

**INFLUENCE OF PROVISION OF SCHOOL PHYSICAL  
INFRASTRUCTURE ON STUDENTS' PERFORMANCE IN  
KENYA CERTIFICATE OF SECONDARY EDUCATION IN  
MWINGI CENTRAL DISTRICT, KENYA**

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for the Award of the Degree of Master of Education in Educational  
Administration**

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## **DECLARATION**

This research report is my original work and has not been presented for award of a degree in any other university

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## **DEDICATION**

This research work is dedicated with a lot of love, respect and appreciation to my husband Stephen Musyoka Kitungu, and our children Nixon Kitungu, Franklin Muthui, Nancy Mueni, Faith Mumbembe and Mercy Mawia.

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## **LIST OF ABBREVIATIONS & ACRONYMS**

AFT	American Federation of Teacher's
CAPE	Commonwealth Assessment of Physical Environment
CSEQ	College Student Experience Questionnaire
DEO	District Education Officer
EFA	Education For All
HMLE	Half Modern Learning Environment
KCSE	Kenya Certificate of Secondary Education
MLOL	Modern Learning, Obsolete Learning
MOEST	Ministry of Education Science and Technology
NCST	National Council for Science and Technology
NSSD	National Summit on School Design
NCES	National Center for Education Statistics
SOL	Standards of Learning

## ABSTRACT

Education plays a key role in socializing an individual to fit and participate adequately in development of the society. An educated population has been recognized as being more productive than one that is not, as the former is easier to train and work better than the later, and those educated are better off economically. The purpose of the study was establish the influence of physical infrastructure on the students' performance of Kenya Certificate of Secondary Education in secondary schools in Mwingi Central district. The objectives of the study were: To establish how classrooms size in schools affected students academic performance, to determine how the provision of science laboratory affected students' academic performance, to examine how school library services influenced students' academic performance , to determine how type of of solid waste disposal affects students' academic performance in Kenya Certificate of Secondary Education Mwingi Central District. This study used descriptive survey design. The target population of the study was all the 30 principals 238 teachers and 2400 students. The researcher used three sets of questionnaires, one for the principal, the other for the teachers and another for students. Quantitative data was analyzed using Statistical Package for Social Sciences and the results presented in frequency tables, pie charts, bar graphs and percentages to make meaningful conclusions. The study findings were that schools do not have adequate physical facilities. Such physical facilities includes classrooms, laboratories, library, desks and toilets which negatively impacts on their academinc performance. From the study findings that schools should be sensitized to acquire physical facilities that are important for the success of schools in academic performance. Among the ways of lobbying money may include sensitizing parents to pay school fees on time, holding harambees, writing proposals to well wishers and governmental programmes that deals with educational development e.g. CDF funds, LATIFF among other ways. Parents should also be sensitized to engage in programmes that are geared towards improving the schools physical facilities in order to improve the learning environment for academic excellence of their children. This can be done through participating in school income generating activities e.g. provision of market to school products and contributing towards development of the school programmes e.g. building of classes and other physical activities.

# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1. Background of the study**

Education plays a key role in socializing the individual to fit and participate adequately in development of the society (Sifuna, 1990). A educated population has been recognized as being more productive than one that is not, as the former is easier to train and work better than the later, and those educated are better off economically. (Murphy, 2008). Psacharopoulos (1985) has highlighted the benefits of education as: improving the productive capacity of the society, reducing poverty by mitigating its effects on population, health and nutrition.

Increasing the value and efficiency of the labour offered by the poor and enhancing democracy and good governance among others. The government of Kenya has recognised that elimination of poverty, promotion of human rights and attainment of sustainable development are noble goals and can only be realised by placing education at the core of national development agenda MOEST (2002).

In view of the great importance attached to education a large portion of the national budget in the country and indeed in most developing countries goes towards education. Governments spent large amount of money in improving physical infrastructure in school. Education plays a crucial role in preparing the young for their roles in society. Education has become one of the basic

rights which every citizen must have access to. Therefore the need for education of both girls and boys should be stressed.

In the World Conference on Education for All (EFA) held in Jomtein in 1990. It was agreed that education is a basic need for all people. In Africa, this declaration was domesticated by the Dakar Framework of Action (2000). The participants identified several elements necessary for quality education among them motivated students, well trained teachers using actual learning techniques, adequate facilities and materials, local language curriculum that builds on teachers and learners knowldge and experience, welcoming gender sensitive, health, safe environment that encourage learning and accurate assessemtn of learning outcomes (UNESCO, 2000).

The importance of education was to meet the goals of EFA which was set by 2015. In order to have expanded and improved all aspects of quality education and ensure excellence. Provision of quality education is enhanced by providing adequate physical infrastructure. Since time immemorial human beings have done a lot to facilitate their lives with all the physical infrastructure in the world. physical infrastructure include laboratory, library,dormitory, solid waste disposals and classroom. These plays an important role in enhnacing safe and clean encironment which is condusive for high achievement of students and physical comfort. Heyneman (1980) supports the idea (as cited in John Beynon 1997) that developing countries, low levels of learning among children can be partly attributed to poor and inadequate physical infrastructure in schools.

For successful achievement of academic performance in schools there is need to provide key physical infrastructure which include:- science laboratory, school library, classrooms and various types of solid waste disposal.

Science laboratory is central to scientific instruction and it forms essential component of science education. It is where various kinds of practical work are carried out by students under the guidance of their teachers. Without proper and well- equipped science laboratory, it is not possible to carry out the science teaching process effectively in any school or educational institutions.

Library is a section of the school organization where there is group of books, magazines, articles and newspapers. Some school have audio-visual section in their library. The need for a good library service is no longer an issues of debate. A library is therefore indispensable because it is the hub of intellectual activities in the school just as a laboratory.

Classrooms are key infrastructural facilities in the school where the teaching learning process takes place. Spacious classroom gives the teacher and student good room for interaction. Solid waste disposal system are important in enhancing safe and clean environment. There is need for proper management of solid waste disposal in schools because this enhances positive attitude towards personal hygiene and environment.

Ayot and Briggs (1992) are of view that learning achieved as seen from performance depends so much on the principals' ability to monitor physical infrastructure. Therefore, the impact of school management is an essential element of such studies.

The differential academic achievement of students in examination has been of concern to the researchers and educators, Government and parents World over. There has been long-held assumption that curriculum and teaching have an impact on learning. However, it is becoming more apparent that the physical infrastructure of schools can influence student achievement.(Olagbemiro 2010). Similar sentiment were given by Lyons, (2002) who said that learning is a complex activity that puts students' motivation and physical condition to the test.

