo (1983) and Owigar (1980) have shown that English comes up as an important factor. Whenever they were investigated, non-academic factors, namely gender and high school background feature strongly as factors bringing up biases in performance.

2.3.3 Aptitude and Achievement Tests

Ayers and Peleu, (1977) examined the validity of the Test of English as a Foreign Language (TOEFL), Graduate Record Examination (GRE) in relation to the prediction of success of 50 Asian students who had completed Masters programs in Engineering, Chemistry and Mathematics. Scores of TOEFL, GRE and overall Grade Point Average, the criterion were obtained from university records. Means, standard deviations, intercorrelations and regression equations were calculated. There were significant relationships between TOEFL and GPA at the 0.01 level. A stepwise regression equation to predict success was computed, where;

$$\text{GPA} = 0.04 \text{ TOEFL} - 0.002 \text{ GRE} + 2.32$$

Evidence from the study indicated that TOEFL was a useful predictor of success at Masters level for Asian students. The sample for the study was small and the results of the study could not be extended to other areas and samples. The study highlighted the importance of fluency in the language of instruction in selection. Also, in this instance the achievement test was shown to be contributing more to the criterion than an aptitude test.

Trusheim and Crouse (1982) studied the practical consequences of using the Scholastic Aptitude Test (SAT) in college admissions. The results of this study were to be used in comparing two selection strategies for college admissions. A national sample of the high school leavers who took the SAT in their senior year, whose high school supplied information on class rank and reported their

freshman college grades in 1973 was used. Standardized coefficients from freshman GPA regression on SAT-verbal, SAT-quantitative and high school rank indicated that high school rank (HSR) was the best single predictor. The regression equation obtained was;

$$\text{GPA} = .291 \text{ HSR} + .193 \text{ SAT-V} + .072 \text{ SAT-M}$$

In order to compare the effects of two college admission strategies, the researchers attempted to answer the following questions “what is the effect of using HSR alone, as opposed to using HSR plus SAT, to admit students with predicted freshman grades above a certain value?” To answer the question non-standardized regression equations were used to calculate freshman GPA based on HSR alone, and another equation having both HSR and SAT scores. The predicted GPA of 2.5 was used as a criterion cut-off. Results were presented in bivariate frequency distribution between predicted GPA and actual freshman grades.

The findings suggested two conclusions; that when selection strategies with and without SAT were compared, the SAT appears to add virtually no information that would help the typical college to maximize the percentage of correct decisions. This study gives an outline of the method for evaluation selection strategies. The regression equation is used as the main tool of analysis.

Bali, Drenth, Flier and Young (1984) investigated the contribution of a battery of tests named Intelligence and Development Tests for East Africa (IDEA), and the Certificate of Primary Education (CPE) examination to the prediction of the Kenya Certificate of Education (KCE) examination. The purpose of the study was to validate a series of ability tests that could be used to support selection

decisions in an effort to achieve a fair distribution of educational opportunities in Kenya. The sample consisted of 571 students from ethnically, economically and geographically diverse regions in Kenya. The subjects' CPE scores, environmental background variables, and information on quality of primary school attended were collected. The subjects were followed up to secondary school (KCE) performance.

The results showed a high correlation between the CPE and KCE examination ($r=0.62$). Six of the fifteen ability tests had high correlations ($r>0.4$) with the KCE. The possible extra contribution of the aptitude tests above the CPE examination results was evaluated by entering the CPE total score in a regression equation as the first predictor. The most substantial increment was found for the CPE total score and Components Test combination, which yielded a multiple R of 0.65. The authors suggested that a conjunctive model may be used to increase efficiency in the selection of secondary school students. Here secondary school applicants may be screened in the first instance using the CPE score, followed by further selection using those ability tests which together yield the highest multiple correlation to the criterion. Among the non-academic factors, there was a substantial correlation between teacher quality at primary school and KCE performance. Pupils from primary schools with well-trained teachers do better in secondary school than pupils from schools where the teachers were less qualified.

This study provided insight into the conjunctive selection model as a strategy for combining ability tests and achievement tests. It revealed that there was an effect of quality of primary school on secondary performance.

Katigo (1991) sought to investigate the predictive validity of the Differential Aptitude Test (DAT), the Kenya Certificate of Primary Education (CPE) examination, and the Kenya Certificate of Education (KCE) in relation to success in technical training institutes. The contention of the researcher was that the KCPE and KCE examinations were inadequate measures for selection candidates for technical courses as they were academically biased. Academically biased examinations are heavily loaded with verbal and reasoning factors, and serve well to predict academic but not technical courses. The DAT contains mechanical and spatial reasoning factors and was therefore expected to be a better predictor for technical courses.

In this longitudinal study, the sample consisted of 210 students on two levels of technical training, craftsmen, who are secondary school leavers (N=149) and artisans, who are primary school leavers (N=61). The DAT was administered one year before the technical examinations. KCPE and KCE results were extracted from admission records of the institutions. The correlation between the KCPE total grade and the Artisan composite grade was .55, significant at the $\alpha=.01$. The following KCE subjects were significantly related to the Craftsmen composite grade, Technical Drawing ($r=.87$), Geography ($r=.52$), Biology ($r=.33$), and Mathematics ($r=.28$).

Results revealed that DAT tests could be combined for maximum prediction. In the case of the Artisans, a combination of KCSE Geography/History/Religious Education (GHR), DAT Mechanical Reasoning (MR), DAT Numerical Ability (NA), and DAT Spatial Relations (SR), entered in

the regression equation in that order, together yielded a significant multiple $R=.71$. In the case of the Craftsmen, KCE Geography, DAT Verbal Reasoning (VR), DAT (NA), and DAT (SR), entered in the regression equation in that order, together provided a significant multiple $R=.54$.

In this study English did not feature as a strong predictor of technical education, in opposition to the findings by Owigar (1980). The researcher recommended further research using the DAT in polytechnics and universities, in particular career lines .

Results of the studies reviewed in this subsection reveal the general trend that achievement measures are better predictors than aptitude predictors when the two are considered in combination. This may be due to the fact that advanced courses in college require the same test-taking skills as in the selection achievement tests. Nevertheless, when combined using standardized multiple regression equations for optimum prediction, the two kinds of measures provided improvements in prediction of the criterion.