Several studies have been carried to establish the influence of physical facilities on student's performance in examinations. Studies have shown that in most school laboratory activities, the student's laboratory guide, handbook, or worksheet, continues to play a central role in shaping the students' behaviors and learning. Lunetta and Tamir (1979) developed a set of protocols for analyzing student laboratory activities, which they used in the 1980s to analyze several secondary school science laboratory programs systematically. Similar protocols were used more recently in Australia by Fisher (2010) and the results shows that to date, many students engage in laboratory activities in

which they follow recipes and gather and record data without a clear sense of the purposes and procedures of their investigation and their interconnections.

The quantity of information presented in the laboratory guide is often so substantial that the details can promote the learners interest towards the main goal of the practical task. Consistent with the findings of Lunetta and Tamir (1979) and others, students are seldom given opportunities to use higher-level cognitive skills or to discuss substantive scientific knowledge associated with the investigation, and many of the tasks presented to them continue to follow a “cookbook” approach (Roth, 1994).

In Virginia, Cash (1993) developed research that examined the impact of various factors of building condition on student achievement in a manner that controlled for socio-economic status of the students. Cash (1993) found that when socio-economic factors were constant, facility condition had a significant correlation with student achievement. Cash (1993) found that air conditioning, absence of graffiti, condition of science laboratories, classrooms, condition of library facilities, types of solid waste disposals systems correlated with student academic achievement at a significant level when controlling for socio-economic status of the students.

Chan (1996) conducted a similar study of the impact of physical infrastructure on students’ performance. Chan (1996) concluded that technology and adaptabilities of physical infrastructure better equipped students for success and that to ignore that fact was to disregard the physical difficulties of learning. On classroom size, studies have shown that students



in larger classes may perform more poorly if the resulting reduced motivation leads to increased absenteeism. However, such issues have not been empirically tested. Teaching is generally assumed to be a public good, however, as Bonesronning (2003) points out, there are also private good aspects. As classroom size is reduced, instructors have a greater chance to provide students with individual attention and can respond to the reduced class size by reallocating resources towards low-achieving students or by adopting teaching methodologies geared towards student needs (Brown and Saks 1987). The impact of classroom size on achievement can therefore be ambiguous, depending on the instructor's teaching method and student motivation.

The physical infrastructure include laboratory, library, classroom and solid waste disposal. A well planned and organized layout of physical infrastructure do much to banish apathy, supplement inadequacy of books as well as arouse students interest by giving them something practical to see, do and at the same time helping to train them to think things out themselves. Savoury (1958) suggested a catalogue of useful visual aids that are good for teaching history be pictures, post cards, diagrams, maps, filmstrips of materials. It is against this background that this study seeks too establish the influence of physical infrastructure on the performance of students in Kenya Certificate of Secondary Education in Kenya.

## 1.2 Statement of the Problem

There have been claims from parents, members of public and other beneficiaries of education that Kenya Certificate of Secondary Education results in Mwingi Central District are not helping candidates compete favorably with those from other Districts in access to tertiary education. (D.E.O Mwingi 2012). This is attributed to poor performance in Kenya Certificate of Secondary Education in the district. Several studies have been carried out to establish the factors that contribute to poor performance in secondary schools, however such studies focused on students attitude towards education, cultural factor and personal characteristics of students.

In Mwingi Central District students performance in Kenya Certificate of Secondary School Education has been poor as compared to the neighboring district of Migwani, Kyuso and Mwingi East as shown in table 1.1

**Table 1.1 KSCE performance year 2008-2011 (means score)**

	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
Mwingi central	4.61	4.83	4.78	5.23
Kyuso	5.12	5.33	5.51	5.3
Migwani	5.67	5.81	5.71	5.6
Mwingi East	4.8	4.89	4.82	5.32

**Source: DEOs' Office Kyuso, Mwingi Central, Migwani and Mwingi East.**

This poor performance can be attributed to lack of adequate infrastructure in Mwingi Central District as compared to the neighbouring district of Kyuso, Migwani and Mwingi East as shown in table 1.2.

**Table 1.2 Physical Infrastructure available in the secondary schools in Mwingi Central District Kyuso, Migwani and Mwingi East District.**

	<b>Labaratory</b>	<b>Library</b>	<b>No. of classroom</b>	<b>No. of schools with proper solid waste disposal</b>
Mwingi central	20	5	150	30
Kyuso	25	8	160	40
Migwani	30	12	155	42
Mwingi East	24	11	158	35
<b>TOTAL</b>	<b>99</b>	<b>36</b>	<b>623</b>	<b>147</b>

**Source: DEOs' Office Kyuso, Mwingi Central, Migwani and Mwingi East.**

The available literature showed that there is no single study that was carried in Kenya to establish the influence of physical infrastructures on the performance of the students in Kenya Certificate of Secondary Education. This study therefore, sought to establish the influence of the physical infrastructure on students performance in Kenya Certificate of Secondary Education in Mwingi Central district.

### **1.3 Purpose of the study**

The purpose of the study was to establish the influence of physical infrastructure on the performance of Kenya Certificate of Secondary Education in secondary schools in Mwingi Central district.

### **1.4. Objectives of the study**

Objectives that guides the study were:

- (i) To establish how physical classroom size in schools affected students academic performance in Kenya Certificate of Secondary Education in Mwingi Central District.
- (ii) To determine how the provision of science laboratory affected students' academic performance in Kenya Certificate of Secondary Education Mwingi Central in District.
- (iii) To examine how school library services influence students' academic performance in Kenya Certificate of Secondary Education Mwingi Central District.
- (iv) To determine how type of solid waste disposal affect students' academic performance in Kenya Certificate of Secondary Education Mwingi Central District.

### **1.5 Research questions**

The research questions for this study were;

- (i) How does the classroom size affect students academic performance in Mwingi Central District?

- (ii) What is the influence of the presence of laboratory on students' academic performance in Mwingi Central District?
- (iii) What is the effect of the availability of library services on students' academic performance in Mwingi Central District?
- (iv) How do solid waste disposal systems affect students' academic performance in Mwingi Central District?

### **1.6 Significance of the study**

It is hoped that this study's findings may be useful to the school management committees because they may use the findings to provide the necessary physical infrastructures to enhance academic performance of Kenya Certificate of Secondary Education.

The study findings may also give suggestions which may be used in the formulation of necessary policy statements through its recommendations on the availability of physical infrastructures in schools. Such recommendations may help the school administration and management committees to prioritize and avail the necessary infrastructure which may be used in improving academic performance of Kenya Certificate of Secondary Education. The study findings may benefit the teachers and the learners by encouraging them to utilize well the physical infrastructure provided in the school. The study findings may contribute to the pool of knowledge in the area of education administration.