2.3.4 Achievement Tests and other predictors

An ex-post facto correlational study by Abbie (1988) investigated the contribution of academic success at the Pacific Graduate School of Psychology by various academic criteria. These were undergraduate and masters grade point average, final dossier, interview ratings and other applicant factors at admission (age & gender). The data was gathered from files of 54 students (37 males, 17 female) at the PGSP who had taken the selection Comprehensive Examination

(CE). The results suggested that Masters GPA seemed to be a good predictor of the criterion measure. Age and sex seemed to have no relationship with the Comprehensive Examination. Application Dossier and Interview Ratings did not differ significantly, suggesting that either one or the other may be eliminated from the evaluation process without jeopardizing the vigor of the selection process.

In this study, academic predictors were shown to be unaffected by non-academic factors like age and sex of applicant. Achievement measures were shown to be useful in the selection process.

Mbeche (1979) investigated the relationship between performance of student teachers in their Teaching Practice and their academic qualifications in the East African Certificate of Secondary Education (EACE) examination, college performance, attitudes to teaching, social background and their creative ability. A sample of 140 final year students at a post-secondary certificate teacher college in Kenya was considered. All EACE and college grades were obtained from college records. Data was analyzed using Pearson's product moment correlation coefficient and tested for significance at the 0.05 level.

From among the academic predictors only the college Teaching Subject correlated significantly with the criterion ($r=.23$). The correlation coefficients between EACE results and the criterion may have been small and non-significant because of the pre-selection of the subjects. Other results indicated that the planning component of the test of creative ability correlated significantly with Teaching Practice performance ($r = .24$). The implication of this was that success in teaching requires one to plan. Background variables that correlated significantly

with performance were parents' education level and sex ($r = .31$, $r = -.27$ respectively). A t-test showed that female students ($N=25$) performed better in Teaching Practice than their male counterparts.

In the multiple regression analysis, the researcher used the forward selection procedure. Here variables were added to the regression equation one by one, in the end yielding the highest possible multiple R. Parent education level, teaching subject scores and the Planning sub-test of creativity variables and the teaching subject score appeared to be the four most important predictors, all together providing a significant multiple $R=.42$.

The studies in this subsection have contradictory results. The first by Mbeche (1979) showed non-academic factors like sex of student to be important and that the achievement test used in selection to be useful only in combination with other predictors.

EACE performance in this study appeared not to contribute significantly to Teaching Practice performance. The researcher therefore recommended that if the EACE results were to be used for selection, then it was necessary to find out which other variables they might be combined with. This study considered non-academic factors' effect in prediction of college performance. Conversely, Abbie (1988) showed that achievement was more useful in selection than the other predictors and that gender did not affect performance in the criterion.

2.4 Summary of Review of Literature

The Review of Literature revealed that predictive validity studies have been done over a long time. Most of those came up with findings and recommendations aimed at improving the efficiency in the selection procedures. There were recommendations for the use of a combination of different measures (Katigo, 1991, Bali, et al, 1984, Mbeche, 1979).

Some of the results were controversial. Some studies showed that English Language ability is more predictive of the criterion than other measures (Gatumu, 1989; Lunalo, 1983; Owigar, 1980; Ayers & Peleu, 1977). Findings to the contrary were by Katigo (1991). In addition to this some studies revealed sex and high school background differences in performance. (Tambo, 2000, Andres, 1996, Luthy, 1996, Bali et al, 1984, Lunalo, 1983).

The correlational study design was used in the studies. School and college records were shown to be important sources of data. In the colleges, cohort samples were used. Most of the studies reviewed were done in other countries. Those done in Kenya were not up-to-date. This is the gap that this study intends to fill.

2.5 Research Hypotheses

This study will set out to test the following research hypotheses.

1. There is a significant relationship between the KCSE Aggregate Grade and the University Performance of Arts (BEd) and Science (BEd) students.

2. The KCSE Aggregate Grade and the KCSE Cluster Aggregate Grade when considered in together significantly correlate with University Performance for Arts (BEd) and Science (BEd) students.
3. The KCSE Aggregate Grade, the KCSE Cluster Aggregate Grade and the KCSE English Grade when considered in together significantly correlate with University Performance for Arts (BEd) and Science (BEd) students.
4. There is a significant difference in University Performance between male and female Arts (BEd) and Science (BEd) students.
5. There is a significant difference in University Performance for Arts (BEd) and Science (BEd) students from different high school backgrounds.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

The chapter is divided into the five sections, and a description of each will be given. The research design gives the overall structure of the study. Here, the dependent and independent variables will be described. The population and sampling section outlines the sampling technique and the type of sample obtained. A detailed description of the instruments is followed by an outline of the data collection method. The last section deals with the methods of data analysis with respect to the research hypotheses.

3.1 Research Design

This was a correlational study to investigate the efficiency in the selection of university Education students. The independent variables that were considered are the KCSE Aggregate Grade, the KCSE Cluster Aggregate Grade, the KCSE English Grade, gender and high school background. The dependent variable was University Performance.

The Correlational method has some advantages. The first one is that the technique permits one to measure a great number of variables and their interrelations simultaneously. In experimental technique this is not possible as it permits the manipulation of a single variable. The second one is that it provides

information concerning the degree of relationship between variables being studied. Thirdly the correlational technique minimizes the high level of artificiality encountered in research situations, for example, when experimental conditions are used.

On the other hand, the correlational technique, though widely used in selection decision-making studies, has some drawbacks. The first is the restriction of range. The correlation coefficient r_{xy} is calculated for only those students who survive the selection examination, and the outcome may be depressed value of r_{xy} that can lead to wrong interpretations.

Secondly, it is important to note that correlation does not imply causality. In the absence of experimentally imposed manipulation of variables in a retrospective study, we lack control over a potentially large number of other variables present during the establishment of the relationship between the predictor and the criterion. This means that a strong relationship does not justify the inference of causality (Keppel, Sanfely & Tokunaga, 1992).

The correlation technique has been used in most researches especially prediction studies. This study therefore utilized this design with the aim of testing the hypotheses outlined.

3.2 Population and Sample

A study to evaluate selection protocol requires use of a cohort sample (Campell, 1986). For this reason Education degree courses will be considered. They were chosen from among other courses at the Kenyatta University because of

having a large number of graduands in the year 2000 (about 45 percent). The Education graduates were in the larger cohort that sat for the Kenya Certificate of Primary Education (KCPE) examination in 1990. A total of 366,761 students sat for the KCPE examination in that year. Of these 177,470 (48 percent) joined secondary school. Some 1,609 went to National schools. Another 24,000 joined Provincial schools and 128,831 went to District schools. The remainder of 22,150 joined private schools. (The East African Standard, 1991).

After four years (1994) this group sat for the Kenya Certificate of Secondary Education (KCSE) examination. The total number of candidates had gone down to 143,157. Of these 42,332 applied for university places. In the 1995/96 academic year, only 8,319 were admitted to public universities. The KCSE aggregate score cut-off stood at 63 points, a B minus, for boys and 62 points, a B minus, for girls. Cluster score cut-off for Science (BEd) stood at 38 out of 48 points and for Arts (BEd) at 33 points. (Daily Nation, 1995). The following is the number of students admitted to Education courses.

Table 3.1: Number admitted to Education courses in the year 1995/96

University	Arts (BEd)	Bed (Science)
Kenyatta	512	184
Nairobi	326	-
Maseno	411	-
Egerton	212	204
Moi	323	48
Total	2006	436

Source: JAB Selection List (1995)

The numbers do not concur with the graduating class populations at the Kenyatta University. The total number of Arts (BEd) and Science (BEd) graduands in the year 2000 were 689 and 341 respectively. This is because a lot of changes took place in the first year of study, where inter-university and inter-faculty transfers took place. A total of 92 students transferred into Arts (BEd) and a total of 83 transferred into Science (BEd) from the BA and BSc courses.

A number of students admitted in the following year, 1997 were able to accelerate their study, and graduated together with the target sample. In addition students repeated from the classes ahead of the target sample, and graduated in the year 2000. Further some 284 Arts (BEd), and 61 Science (BEd) students in the JAB selection list could not be traced to the graduating class. Thus a total of 320 students in the Arts (BEd) course, (162 males and 158 female), and 206 students in the Science (BEd) course (109 male and 97 female) were fully traced in this study.

3.3 Instruments

This section looks at two instruments considered in this study. A description of the setting and administering process is given, highlighting the efforts made to ensure their reliability and content validity. In the last subsection are the grading standards used.

3.3.1 Kenya Certificate of Secondary Education KCSE Examination

The KCSE Grades provide the independent variables in this study. Forth Form secondary school students sit for the KCSE at the end of each year. According to Wasanga (2001), the KCSE is set by a team of test developers. Subject experts submit sample questions to the panel. The questions are checked for relevance and if they are capable of solution. The questions accepted are put in a test bank. It is from this test bank that examination test papers are constructed. This process of test development ensures content validity.

The KNEC administers the KCSE with the help of District Education Officers, exam center supervisors and invigilators. For purpose of marking examination scripts, examiners are recruited and trained from among qualified and experienced teachers. Marking is done under supervision of Chief Examiners who ensure uniformity in the marking standards and in the awarding of marks.

There are thirty two subjects examined and each student may sit for up to ten, but performance in the best eight is considered in awarding an overall grade. Each subject is scored out of 100 marks. The raw marks are converted to a letter grade and the corresponding point in brackets as shown below;

0-29 E (1)	40-44 D+ (4)	55-59 C+ (7)	70-74 B+ (10)
30-34 D- (2)	45-49 C- (5)	60-64 B- (8)	75-79 A- (11)
35-39 D (3)	50-54 C (6)	65-69 B (9)	80 - A (12)

The point grades in the best performed eight subjects are added up (including the three compulsory subjects and at least two science subjects). The sum is divided by eight to give the mean grade. For example a student X may have the following grades: Mathematics A, English C, Kiswahili B, Chemistry B+, Biology C-, History A, French D, Commerce B, Metalwork B. There are nine subjects, out of these the grades in the best eight subjects, including the three compulsory subjects are added up.

The total point grade = $12 + 6 + 9 + 10 + 5 + 12 + 9 + 9 = 72$ out of 96.

The mean point grade is 9. The corresponding mean letter grade is a B plain, is also the KCSE Aggregate Grade.

The results of the examination are released by the KNEC. The Joint Admission Board used the aggregate grades in setting a cutting score for admission to university.

The following subsection deals with the university examination system.

3.3.2 University Examinations

Results of the University examinations were the dependent variable in this study. Subject programs at the university divided into a number of prescribed sections or units of teaching and study. These units are examined separately. The purpose of course units are to provide flexibility in the instructional process. This enables some students to do some units in the summer program so as to finish their degree program in a shorter duration. The unit system also accommodates various

student interests and occupational aspirations by allowing a choice of elective subjects at the advanced stages of their academic programmes.

According to Mutunga (2001), there are six Science (BEd) teaching subjects and eighteen Arts (BEd) subjects. A student is expected to take two subjects, or double in the case of Mathematics, Botany/Zoology, English/Literature and Music, which can form unique and inseparable subject combinations. The rest of the subjects can be in any two-subject combination.

There are Education common courses which are compulsory for every education student. These are Educational Foundations, Communication Technology, Psychology, Administration, Planning and Curriculum Development. In the first year of study students are required to take two university common courses. These are Communication Skills and Development Studies. In the four years of study a student will have taken thirty-two teaching subject units, sixteen Education common units and two University common units. The total number is forty-nine, but if one takes extra electives the total may go up to fifty-two. In the fourth year of study education students go for teaching practice. The performance in teaching practice is not graded, a student can obtain either a pass or a fail in this unit.

At the end of each semester students are examined in each unit taught.

An end of semester examination accounts for 70 percent of the total unit score. The continuous assessment tests done over the duration of the semester account for the other 30 percent. (Kenyatta University Calendar, 1998) Internal examiners (unit lecturers) set examinations at the beginning of each semester and administer

the same at the end of the semester. External examiners, who are lecturers in other public universities, moderate the examinations. Another duty of the external examiners is to ensure fairness in the marking of examination scripts. Sampling a proportion of the marked scripts and marking according to the marking scheme does this. Scores obtained are compared with those awarded by the lecturers.

According to the Undergraduate Students Guideline Handbook, (Kenyatta University, 1999), the final degree classification is based on the cumulative score average. All the marks obtained in all the units done in the four years of study are added up and divided by the number of units to give the average score.

Classification for degree award is done using the following scale;

70 percent and above is a First Class Honours, 60-69 percent is an Upper Second Class Honours, 50-59 percent is a Lower Second Class, 40-49 percent is a Pass.

39 percent and below is not awarded a degree.

3.4 Data Collection

University examination results were obtained from records at the Kenyatta University. Data on KCSE performance, name of secondary school attended, name and gender of student were collected from the Institute of Computer Science, University of Nairobi, which hosts the Joint Admissions Board registry. Permission was obtained from the Academic Registrar, University of Nairobi. The researcher traced students from the JAB records to University records by matching two or three names. Ambiguous matches such as multiple subjects with a similar

name were not included in the sample. Information on secondary school type was obtained from the office of the Director of Education.