### **1.7 Limitations of the study**

Due to tight schedule of the principals most of them were not readily available for the interview. However, efforts were made to make prior appointments booking on the date for the meetings with the principals. Some respondents were reluctant to provide information for the study due to conservatism in exposing the state of their institutions. The researcher overcame this by assuring the respondents that the findings of the study are for academic purpose only and their identity would not be disclosed.

### **1.8 Delimitations of the study**

The study only focused on the contribution of the physical infrastructure on the performance of Kenya Certificate of Secondary Education in 30 public secondary school in Mwingi Central District and other factors that contribute to the performance of Kenya Certificate of Secondary Education were not considered. The study also sought the views of the principals, teachers and form four students only.

### **1.9 Assumptions of the study**

This study was based on the following assumption:

- a. That the poor performance of KCSE in Mwingi Central district is associated with provision of inadequate physical facilities in schools.
- b. The other assumption is that the respondents gave genuine responses.

### **1.10 Definition of Significant Terms**

**Library service:** refers to the provision of reading materials in a special room designed for reading.

**Low (Poor) Results:** refers to examination outcomes in which the mean grade or individual subject performance curtails the learner from higher education or further training.

**Performance:** refers to the grades both per subject and overall that the pupil obtained in Kenya Certificate of Secondary Education Examinations.

**Physical infrastructure:** refers to basic facilities and equipment needed for functioning of a school for example include classrooms, drawing boards/stools, computer room and library.

### **1.11 Organization of the study**

The study consists of five chapters, chapter one covers background to the study, statement of the problem, the purpose of the study, limitations of the study, objectives of the study, research questions, significance of the study, basic assumptions, definition of significant terms and organization of the study. Chapter two consists of literature review, introduction, conceptual frame work, the influence of the conditions of the physical infrastructure on examination performance, the influence of class size on students performance in examinations, on students performance, the influence of laboratory on the performance of students in examinations and theoretical framework. Chapter three involves research methodology, introduction, research design, target population , sample size and sampling procedure, research instruments, validity of the instruments, instrument reliability , methods of data analysis

and data collection procedures. Chapter four consists of data analysis, interpretation and discussion. Chapter five covers summary of the findings, conclusion and recommendation for further studies.



## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter reviews the available related literature on the influence of physical infrastructure on students performance in Kenya Certificate of Secondary Education. The literature focuses on the influence of classroom size on performance and the influence of availability of laboratory on students performance in examinations.

##### **2.1.2 The education system in Kenya since independence.**

Education and training in Kenya is governed by the Education Act (1968) and other related Acts of Parliament, including TSC Act, KNEC Act, Adult Education Act, University Act, and various Acts and Charters for universities. However, the Education Act of 1968, and the related Acts are not harmonized, and are no longer adequately responsive to the current and emerging trends in education and training. The legislation governing the sector has therefore not kept pace with new developments.

Since independence, the Government has addressed the challenges facing the education sector through commissions, committees and taskforces. The first Commission, after independence, came up with the Report of the Kenya Education Commission referred to as the Ominde Commission (The Government of Kenya, 1964) that sought to reform the education system inherited from the colonial government to make it more responsive to the needs of the country. The Commission proposed an education system that

would foster national unity and creation of sufficient human capital for national development. Sessional Paper No: 10 of 1965 on African Socialism and its Application to Planning in Kenya formally adopted the Ominde Report as a basis for post-independence educational development.

The Report of the National Committee on Educational Objectives and Policies referred to as the Gachathi report of 1976, focused on redefining Kenya's educational policies and objectives, giving consideration to national unity, and the economic, social and cultural aspirations of the people of Kenya. It resulted in Government support for 'Harambee' schools.

The Report of the Presidential Working Party on the Second University in Kenya (Mackay Report, 1981), led to the removal of the advanced (A) level of secondary education and the expansion of other post-secondary training institutions. In addition to the establishment of Moi University, it also recommended the establishment of the 8:4:4 systems of education and the Commission for Higher Education (CHE). The Report of the Presidential Working Party on Education and Manpower Training for the Next Decade and beyond (The Kamunge Report, 1988) focused on improving education financing, quality and relevance. This was at a time when the Government scheme for the provision of instructional materials through the National Textbook Scheme was inefficient and therefore adversely affected the quality of teaching and learning. From the recommendations of the Working Party in 1988, the Government produced Sessional Paper No 6 on Education and

Training for the Next Decade and beyond (Kamunge Report,1988). This led to the policy of cost sharing between government, parents and communities. This indicates that the government of Kenya values education as a worthwhile investment .

## **2.2 The influence of the conditions of the school physical infrastructure on students' performance**

School facilities have been observed as a potent factor to quantitative education. The importance to teaching and learning of the provision of adequate instructional facilities for education cannot be over-emphazied. The dictum that “teaching is inseparable from learning but learning is not separable from teaching” is that teachers do the teaching to make the students learn, but students can learn without the teachers.

According to Akande (1985), learning can occur through one's interaction with one's environment. Environment here refers to facilities that are available to facilitate students learning outcome. It includes books, audio-visual, software and hardware of educational technology; so also, size of classroom, sitting position and arrangement, availability of tables, chairs, chalkboards, shelves on which instruments for practicals are arranged (Farrant, 1991 and Farombi, 1998). According to Oni (1992), facilities constitute a strategic factor in organizational functioning. This is so because they determine to a very large extent the smooth functioning of any social organization or system including education. He further stated that their availability, adequacy and relevance influence efficiency and high productivity. In his words, Farombi (1998) opined that the wealth of a nation

or society could determine the quality of education in that land; emphasizing that a society that is wealthy will establish good schools with quality teachers, learning infrastructures that with such, students may learn with ease thus bringing about good academic achievement. Writing on the role of facilities in teaching, Balogun (1982) submitted that no effective science education programme can exist without equipment for teaching. This is because facilities enable the learner to develop problem-solving skills and scientific attitudes. In their contribution, Ajayi and Ogunyemi (1990) reiterated that when facilities are provided to meet relative needs of a school system, students will not only have access to the reference materials mentioned by the teacher, but individual students will also learn at their own paces. The net effect of this is increased overall academic performance of the entire students.

In his study on resource concentration, utilization and management as correlates of students learning outcomes in Oyo State, Farombi (1998) found that the classroom learning environment in some schools was poor. He cited examples of schools without chalkboard, absence of ceiling, some roofing sheets not in place, windows and doors removed among others, a situation which the researcher regarded as hazardous to healthy living of the learners. According to Nigerian Tribune on Thursday 25 November 1999, in caption; *Mass Failure will Continue until...*” the chairman of the National Committee of WAEC, Dr. U.B Ahmed opined that the classroom is the origin of failure... a close look at the public schools and what goes on there shows that nothing good can come out of most schools as they do not have facilities, adequate and appropriate human resources to prepare candidates for WASCE.

The above statement indicates that the problem of candidates' mass failure in WAEC's organized examination will continue until the situation of the nation's public schools change for the better. Writing on how to improve primary education in developing countries, World Bank publication (1990), citing Mwamwenda and Mwamwenda (1987) linked performance of students to the provision of adequate facilities while referring to a survey of 51 primary schools in Botswana that students performed significantly better on academic tests when they had adequate classrooms, desks and books. Earlier, Fagbamiye (1979) attesting to why students' performance standard fall observed 559 cases from 13 secondary schools in Lagos State using age, type of school (Day or Boarding, mixed or single sex), teachers qualification and teaching experience as well as intake quality using students' entrance examination achievement. His findings revealed that schools which are equipped had good records of achievement and attracted more students. He concluded that good quality schools in terms of facilities and younger students' intake perform better in WASCE. Commenting on why high academic attainment is not in vogue in Nigeria, Adesina (1981) identified poor and inadequate physical facilities, obsolete teaching techniques... overcrowded classrooms among others, as factors.

There is a large and controversial literature analyzing the relationship between school resource levels and pupils achievement, dating back to the pioneering work by Coleman et al (1966). Early work on this issue using US data

suggested a weak and somewhat inconsistent relationship between school resources and pupils achievement (Burtless, 1996 and Hanushek 1979, 1986 & 1997). International research confirms this view (Wosmann, 2003).

However, this view was disputed by some, including Laine et al. (1996), Card and Krueger (1992) and Krueger (2003). A recent and comprehensive summary of a range of evidence on the effect of sizes of class is Averett and McLennan (2004). They found the evidence base to be mixed, in terms of methodologies and results, and could not reach a definite conclusion about the effect of smaller classes on pupils achievement. In the UK, schools with higher concentrations of lower attaining pupils receive more funding per pupil. If this feature of the allocation of resources is ignored, a true positive effect of increasing resources will be understated. It is fair to say, however, that the vast majority of school resource effect studies have not been able to address the endogeneity problem. This is certainly so in the UK (Levacic and Vignoles, 2002). UK studies that have made some attempt to address endogeneity have generally found small but statistically significant positive effects from school resource variables on educational outcomes (Dearden et al, 2001; Dolton and Vignoles, 2000; Dustmann et al., 2003; Iacovou, 2002).

Endogeneity issues are not the only methodological difficulty in this literature. For example, much of the work on resourcing has had to rely on quite aggregated data, rather than data at the level of the individual pupil.

Aggregation bias is therefore a problem for some of the studies in this field (Hanushek et al. , 1996). In Nigeria, a lot of studies have been conducted by various researchers on the relationship between educational resources and students academic performance. Idiagbe, (2004) concluded that teachers qualification and adequate facilities were determinants of assessing academic performance of students in secondary schools. Hence the availability or non availability of facilities in schools affects the academic performance of students in Delta State.

This is in agreement with Nwangwu (1997) who believed that teaching materials facilitate teaching and learning activities, which result in effective teaching and improved academic performance. For efficient educational management, facilities help the school to determine the number of pupils to be accommodated, number of teachers and non teaching personnel to be employed and the cost determination for the efficient management of the system (Osagie, 2001). The school climate is determined by the resources, especially class rooms under which the teachers and pupils operates which influences attitude in teaching and learning. Un conducive class room creates stress on teachers and pupils resulting negative attitude toward school and learning by pupils.

Facilities below approved standard could also lead to reduction in quality of teaching and learning in schools resulting to poor pupils academic performance (Uwheraka, 2005). The school environment affects academic

achievement of pupils. Facilities such as, desks, seats, chalkboard, teaching aids, and cupboard are ingredients for effective teaching and learning. In the same vein the Nigeria Education Research Council of 1998 also emphasized that, for a good education policy or programme to guarantee quality outputs, it must be adequately supplied with necessary facilities and equipment. In Kenya a number of studies have been conducted to assess the level of availability and adequacy of teaching and learning facilities in the schools. The school infrastructure which includes: buildings, science laboratories, play grounds, and school compound were found to play an important role in facilitating academic achievement in schools. An evaluation which was conducted by KIE in the year 2007 to investigate how much prepared schools were for the new curriculum showed most of the sampled schools had inadequate infrastructure for teaching and learning. Other important resources in teaching and learning were found to be textbooks, charts, posters, library and computers. The most commonly used resource was found to be the textbooks some of which, according to a monitoring report have shallow content, contradictory information, too much unnecessary content and factual errors.

In Virginia study, Cash (1993) developed research that examined the impact of various factors of building condition on student achievement in a manner that controlled for socio-economic status of the students. Cash (1993) found that when socio-economic factors were constant, facility condition had a significant correlation with student achievement.



### **2.3 The influence of classroom size on students' academic performance in Kenya Certificate of Secondary Education**

Olutola (1982), noted that the availability of the school building and other plans contribute to good academic performance as they enhance effective teaching-learning activities. He further stated that well sited school buildings with aesthetic conditions, playground, lavatory, etc. according to the scholar usually contribute to achieving higher educational attainment by the students.

Throwing more light on this, the Encyclopedia of Educational Research recorded that the total environment within a school building should be comfortable, pleasant and psychological uplifting. It should provide a passive physical setting that is educationally stimulating, it should produce a feeling of well-being among its occupants, and it should support the educational process (p.1156). The above condition can only be met through the cooperative efforts of imaginative teachers, administrators and a creative knowledgeable architect.

Akinwumiju and Orimoloye (1987) opined that education institutions from Nursery to University require buildings for their effective operations. Classrooms, offices, assembly halls, laboratories and staff quarters are needed, important items like furniture for staff and students, books, science equipment, games and sport equipment should be adequate in number and they should all be in good conditions for schools to function properly. Writing on the deplorable state of public schools in Nigeria, Ogunmoyela (1994)

lamented that school buildings of public schools have no roof, windows and doors, some walls are cracked, instructional facilities are lacking while teachers are frustrated consequent upon lack of equipment/facilities to meet educational endeavours. Comparing schools in developing countries with what obtains in industrialized world, in terms of facilities, materials, utilization, and provision. Akintayo (1997) opined that schooling in developing countries like Nigeria takes place under condition that are very different from those in industrialized countries like Great Britain. He further stated that primary school pupils in developed countries are likely to go to school in modern well-equipped buildings and to have a curriculum that is well thought out in terms of scope and sequence. In line with the above, Lockheed and Verspoor (1991) stated that on the average they receive 900 hours a year of learning time. The situation is not the same in Nigeria, both primary and secondary schools in Nigeria in particularly Ekiti State battle with dilapidated buildings as well as incessant strike action for upward of three to six months that students' average attendance per session is very poor and discouraging.