Data was collected using the data collection sheet. Information collected using this sheet included the student's names, KCSE index number, name of high school attended, KCSE Aggregate Grade, Cluster Grade, and English Grade, University registration number and the university average marks. (Sample of Data sheet in Appendix B).

3.5 Data analysis

Data was analyzed using the Statistical Package for Social Sciences (SPSS) computer program. A descriptive analysis of the examination variables was done. Their means and standard deviations were calculated. In order to find out the shape and spread of the distributions, skew and kurtosis were also calculated for each examination variable. Intercorrelations of the examination variables namely; University Performance (UP), KCSE Aggregate Grade (AG), KCSE Cluster Grade (CG), and the KCSE English Grade (EG) were calculated. The correlation coefficients obtained gave knowledge of the degree of association between the variables. The significance of the relationships were tested at $\alpha = .05$ (two tail tests). The Pearson Product Moment Correlation Coefficient r_{xy} between the criterion and predictors was calculated to determine the degree of relationship between the variable.

The formula for r_{xy} is

$$r_{xy} = \frac{\sum_{i=1}^N (x_i - \bar{x})(y_i - \bar{y})}{N S_x S_y}$$

Where x and y are the two variables to be correlated. S_x and S_y is the standard deviation of the predictor and criterion scores respectively. N is the number of subjects. (Nunally and Bernstein, 1994). The correlation coefficient is limited by the values plus 1 and minus 1. The sign reflects the direction of the relationship.

The square of the correlation coefficient (r_{xy}^2) gives strength of the association between the predictor and the criterion. (Jacob , 1988). In other words r_{xy}^2 gives the percentage of the variability in the criterion y accounted for by performance in the predictor x . Jacob further suggested the following classifications of strength measure in correlational research.

A low relationship where r_{xy}^2 is 0.01, a medium relationship where r_{xy}^2 is .09, a high relationship where r_{xy}^2 is more than .25

The significance of r is tested using F test where

$$F = \frac{r_{xy}^2 (N-2)}{1-r_{xy}^2}$$

$1-r_{xy}^2$ represents the proportion of the total sum of squares that is independent of the linear regression of y on x . n is the number of observations.

The null hypotheses tested were;

H_0 1: There is no significant relationship between the KCSE Aggregate Grade and University Performance for Arts (BEd) and Science (BEd) students.

The multiple regression technique was used to measure and study the degree of relationship between a combination of three or more variables. A standard regression equation is of the form

$$Y=A+B_1X_1+B_2X_2+\dots\dots\dots +B_nX_n$$

Where $X = (x_i - \bar{x})$, $B = b S_y / S_x$, S_x and S_y are standard deviations of X and Y respectively. b is a regression weight. The B (beta) weights indicate which of the predictors best predict the criterion. The B weights can also be tested for significance.

An important term associated with multiple regression is the multiple correlation coefficient R . It is a measure of a relationship between a criterion and a predictor variable or a group of predictor variables. The coefficient of determination R^2 represents the proportion of variance that is accountable from the predictor variate. In forming a regression equation for optimum prediction of the criterion, the variable with the highest zero-order correlation is the first to be entered in the equation. Increments in R^2 are noted for each predictor variable that is added to the equation. The F test of significance will be used where

$$F = (R^2/k) / [(1 - R^2)/(N - k - 1)]$$

N is the total number of observations, k is the number of x variables.

Therefore multiple regression analysis was done to test the following null hypotheses ($\alpha = .05$)

$H_0 2$: The KCSE Aggregate Grade and the KCSE Cluster Aggregate Grade when considered together do not significantly correlate with University Performance for Arts (BEd) and Science (BEd) students.

$H_0 3$: The KCSE Aggregate Grade, the KCSE Cluster Aggregate Grade and the KCSE English Grade when considered together do not significantly correlate with University Performance for Arts (BEd) and Science (BEd) students.

One-Way ANOVA was used to investigate the differences in University Performance between male and female students. The differences was tested for significance at $\alpha=.05$ This tested the following null hypothesis;

H₀ 4: There is no significant difference in the mean University Performance of male and female Arts (BEd) and Science (BEd) students.

One-Way ANOVA was used to test for differences in the university performance of students grouped according to the type of secondary school attended. ($\alpha=.05$) This tested the following hypothesis;

H₀ 5: The mean University Performance of Arts (BEd) and Science (BEd) students from different high school backgrounds do not differ significantly.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.0 Introduction

In this chapter results of analysis of each of the variables under study are presented. In the first section analysis is carried out using descriptive statistics. In the second section of the chapter the hypotheses of the study are considered in relation to the data analysed using inferential statistics. In both sections analysis for the Arts (BEd) subsample will be considered first then the Science (BEd) subsample will follow.

4.1 KCSE Performance for Arts (BEd) students

KCSE examination performance of Arts (BEd) students is presented in the following table.

Table 4.1: KCSE descriptive statistics for Arts (BEd)

Variable	Mean	Min	Max	Std Dev	Kurtosis	Skewness	N
Aggregate Grade	67.15	62	86	4.40	1.16	1.20	320
Cluster Grade	38.95	32	46	2.41	-.31	.27	320
English Grade	7.76	4	12	1.47	.08	-.08	302

The descriptive statistics for KCSE Aggregate Grade show that the mean at 67.15 was well above the cut-off grade of 62 points. The distribution was positively skewed and with a fairly sharp peak (Leptokurtic) indicating that most scores clustered near the cut-off point. The relatively low standard deviations further highlight the competition that exists at this point.

The KCSE Cluster Grade is the sum of the points obtained in a prescribed group of four subjects (cluster) and varies from 8 to 48 points. The mean of 38.95 was considerably higher than that year's cluster cut-off grade of 33 points. The distribution was positively skewed with a flat peak (Platykurtic) indicating that most scores were evenly spread near the cut-off grade.

The KCSE English subject consisted of three papers, composition and grammar and literature. Performance in this subject is a measure of proficiency in the English Language and was reported as a letter grade. The mean grade of 7.76 (equivalent to a B minus) was quite high. The KCSE English Grade was not used in the selection process, and therefore had a larger standard deviation, in this case 1.47. The minimum grade observed was 4 and the maximum was 12. KCSE English Grades were missing from the records for eighteen students admitted under the affirmative action, and were thus designated as missing values.

4.2 KCSE Performance for Science (BE_d) students

Performance in the KCSE for Science (BE_d) students is presented in the following table.

Table 4.2: KCSE descriptive statistics for Science (BEd)

Variable	Mean	Min	Max	Std Dev	Kurtosis	Skewness	N
Aggregate Grade	70.71	62	84	4.89	-.51	.30	206
Cluster Grade	36.38	26	45	3.52	-.11	-.36	206
English Grade	6.96	3	10	1.49	-.31	-.19	203

The mean KCSE Aggregate Grade was 70.71, well above the cut-off grade of 62, indicated a high selection standards for the Science students. The dispersion at 4.89 was relatively small. The distribution was positively skewed and with a flat peak (Platykurtic) indicating that most scores were spread near the cut-off grade.

The mean for the KCSE Cluster Grade at 36.38 was less than the cut-off point of 38. Research records showed that about 60 percent of students had a Cluster Grade below the official cut-off grade. This indicated that there was a late shift in the admission requirements, caused by the high number of students who transferred from other courses such as BA. There was a student in the subsample admitted with a cluster grade of 26 points while the highest in the subsample was 45. The distribution of the KCSE Cluster Grade was negatively skewed, reflecting a high standard in selection.

The mean KCSE English Grade average at 6.96 was less than that obtained by the Arts students (7.76). This may indicate that students aspiring to join sciences were not proficient in the English language as the Arts (BEd) students. The standard deviation (1.49) was also relatively higher than that of the Arts (1.47). The distribution was also negatively skewed showing that the majority of

the scores cluster slightly above the mean. Three Science (BEd) students were missing the KCSE English Grade.

4.3 University Performance

University Performance of both Arts and Science (BEd) students is presented in the table below.

Table 4.3: Descriptive statistics of University Performance

Subsample	Mean	Min	Max	Std Dev	Kurtosis	Skewness	N
Arts (BEd)	62.50	51	76	3.84	1.21	0.00	320
Science (BEd)	60.85	50	73	4.79	-.31	.28	206

The mean University Performance for the Arts (BEd) of 62.50 was slightly higher than that for Science students (60.85). The measure of dispersion was quite small at 3.84. The distribution was leptokurtic.

The mean University Performance for Science (BEd) students was just above the upper second division cut-off point. The minimum and maximum scores are lower than those attained by the Arts students. The standard deviation of performance was also higher than that of Arts (BEd) students. The distribution was slightly skewed to the left the minimum scores of 51 and 50 indicate that there were no failures in both subsamples.

Next the data presented was analyzed using inferential statistics, in the first place for Arts (BEd) students and then Science (BEd) students.

4.4 Analysis of data

In this section, each of the hypotheses are discussed briefly in relation to the results obtained using the inferential statistical tools at the .05 level of significance.

4.4.1 Analysis of data for Arts (BEd) students

In the first part of this section, relationships between KCSE performance and University Performance will be reported. The correlation coefficients between the variables under study are presented below.

Table 4.4 : Intercorrelations among the variables for Arts (BEd)

	UP	AG	CG
University Performance (UP)	-		
Aggregate Grade (AG)	.22*	-	
Cluster Grade (CG)	.20*	.66*	-
English Grade (EG)	.17*	.36*	.20*

*Significant at $\alpha=.05$

The results in Table 4.4 show that all the intercorrelations were significant. The highest correlation was between the Aggregate Grade and the Cluster Grade (.66) and the lowest was between the Aggregate Grade and the English Grade (.17). The significance of the relationships may be explained by the fact that cluster grades for arts courses comprise one half of the cluster grade. In the same way the English grade is also represented fully in the aggregate grade, as it is a

compulsory subject, and partly in the cluster grade. The correlation between Aggregate Grade and University Performance was 0.22 ($r^2=0.05$). Though low, the relationship is significant at $\alpha=.05$. For the Arts (BEd) students, we therefore reject the null hypothesis and accept the alternative hypothesis, that is, there is a significant relationship between Aggregate Grade and University Performance.

Multiple Correlation was carried out to determine the combined contribution of the KCSE Aggregate Grade and the KCSE Cluster Grade to University Performance. The results are presented in the following equation.

$$\hat{Y} = .16*X_1 + .09X_2 + 47.54 \quad (R = .23^*)$$

Where \hat{Y} is the predicted University Performance, X_1 is the KCSE Aggregate Grade, and X_2 is the KCSE Cluster Grade. (*Significant at $\alpha = .05$)

The R value at 0.23 is low but significant at $\alpha=.05$. The R^2 value (.05) indicates that 5 percent of the total variance in University Performance of Arts (BEd) students was accounted for by the combined effect of the KCSE Aggregate Grade and the KCSE Cluster Grade. The largest and significant contributor was the KCSE Aggregate Grade, with a significant beta weight of .16. We therefore reject the null hypothesis and accept the alternative hypothesis, that is, the KCSE Aggregate Grade and the KCSE Cluster Grade when considered together significantly correlate with University Performance for Arts (BEd) students.

Multiple correlation was carried out to determine the combined contribution of the KCSE Aggregate Grade, the KCSE Cluster Grade and the

KCSE English Grade on University Performance. The results of this analysis are presented in the following equation.

$$\hat{Y} = .14*X_1 + .09X_2 + .10X_3 + 46.61 \quad (R = .26^*)$$

Where \hat{Y} is the predicted University Performance, X_1 is the KCSE Aggregate Grade, X_2 is the KCSE Cluster Grade and X_3 is the KCSE English performance.

(*Significant at $\alpha=.05$)

The multiple R of .26 was low but significant. The three predictors together accounted for 6.6 percent of the total variance in University Performance, an increase of about 1.6 percent. This was a substantial contribution by the addition of the English Grade. Further, the combined contribution of the three independent variables is significant at $\alpha=.05$. We therefore reject the null hypothesis and accept the alternative hypothesis, that is, the KCSE Aggregate Grade, the KCSE Cluster Grade and the KCSE English Grade when considered together significantly correlate with University Performance for Arts (BEd) students.

In the following section results of descriptive analysis by gender is presented. The Table 4.5 below shows that the number of females in the Arts (BEd) students is slightly lower than that of males. The female students had performed slightly better than their male counterparts.

Table 4.5: University Performance by gender for Arts (BEd)

Gender	Mean	Std dev	N
Male	62.08	4.01	162
Female	62.90	3.64	158
Total	62.50	3.84	320

Further analysis was done to find out the significance of this difference in performance. Results of this analysis are presented in the following table.