Research on the impact of classroom size on students' achievement has not focused on motivational issues or absenteeism. But rather it has shown that after accounting for student ability and other factors, classroom size does not impact on student grades on multiple-choice exams or the ability to recall information in economic courses (Kennedy and Siegfried 1997, Mirus 1973, Lewis and Dahl 1972).

However, Becker and Powers (2001) demonstrate that after accounting for missing student data due to student withdrawals, class size can impact student performance even on multiple-choice exams, while Becker and Johnson (1999) demonstrate that testing format can bias results. Studies have also shown that the higher level cognitive skills required to answer essay questions can be impacted by class size (Raimondo et al. 1990, Siegfried and Fels 1979, Lewis and Dahl 1972, Crowley and Wilton 1974).

The impact of building features on student achievement if buildings played no role in the educating of future generations, then ignoring their further deterioration could be tolerated provided issues of structural integrity, efficiency, and safety were addressed. However, over sixty years of research continue to support the positive relationship between building quality and student achievement. Researchers within the United States have been joined by international researchers in confirming the link between the building and achievement. Cash (1993) reported that the condition of facilities can account for as many as 11 percentile points on student accountability assessments.

The American Federation of Teacher's (AFT) publication, *Building Minds, Minding Buildings: Turning Crumbling Schools into Environments for Learning*, was commissioned in response to Section 5414 of the No Child Left Behind Act on the "health and learning impacts of environmentally unhealthy public school buildings on students and teachers." (Building Minds, 2006).

The commissioned report found “poor environments in schools, adversely influence the health, performance, and attendance of students.”(Building Minds, 2006). Factors such as poor lighting, inadequate ventilation, crumbling walls, damaged ceiling tiles, and inoperative heating and air conditioning systems were reported in AFT’s 2006 research results.

The results also included the factors of noise, overcrowding, and air quality, recognizing their link to student learning (Building Minds, 2006). Many researchers have categorized building factors as either cosmetic or structural. The cosmetic factors, those that can be seen, consistently are linked with improved student performance. Structural factors, including heating and air-conditioning, also are linked to student achievement. Factors that have been noted repeatedly to influence student achievement include natural lighting, paint colors and paint cycles, general cleanliness, air quality, temperature control, acoustical enhancements, safety features, absence of graffiti, and air conditioning.

Cash (1993), in a study of small rural high schools in Virginia found a connection between building condition and student achievement as measured by standardized tests. The factors that were major contributors to the identified relationship included windows in classrooms, cleanliness, absence of graffiti, and presence of air conditioning.

This study was replicated in large high schools in Virginia (Hines, 1996) with similar findings. The same methodology was employed in a study of high schools in Central Dakota (Earthman, Cash, & Van Berkum, 1995) and the

results were consistent with those from the earlier studies. O'Sullivan (2006) found similar results in his study of student achievement in Pennsylvania high schools. Crook (2006) examined the relationship between the condition of the physical environment and number of students who passed the Virginia Standards of Learning (SOL) examinations, and found building condition to be a predictor of student success.

Lanham (1999) studied the performance of elementary school students. Each of these studies utilized the same instrument, the Commonwealth Assessment of Physical Environment (CAPE), to determine the building physical condition. While student achievement measures varied, the connection between the building's condition and the student's academic performance was similar. In each case, windows and natural lighting, air-conditioning, cleanliness, freedom from graffiti, and wall color and paint freshness were building elements that showed a positive correlation with student achievement. Other researchers have found similar connections between student learning, behavior and buildings. (Cervantes, 1999; Earthman & Lemasters, 1996).

Duran-Narucki's 2008 study of school building condition, attendance, and academic achievement in New York City, found building conditions to be a predictor of student attendance and student achievement on standardized tests. These results were reported after controlling for other possible factors, including socioeconomic status, ethnicity, and teacher quality. (Duran-Narucki, 2008) That poorer building condition negatively impacts student

attendance and that coming to school is necessary to learning are both logical arguments that continue to be supported by research.

The National Summit on School Design (NSSD) reported eight recommendations for school design excellence. These included designs to support a variety of learning styles, and the creation of healthy, comfortable, and flexible learning spaces. These recommendations have several implications for changes in the learning environment (NSSD, 2005). While the cumulative effect of the school facility's condition has been related to student outcomes, further research has been done to pinpoint several specific factors that contribute to this overall phenomenon.

These specific factors include lighting, building cleanliness, health and safety, painting, and student and teacher morale. Lighting Research has indicated that controlled day lighting and appropriate artificial lighting improve the performance of students and teachers and their health (Woodside, 2008). Research by Conway, Epps, and Plympton (2000) supported the relationship between lighting and student test scores and health. They further reported that schools found increasing natural lighting in construction did not necessarily increase the cost of construction or operational costs. Heschong-Mahone Group (1999) reinforced the positive effect of day lighting in student performance.

The 2006 AFT publication points to key elements that are indicators of a commitment to high standards in schools. These include building and classroom sizes conducive to learning, adequate ventilation, heating and air-

conditioning systems, extensive use of natural daylight, acoustic materials that reduce noise levels that interfere with learning, safety and security concerns effectively addressed, integrated technology, infrastructure that supports special needs students, and adequate staffing to keep schools clean and well-maintained. It further maintains that these conditions can be incorporated in new and old buildings. (Building Minds, 2006) Both the presence of sunlight and the types of classroom lighting have been linked to improved student performance (Cash, 1993; Hines, 1996; Earthman et al, 1995; Crook, 2006). The National Summit on School Design (2005), in its recommendations, included an emphasis on daylight in learning spaces and energy-efficient and aesthetically pleasing lighting within the building.

Kennedy (2008) affirmed that daylight is recognized as valuable for enhanced student performance and as a critical consideration for energy conservation. Several factors addressed in research relate to the cleanliness of the school facility. A connection has been made between lack of graffiti, clean floors or walls, and other measures of a school's cleanliness and student academic performance. In a survey of sophomores, according to the Educational Longitudinal Study of 2002 conducted by the National Center for Educational Statistics, disrepair and inadequate cleanliness were major concerns. Overall, in this national survey, 66% of the 10th grade students reported at least one unacceptable building condition related to vandalism, disrepair, or cleanliness. These conditions included trash on the floors, graffiti on the building, unclean floors, walls, bathroom stalls without doors, unrepaired ceilings and chipped paint on the walls (Planty & DeVoe, 2005).