Table 4.6: ANOVA results by gender for Arts (BEd)

Source	df	Sum of squares	Mean squares	F ratio	F prob
Between groups	1	53.65	53.65	.66	.06
Within groups	318	4660.35	14.66		
Total	319	4714.00			

The results in Table 4.6 show that the F ratio of 0.66 is not significant. We therefore failed to reject the null hypothesis and accept the alternative hypothesis, that is, there is no significant difference in the mean University Performance of male and female Arts (BEd) students at the university. It is important to note that when females were admitted with lower grades than their male counterparts, they performed better.

The effects of high school background were also explored.

The Table 4.7 below shows that Arts (BEd) students from Provincial schools performed slightly better than their colleagues from other school types,

followed by National schools leavers, with the District schools graduates in the last position.

Table 4.7: Mean University Performance by High School Background for Arts (Bed)

High School Background	Mean UP	Std dev	N
District	62.12	3.70	110
Provincial	62.70	3.97	178
National	62.69	3.59	32
Total	62.50	3.84	320

Further analysis was done to determine the significance of those differences, and the findings are presented in the following table.

Table 4.8: One Way ANOVA results by High School Background for BEd (Arts)

Source	df	Sum of squares	Mean square	F ratio	F prob
Between groups	2	24.04	12.02	.81	.44
Within groups	317	4689.97	14.80		
Total	319	4714.00			

Results in Table 4.8 reveal that the F ratio of .81 is not significant at $\alpha=.05$. We therefore fail to reject the null hypothesis and accept the alternative hypothesis, that is, the mean University Performance of Education Arts students

with different high school backgrounds do not differ significantly for Arts (BEd) students.

In the following section analysis of data for Science (BEd) students will be carried out.

4.4.2 Analysis of data for Science (BEd) students

In the first part of this section, The correlation coefficients between the variables under study are presented in Table 4.9. Discussions of the results related to the first null hypothesis are given below.

Table 4.9: Intercorrelations among the variables for Science (BEd)

	UP	AG	CG
University Performance	-		
Aggregate Grade (AG)	.22*	-	
Cluster Grade (CG)	.08	.62*	-
English Grade (EG)	.11	.42*	-.05

Significant at $\alpha=.05$

Correlation analysis as presented in Table 4.9 shows that the highest correlation coefficients was that between Cluster Grade and Aggregate Grade (.62). The reason for this is that the Cluster Grade is made up by grades in four subjects that are already included in the Aggregate Grade. The same may be said of the English Grade that has the second highest correlation with the Aggregate Grade (.42). It is interesting to note that the Cluster Grade had a low and non-

significant correlation with University Performance (.08). The reason for this may be the downward shift in Cluster Grade requirement for admission to the Science course. About 40 percent of students in the Science (BEd) course had transferred from other courses, mostly with low science cluster grades. The lowest and negative non-significant relationship was that between the Cluster Grade and the English Grade (-.05). The reason for this may be that English being a measure of verbal ability, will have a low correlation with a science cluster measuring numerical/scientific ability. The relationship between Aggregate Grade and University Performance was .22 ($r^2=.048$). This correlation is low and significant. We therefore reject the null hypothesis and accept the alternative hypothesis, that is, there is a significant relationship between the Aggregate Grade and University Performance for Science (BEd) students.

Multiple correlation was carried out to determine the combined contribution of the KCSE Aggregate Grade and the KCSE Cluster Grade to University Performance. The findings are presented in the following equation.

$$\hat{Y} = .27 * X_1 - .09 X_2 + 46.61 \quad (R = .23^*)$$

Where \hat{Y} is predicted University Performance, X_1 is the KCSE Aggregate Grade, and X_2 is the KCSE Cluster Grade. (*Significant at $\alpha=.05$)

The R value at .23 though significant, is low. This may be due to the relatively high and significant correlation between the two predictors ($r=.62$) and the low correlation ($r=.08$) between the Cluster Grade and University Performance, hence the low incremental gain. The R^2 value shows that 5.1 percent of the total

variance in University Performance were accounted for by the combined effect of the two predictors. However R was significant at $\alpha = .05$. We therefore reject the null hypothesis and accept the alternative hypothesis, that is, the KCSE Aggregate Grade and the KCSE Cluster Grade when considered together are significantly related to University Performance for Science (BEd) students.

Multiple correlation was carried out to determine the combined effect of the KCSE Aggregate Grade, the KCSE Cluster Grade and the KCSE English Grade on University Performance. The findings are presented in the following equation.

$$\hat{Y} = .27X_1 - .09X_2 - .01X_3 + 46.51 \quad (R = .22^*)$$

Where \hat{Y} is predicted University Performance, X_1 is the KCSE Aggregate Grade, X_2 is the KCSE Cluster Grade and X_3 is the KCSE English performance.

(*Significant at $\alpha = .05$)

The results in the equation show a low multiple R of .22. The reason for this depressed value may be the relatively high and significant correlations between the Aggregate Grade with both the Cluster Grade and the English Grade ($r = .62$ and $.42$ respectively). On the other hand each of these two predictors have a low correlation with University Performance ($r = .08$ and $.11$ respectively). About 4.75 percent of the total variance in University Performance was accounted for by the combined effect of the three predictors. In addition to this, their contributions were significant at $\alpha = .05$. We therefore reject the null hypothesis

combination significantly correlate with University Performance for Science (BEd) students.

The following table shows University Performance differences between male and female of students.

Table 4.10: University Performance by gender for Science (BEd)

Gender	Mean UP	Std dev	N
Male	60.69	4.93	133
Female	61.14	4.55	73
Total	60.85	4.80	206

The Table 4.10 shows that number of female students is lower than that of males, accounting for only about a third of the total population. Female students performed better than their male counterpart. Further statistical analysis was done to find out if there exists any significant differences between the performances.

Table 4.11: One Way ANOVA results by gender for BEd (Science)

Source	df	Sum of squares	Mean squares	F ratio	F prob
Between groups	1	9.34	9.34	.41	.53
Within groups	204	4700.99	23.04		

The results in Table 4.11 show that the F ratio of .41 is not significant at $\alpha=.05$. We therefore fail to reject the null hypothesis, that is, there is no significant difference in the mean University Performance of male and female Science (BEd)

difference in the mean University Performance of male and female Science (BEd) students. This also shows that when female students are admitted with lower grades they perform as well as male students at the university.

The table below shows the differences in performance between students with different high school backgrounds.

Table 4.12: Mean University Performance by High School Background for Science (BEd)

High School Type	Mean UP	Std dev	N
District	60.954	4.72	109
Provincial	60.73	4.89	97
Total	60.85	4.80	206

In this subsample students with a national and private schools background were less than ten in number, and were thus counted in the provincial group. Results in Table 4.12 show that the students with a District School background performed slightly better than those from Provincial schools. Further analysis was done to find out if there were any significant differences in University Performance.

Results in Table 4.13 below reveals that the F ratio at .11 is not significant at $\alpha = .05$. We therefore fail to reject the null hypothesis, that is, the mean University Performance of Science (BEd) students with different high school backgrounds do not differ significantly.

Table 4.13: One Way ANOVA results by High School Background for Science (BEd)

Source	df	Sum of squares	Mean square	F ratio	F prob
Between groups	1	2.53	2.53	.11	.74
Within groups	204	4707.80	23.08		
Total	205	4710.34			

4.5 Summary of findings

The following is a summary of the findings of the study. The Arts (BEd) subsample will be considered first followed by Science (BEd) (at $\alpha=.05$)

For the Arts (BEd) students, there was small but significant relationship between the KCSE Aggregate Grade and University Performance. The KCSE Aggregate Grade and the KCSE Cluster Grade are used in the selection of university students. When both were considered together they yielded a multiple correlation coefficient of .23, which was significant. The ratio of the beta coefficients for the KCSE Aggregate Grade and the KCSE Cluster Grade was about 2:1. Inclusion of the KCSE English Grade to the multiple correlation equation brought about a modest increase to multiple R, to .26, which was also significant. The ratio of the beta coefficients of the three predictors was about 2:1:1, showing that the KCSE Aggregate Grade was the highest contributor to the value of the multiple correlation coefficient.

The study revealed that female students performed better than their male counterparts, though this difference was not significant. Similarly it was found that

students with different high school backgrounds did not have significantly different means in University Performance. Here three high school types were considered; the district, provincial and the national.

On the other hand, the Science (BEd) subsample provided the following findings. In the first place the relationship between the KCSE Aggregate Grade was low but significant. Together the KCSE Aggregate Grade and the KCSE Cluster Grade yielded a multiple R of .23 that was significant. The ratio of the beta coefficients was in the order of 3:1, showing that the KCSE Aggregate Grade was the main contributor to the value of multiple R. While retaining its significance, the multiple R was reduced to .22 by the addition of the KCSE English Grade. The ratio of the beta coefficients in the order of addition was 27:9:1, showing again that the KCSE Aggregate Grade was the main contributor to the value of R.

As in the Arts, Science (BEd) female students performed better than their male counterparts, though this difference was not significant. In this subsample two school backgrounds were considered, the district and the provincial. Students with a district school background performed better at the university, though this difference was not significant

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

In this chapter the results are discussed, the conclusions and recommendations are given. The discussion is organized according to the factors under study. In the first place discussion will be on the achievement examination grades used in selection, followed by the results of investigations on the effect of non-academic factors, namely gender and high school background.

5.1 KCSE Variables

KCSE results are used in the selection of university students from among form four leavers wishing to join the public universities in Kenya. In this study the KCSE grades were correlated to University Performance. For the Arts (BEd) course the mean for the KCSE Aggregate Grades and the KCSE Cluster Grades (67.15 and 38.95, N=320) were both well above the cut-off grades of 62 and 33 respectively. This showed that admission was very competitive. While the mean KCSE Aggregate Grade of 70.71 for Science (BEd) students was above the cut-off of 62, the mean KCSE Cluster Grade of 36.38 was less than the cut-off grade of 38 points (N=206). This could have been the result of the inclusion of a high number of transferees from other courses that admit students with lower cluster grades, who numbered 83.

Results showed that KCSE Aggregate Grade was significantly related with University performance ($r=0.22$) for Education Arts students. The correlation coefficient between the KCSE Aggregate Grade and University Performance for Science (BEd) students was also low (.22) and significant.

The main reason for the low value of the correlation coefficient is restriction of range, a problem in any selection study. In this case the selection has been especially severe, where the selection ratio is in the order of .05 (refer to Chapter 3 section 2). The distributions of the scores also deviated from normal, all except the Science (BEd) Cluster Grade were positively skewed, thus further affecting the r_{xy} value.

The combination of the KCSE Cluster Grade and the KCSE Aggregate Grade was significantly related to University Performance for Arts students. This supported the second hypothesis. The multiple correlation coefficient increased by only .01. This was low because of the high correlation between these two variables. Similar results were obtained when the same was done for Science (BEd) students. This implies that the Cluster Grade adds little to the selection efficiency because it shares a lot of common variance with the Aggregate Grade. Another reason for the low increment in multiple R is the effect of the high rate of student transfers in the first year at university. About 28 and 40 percent of students in the Arts and Science subsample respectively had transferred from other courses (refer to Chapter 3 section 2). These students who had entered into courses they had not applied for may not have put optimum effort in their studies, due to frustration at not attaining their career ambitions. This therefore contributed to the

low correlation between the Cluster Grade and University Performance. Similarly, for the Science (BEd) subsample, the high rate of transfers from other courses that led to a compromise in the KCSE Cluster Grade cut-off point further contributed to the non-significance of the relationship between the KCSE Cluster Grade and University Performance.

An exploratory analysis on the effect of English language fluency carried out by adding the KCSE English Grade to the equation. In Arts (BEd) the zero-order correlation coefficient was .17 and .08 for the Science (BEd). In both cases the multiple R was significant, confirming the third hypothesis. This increased the multiple R to .26 for Arts (BEd) students, which was substantial and it indicated that English was useful in increasing efficiency in the selection of Arts students. On the other hand, inclusion of English in the regression equation for Science (BEd) students yielded a depressed value of multiple R. The reason for this may be that English being a measure of verbal ability, will have a low correlation with a science cluster measuring numerical/scientific ability. In addition this indicates that there was poor performance in the English subject in District high schools, which produced students with the best University Performance in the Science (BEd) subsample.

In general, the results have shown that achievement examinations in a conjunctive model provide efficiency in selection. This is inspite of the pronounced effects of restriction of range that resulted from the severe nature of the selection process.

5.2 Non Academic Factors

In this section the results of the investigation on the effect of non-academic factors namely gender and high school background, that may have an influence on university performance, will be discussed.

The Arts (BEd) subsample had an almost equal representation of both genders. This was not the case in Science (BEd) where the male to female ratio was 3:1. These findings are consistent with the results of a survey of university populations by gender, where Karega (2000) found that female students were better represented in Arts based courses than in the Sciences. An interesting observation to note in both cases is that the mean University Performance for females was higher than for males. Though these differences were not significant it indicated that females could perform just as well if not better than males in the university. This is contrary to what others have found out at primary and secondary schools, where boys do better than girls in examinations. (Lunalo, 1983 and Muya, 2000). The reason for this may be that when there is a level playing ground in terms of educational opportunities, gender differences in academic performance cease to exist.