Further, it was noted that students who scored in the lowest quartile of their composite achievement tests were more likely than students who placed in the highest composite achievement test quartile to attend schools with trash on the floors and graffiti. (Planty & DeVoe, p. 10) If the students found those building conditions to be unacceptable, their attitudes toward the building were impacted by the observations, and their performance may have suffered. Teacher satisfaction is also impacted by the cleanliness and condition of the building (Ruszala, 2008). The connection between attitude, whether it is the teacher's or student's attitude, and performance is a factor that impacts student performance, teacher performance, and teacher retention.

Krueger (1999) utilizes multiple regression analysis and the composite mathematics and reading score from the Stanford Achievement Test. Controlling for numerous family background and school characteristics, he finds that students in smaller classes performed approximately .2 to .3 standard deviations better on this standardized test than students in the larger classes over the first four years of schooling. The STAR program design has been criticized for a failure to pre-test the participating students to assure that the assignment was truly random across class size. Additionally, some of the participating students were reassigned across class sizes due to behavior problems or at the request of the parents.

An additional field experiment was performed in North Carolina in 1991, partly in response to the criticisms of the STAR program design. Students were assigned to classes of either 15 or 25 students in first through third grade. Achilles et al. (1995) finds that students in the smaller classes achieved



test scores that were .45 and .56 standard deviations higher than their peers in the larger classes, on the mathematics and reading tests, respectively.

Other studies have focused on non-experimental data to estimate the impact of class size on elementary student performance. For example, Angrist and Lavy (1997) and Hoxby (2000) rely on discontinuities in class size that arise from mandated caps on class size. For example, Angrist and Lavy examine class size information in Israel where Maimonides' Rule dictates that classes should be no larger than forty students. Similarly, Hoxby uses twenty four years of data from Connecticut for fourth and sixth graders. Some school districts cap enrollment at twenty five students per class. This creates variation in class sizes when the total number of students surpasses multiples of twenty five, and thus prompts an increase in the number of classes offered. Angrist and Lavy generally find a significant class size effect, while Hoxby generally does not find a significant class size effect.

Other studies have examined the influence of class sizes on older students using data from the National Educational Longitudinal Study (NELS). This study began in 1988 with a national (U.S.) sample of eighth grade students. A subset of the participants was re-interviewed in 1990, 1992, 1994, and again in 2000. Goldhaber and Brewer (1997) incorporate an exhaustive set of controls for teacher ability and behavior, as well as numerous student attributes including previous test scores to control for student ability. They report a positive and statistically significant effect of class size on standardized test scores in the tenth grade. Akerhielm (1995) also utilizes the

NELS data set and attempts to account for the possible endogeneity of class size in standardized test scores due to less able students being assigned to smaller classes. She uses two stage least squares with the average class size for a given subject in a school and eighth grade enrollment in the school as identifying instruments. She finds that once the endogeneity of class size is accounted for the influence of class size on test scores goes from positive to negative, and in some instances is statistically significant.

The studies most relevant to this paper examine the influence of class size on student outcomes in tertiary education. Because most students in higher education cannot be made or incentivized to take a single standardized test, the most commonly examined measures are student grades in a course and student self reported satisfaction with or assessment of the quality of a course or instructor. Studies that have examined student assessment of a course universally agree that class size has a negative impact on student course evaluations, with larger courses receiving statistically significant lower scores than smaller courses. For example, Bedard and Kuhn (2008) examine student evaluations of economics courses at the University of California at Santa Barbara, from 1997 to 2004. They find a large, highly significant, and nonlinear negative impact of class size on student evaluations of instructor effectiveness. Their result is robust to instructor and course fixed effects.

Walia (2008) utilizes 19 semesters of student evaluations of economics courses at Kansas State University. Once again class size is found to have a negative and statistically significant impact on student course evaluations.

Illustrating that this result is not unique to economics students nor the United States, Westerlund (2008) reports that increases in the size of mathematics classes at Lund University in Sweden leads to significantly lower student course evaluations there, as well.

Fewer studies still have examined the impact of class size on student performance in higher education. Bandiera et al. (2009) examine administrative records from a leading UK university and find a significant negative, but highly non-linear effect of class size on student tests results. They conclude that changes in class size have a significant impact on student performance but only at the very top and bottom of the class size distribution. Furthermore, they find that students at the top of the grade distribution are most negatively affected by class size, particularly in large class sections. They rule out class size effects being due to non-random assignment of faculty across class size, student self-selection into class size, omitted inputs, or changes in grading policies based on class size. Similarly, Kokkelenberg et al. (2008) find that average grades decline significantly with class size at a public northeastern U.S. university. They find that grades drop dramatically with class size up to twenty students, and less steeply but nonetheless monotonically thereafter.

Correa (1993) posits a theoretical explanation for the importance of class size in the education production function that focuses on the role of individual faculty-student interaction. His model describes teachers that must weigh efforts directed to the whole class versus individual student attention.

The larger the class the greater the instructor effort devoted to class-wide activities at the expense of individual attention. In this way, individual student learning and outcomes decline as class size increases. His model illustrates the importance of separating class size effects from total student responsibilities effects. Lazear (2001) outlines a theoretical model where class size itself is important due to the role that class size plays in setting the class room environment. Large classes (more students) may allow students to be more disruptive, allow them to “hide” from participation, engagement, or even attendance, while small classes may more easily lend themselves to pedagogical activities that improve learning, such as hands on activities and student-faculty classroom interaction.

While the existing literature on primary and secondary class size effects is mixed, the evidence of class size on student assessment and student grades in higher education is more consistent. Unfortunately, the higher education literature suffers from a lack of random, substantial changes in class size within instructors and courses, and confounds class size effects with student oversight effects. This paper contributes to this literature by exploiting a natural experiment in class sizes that allows for an approximate fifty percent increases in class size, within instructor and course, without a change in the total number of students taught by that instructor.

## **2.4 The influence of library on the performance of students in Kenya**

### **Certificate of Secondary Education**

Library is an essential factor in teaching-learning process. It forms one of the most important educational services. The educational process functions in a world of books. The chief purpose of a school library is to make available to the pupil, at his easy convenience, all books, periodicals and other reproduced materials which are of interest and value to him but which are not provided or assigned to him as basic or supplementary textbooks. The importance of library has been demonstrated by the government when she expressed in the National Policy on Education (NPE) that every state Ministry needs to provide funds for the establishment of libraries in all her educational institutions and to train librarians and library assistants. As a resource, it occupies a central and primary place in any school system. It supports all functions of school-teaching and provides service and guidance to its readers.

According to Fowowe (1988) a library must be up-to-date and at the same time allow access to older materials. It must be properly supported financially to fund materials and services among others. While itemizing the types of libraries, Ola (1990) opined that secondary school library in whatever form, has replaced the traditional method of 'chalk and talk' in imparting knowledge to students that its effect on academic performance need not to be over-emphasized. He concluded that a well equipped library is a major facility which enhances good learning and achievement of high educational standard.

Farombi (1998) reiterated that school libraries may not be effective if the books therein are not adequate and up-to-date as its impact may only be meaningful if the library could be opened to the students always for a considerable length of time in a school day. With all the above mentioned facts, it is sad to know that many schools operate without libraries (Shodimu, 1998) whereas Ogunseye (1986) had earlier noted that total absence of an organized school library would continue to spell dooms for thousands of secondary school students. This statement clearly implied that many schools operate without libraries and had affected the academic performance of their students.

Fuller (1986) identified a school library as an instructional resource which may significantly influence pupils' achievement after controlling for pupils' family background. He found that effect of library size and its activity have been positive in 15 out of 18 analyses. Also, in his study on the relationship between instructional facilities and academic performance, Popoola (1989) discovered that library correlates with academic achievement and those schools with well equipped library normally maintain high academic performance. In another study on raising school quality in developing countries, Fuller (1985) found that collection of books kept for reading in the library is related to performance. Reporting the state of library in Lagos Secondary Schools, Shodimu (1998) submitted that the guidelines that each school should be provided with a library with 100 students seating capacity was not followed as most of the schools he sampled had seating capacity of less than 100 students.

It is generally agreed that library use is indeed beneficial (or even indispensable) for students to achieve their educational outcomes. But to prove that it really does so, or to what degree it contributes to students' attainment of educational outcomes is not at all easy.

Whitmire (2002), examined the relation between library resources and services and students' educational outcomes through multiple regression analysis, utilizing the data collected by the College Student Experience Questionnaire (CSEQ) and the National Center for Education Statistics (NCES). Two assumptions underlie her study: "(1) undergraduates attending institutions with large amounts of academic library resources and services would participate in more academic library activities and (2) undergraduates attending institutions with large amounts of academic library resources and services would report greater gains in critical thinking". Three sets of independent variables were defined as 1) background characteristic variables, (gender; race; age), 2) college experience variables (grade-point averages; class year; enrollment status; student-faculty interactions; engagement writing activities; active learning activities; number of term papers written; hours spent studying per week), and 3) academic library variables (resources; services). The dependent variables were defined as 1) library use (usage as a place; use of indexes to journal articles; developing a bibliography for term papers; use card catalog or computer; ask a librarians for help; reading in the reserve or reference; check out books; checked citations in material read; reading a basic reference; found materials in browsing stacks), and 2) self-reported gains in critical thinking skills (ability to think analytically and

logically; ability to put ideas together, see relationships, similarities and differences between ideas; ability to learn on your own, pursue ideas, and find information you need). The analyses showed, however, that library resources and services had almost no influence over undergraduates' use of library or their self-reported gains in critical thinking skills. Although this was a study that hinted at a way to measure the contribution of academic libraries to undergraduates' educational outcomes, it fell short of proving a positive relationship.

Nagata (2007) conducted a paper survey in 2003 mailed to the former students of Bunkyo University Koshigaya campus (no. of respondents: 340; return rate: 33.7%), focusing on the relations between their library usage and learning outcomes while they were students. The hypotheses that framed this research were: (1) there would be a positive correlation between "library use" (questionnaire items: use of study-related materials; use as a place to study; use in groups; use of library catalog; use of periodical articles database; consulting librarians to search materials; browsing through stacks; reading materials unrelated to classes) and "benefits of library use" (finding information and knowledge looked for; new perspectives and thoughts; encounter with books that would not have happened elsewhere; sense of fulfillment in reading interesting books; place to study; intellectually stimulating ambience; information systems unavailable to individuals; knowledge and skills to search materials and information), (2) there would be a positive correlation between "benefits of library use" and "learning outcomes" (questionnaire items: general knowledge; specialized knowledge; skills to search and utilize



needed information; skills for investigation and reflection; other particular qualifications/experiences/skills intended to be acquired during undergraduate years), and (3) those who evaluated favorably the “benefits of library use” with respect to the variables indicated in hypothesis (2) would also highly evaluate the “degree of library contribution” (questionnaire items correspond with those for “learning outcomes”) Concerning the relationship between “library use” and “benefits of library use,” the analyses indicated positive correlations between 23 of 64 combinations of variables. Correlations between some of these were quite positive. As for the hypothesis (2), positive correlations were found between 16 of 40 combinations. A clear difference was confirmed in the examination of the hypothesis (3). In the positive correlative combinations of “library use” and “benefits of library use,” the respondents who marked high the “benefits of library use” also evaluated the “degree of library contribution” higher than those who did not. Thereby, it was affirmed that “library use,” “benefits of library use” and “learning outcomes” are related and that the library contributes to this relationship. In other words, the grounds for the assessment of academic library usage in its contribution to students’ learning outcomes are prepared.

## **2.5 The influence of laboratory on the performance of students in Kenya**

### **Certificate of Secondary Education**

Laboratory has been conceptualized as a room or a building specially built for teaching by demonstration of theoretical phenomenon into practical terms. Farombi (1998) argued the saying that “seeing is believing” as the effect of

using laboratories in teaching and learning of science and other science related disciplines as students tend to understand and recall what they see than what they hear or were told. Laboratory is essential to the teaching of sciences and the success of any science course is much dependent on the laboratory provision made for it. Affirming this, Ogunniyi (1983) said there is a general consensus among science educators that the laboratory occupies a central position in science instruction. It could be described as a place where theoretical work is practicalized whereas practicals in any learning experience involves students in activities such as observing, counting, measuring, experimenting, recording, observation and carrying out field work. These activities are totally different from the theoretical work which involves listening to talks and taking down notes from such talks.

According to Ango (1986) laboratory work, Stimulates learners' interests as they are made to personally engage in useful scientific activities and Experimentation Promotes that science is not only products or process; Affords the learner the basic skills and scientific method of problem solving; Knowledge obtained through laboratory work promotes long term memory.

Laboratory helps to provide a forum wherein the learner is given the exercise to subjects, his beliefs, ideas, statements, theoretical propositions etc. to some forms of experimental test (Soyibo, 1990). To maintain and arouse the interests of students in subjects involving laboratory work, the teacher should be effectively involved in order to transfer knowledge and facts to learners for

a good performance in any examinations. In line with this, one then pauses to ask, to what extent has laboratory been able to achieve its objectives. Odulaja and Ogunwemimo (1989) highlighted that the teacher assumes a position of dispenser of knowledge with the laboratory serving the function of drill or verification. They further explained that at the other extreme, the teacher assumes the position of guide to learning and laboratory as a place where knowledge is discovered. However, there are growing evidences that teachers do not exhibit behaviours which are complementary to achieving the stated objectives. They include methods of teaching practical work; inadequacy or absence of well-equipped laboratories; high enrollment of students; inadequacy of resources for teaching and learning practical work; quantity and quality of teachers.