This finding supports the decision by the JAB to lower the entry point for female applicants, as this does not compromise standards at the university. These efforts in affirmative action may be extended to further benefit the science-based courses.

In the Arts (BEd) subsample, students with a Provincial school background had the highest mean University performance, followed by National and then those with a District school background. In the Science (BEd) subsample the students from District school performed better at the university than those from Provincial schools. These students were most likely the best in those high schools, and made BEd. courses their first or second choice. The reason for this choice could be the high esteem held for the teaching profession in rural areas, and the inadequacy of guidance in making career choices. Further analysis showed that there were no significant differences in the means, implying that when under similar learning conditions at the university, high school background does not influence performance at the university.

5.3 Conclusion

From the results of the analysis, the Aggregate Grade had significant correlations with Univeresity Performance, showing that it is very useful in the first stage of the university selection process. Even though the Cluster Grade had low incremental value in selection efficiency, it remains a very important tool in the classification process. This is because it is a less costly and a more convenient alternative than using other types of test scores for the same task. The English Grade was more contributive to selection efficiency for the Arts (BEd) subsample than the Science (BEd) subsample, but as yet there is no pressing evidence for its consideration in the selection process.

The results of the study revealed that the gender of a student does not significantly influence performance at the university for both Education Arts and Science students. Similarly high school background does not significantly influence performance at the university for both Education Arts and Science students.

From the results of the study, the following recommendations were made.

5.4 Recommendations

The following recommendations have been put forward based on the observations made in this study. First, recommendations will be made on the selection model, followed by those related to non-academic factors in the selection process.

The performance in the KCSE is used as the sole criteria for admission to the university. In this study KCSE Aggregate Grade was shown to be significantly related to University Performance, and therefore needs to be retained in use as a selection tool in the first stage of the selection process. There was however, one major drawback in its use in university selection. The examination has had an undue influence on teaching in secondary school. Here school instruction may be geared to passing the examination, manifested in such practices as drilling, repetition of classes by less able students and after-class coaching sessions. While there may be alternative selection tools such as aptitude tests, this study has reinforced the idea that achievement is the best predictor of future achievement. There is need to address the issue of classification. In this study more than 90

percent of students were not first choice applicants to the BEd. course. Some were second, third, fourth or had not at all chosen the BEd. course. This means that many students are in the Education course against their wish. The classification process was compromised, and needs to be streamlined. This again may be done by adequate guidance in the classification process. It appears that there is a problem in the flow of information from the JAB secretariat to the school level. It is therefore hoped that information contained in this study and that in other relevant sources will be found to be useful in gaining a better understanding of the selection process.

In order for the KCSE results to have more relevance in the selection process, there is need to reduce the gap in time between the release of KCSE results and admission to university. Currently the minimum time taken is two years, and this leads to changes in some factors like career interests which in turn affect later academic performance.

The campaign on education of girls has gained a fresh impetus in the recent years (Karega, 2000, Musembi, 1997), yet girls remain inadequately represented at the university, especially in science-based courses. There is need for focussed career guidance and counseling services in high schools. This is to help pupils especially girls to understand their strengths and to make the right and relevant decisions concerning their vocational and educational future, especially in the opportunities available to them in the field of sciences. The results of this study showed female students performed well if not better than their male counterparts at the university, and thus may be quoted in the counseling process.

Employers in the education sector need to improve conditions for teachers so as to attract high performing students to the teaching profession. This will increase the number of students who choose BEd. courses in the first or second place.

In general there is need for better record-keeping by the universities in order to facilitate the monitoring of student progress through university. This is possible with the introduction of information technology. Further, the university admission managers should use the results of studies such as this in the selection decision making process. This will be a departure from the current norm where demand and supply dictates admission policy.

5.5 Suggestion for further research

The selection is a complex process involving many factors. There is therefore need for further research on how other factors such as interest in the teaching profession may influence the efficiency in the selection process.

There is also need to conduct similar research in other programs of study across institutions. This is important especially for those universities admitting students outside the JAB guidelines and need to validate their selection protocol.

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APPENDICES

APPENDIX A

KCSE SUBJECT GROUPINGS FOR THE 1995/96 ACADEMIC YEAR

		Subject Selection			
abbreviation	Subject		Alternative A	Alternative B	
Group I	ENG MAT KIS	English Mathematics Kiswahili	Compulsory Compulsory Compulsory	3 3 3	
Group II	BIO PHY CHE PSC BSC	Biology Physics Chemistry Physical Sciences Biological Sciences	Alt A Alt B	At least two (2) Two (2)	
Group III	HAG GEG CRE IRE SEE HRE	History And Government Geography Christian Religious Education Islamic Religious Education Social Education And Ethics Hindu Religious Education	At least one	1 1	
Group IV	HSC ARD AGR WDW MTW BCN PME ELE DWD AVA	Home Science Art And Design Agriculture Woodwork Metal Work Building Constructuion Power Mechanics Electricity Drawing And Design Aviation Technology	At least one	1 1	
Group V	FRE GER ARB MUS ACC COM ECO TOP	French German Arabic Music Accounting Commerce Economics Type Writing With Office Practice		7 7	

Note: selection of the eighth subject

Candidates opting for Alternative A subjects in Group II select the eighth subject from Group II/III/IV/V.
A candidate opting for Alternative B subjects in Group II select the eighth subject from Group III/IV/V

APPENDIX B

Data collection sheet

Name _____

Surname

First

Middle

University registration number _____ Sex _____

KCSE Index Number _____ Year of sitting for the KCSE _____

Secondary school _____ Type _____

University Average Grade _____

KCSE SUBJECT GRADES

Group I English _____ Mathematics _____ Kiswahili _____

Group II _____

Group III _____

Group IV _____

Group V _____

KCSE Cluster Grade _____

KCSE Aggregate Grade _____

Data collection sheet

Name _____

Surname

First

Middle

University registration number _____ Sex _____

KCSE Index Number _____ Year of sitting for the KCSE _____

Secondary school _____ Type _____

University Average Grade _____

KCSE SUBJECT GRADES

Group I English _____ Mathematics _____ Kiswahili _____

Group II _____

Group III _____

Group IV _____

Group V _____

KCSE Cluster Grade _____

KCSE Aggregate Grade _____

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