Nwachukwu (1984) discovered in her survey of the resources for the teaching and learning of Biology in some of the new secondary schools in Lagos that there was a general inadequacy of resources. She also found out among other things that (a) out of 80 per cent of the old schools that accepted as having laboratories, none had a well-equipped laboratory and (b) 40 per cent of the schools had no laboratory at all, while the remaining 60 per cent had rooms labeled "laboratory" without adequate apparatus, she concluded that teaching of Biology practical by teachers would be difficult and that students learning experiences would be limited. In his contribution, Balogun (1982) submitted that no effective science education programme can exist without equipment for teaching. Writing on the situation of our secondary schools today, Okoli (1995) reported that laboratories have become shelves of empty bottles of

chemicals. In terms of academic achievement, Soyibo and Nyong (1984) have shown that schools with well-equipped laboratories have better results in the school certificate science examinations than those that are ill-equipped.

Gana (1997) reiterated that students instructed entirely by the laboratory methods had higher attitude's scores but lower achievement scores than students instructed entirely by the traditional lecture or textbook mode. Yadar (2007) opines that no course in science and mathematics can be considered as complete without including some practical work. The practical work ought to be carried out by individuals either in science laboratories or in classes. At school level, practical work is even more important because of the fact that we learn by doing. Scientific practices and applications are thus rendered more meaningful. It is an established truth that an object handled impresses itself more firmly on the mind than the object merely seen from a distance or in an illustration. Thus practical work forms an important feature in any science and mathematics course (UNESCO, 2008). In view of these different and conflicting findings, the study found the relationship between teachers' quality and students' academic achievement.

In most school laboratory activities, the student's laboratory guide, handbook, or worksheet, continues to play a central role in shaping the students' behaviors and learning. The guide focuses students' attention on the questions to be investigated and on what is to be done, observed, interpreted, and reported. It plays a major role in defining goals and procedures.

Lunetta and Tamir (1979) developed a set of protocols for analyzing student laboratory activities, which they used in the 1980s to analyze several secondary school science laboratory programs systematically. Similar protocols were used more recently in Australia by (Fisher 1999). The analyses continue to suggest that to date, many students engage in laboratory activities in which they follow recipes and gather and record data without a clear sense of the purposes and procedures of their investigation and their interconnections.

In addition, the quantity of information presented in the laboratory guide is often so substantial, according to Johnstone and Wham (1982), that the details can distract the learner from the main goals of the practical task. Consistent with the findings of Lunetta and Tamir (1979) and others, students are seldom given opportunities to use higher-level cognitive skills or to discuss substantive scientific knowledge associated with the investigation, and many of the tasks presented to them continue to follow a “cookbook” approach (Roth, 1994). Our 1982 review also reported that there were vast differences in the learning strategies implicit in different laboratory guides that were bound to influence students’ learning.

The nature of the instructions and especially of the evaluation shapes the expectations, purpose, and behaviors of the students in laboratory activities. Gathering and analyzing such information is a very important element of

research in the laboratory that should be included in research reports. At this writing, the recommendations of science education standards and reform documents appear to have had only marginal influence on the development and publication of laboratory guides, practical assessment, and on the school laboratory practices that follow. In fact, the almost simultaneous emphasis on *conventional* paper and pencil assessment (not performance assessment) has almost certainly had a negative effect (Bryce & Robertson, 1985; Lazarowitz & Tamir, 1994).

Nevertheless, there are some noteworthy exceptions such as the resources developed and implemented in the Learning through Collaborative Visualization project and the Detroit urban science initiative project and reported by Fishman et al. (2001), Polman (1999), and others. These projects have developed curriculum and teaching strategies that incorporate constructivist pedagogy enhanced by appropriate computer and communication technology tools; they have also incorporated formative and summative research to inform and assess development and teaching in the projects.

## **2.6 Summary of the Literature Review**

The literature review focused on the influence of the conditions of the physical infrastructure on examination performance. The influence of classroom size on students performance in examination. The influence of libraries on students performance in examinations. The influence of laboratory

on the performance of students in examinations. Mwingi central district secondary have inadequate physical infrastructure as compared to other neighbouring districts of Migwani, Kyuso and Mwingi East. Due to lack of adequate physical infrastructure students performance has continued to deteriorate in Mwingi Central District. Provision of physical infrastructure will lead to improved performance in Kenya Certificate of Secondary Education in Mwingi Central District school.

### **2.7 Theoretical Framework.**

This study is based on Input-output process theory developed by McDonwell and Oakes (1987). The theory presents the education system in terms of inputs (including contents), processes and outputs. The inputs include the economic, physical infrastructure and human resources supplied to different levels of the education system; the characteristics of the teachers and the background of the pupils. In this case since the physical infrastructure are part of the input in education system the provision of such facilities is very key in relation to the output. This theory is suitable for this study because it will be establishing the contribution of physical facilities on students performance in examinations.

## 2.8 Conceptual Framework

**Figure 1.1 Conceptual Framework of the factors influencing**

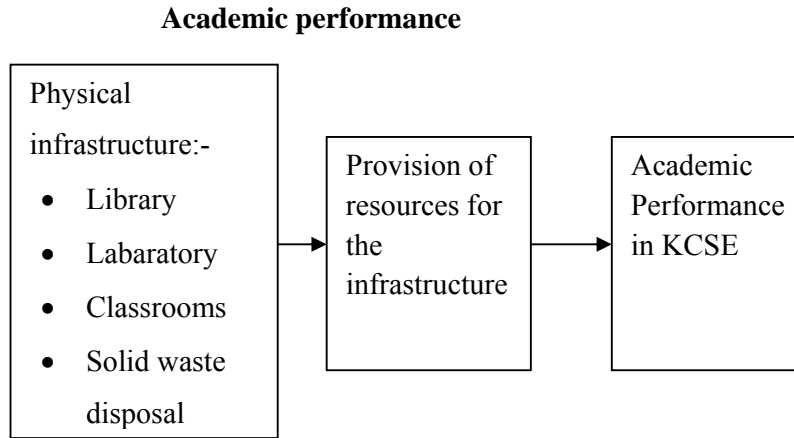


Figure 1.1 shows that the performance of students in examinations depends on the availability of adequate physical infrastructures which includes library, laboratory, classrooms and solid waste disposal. If resources are made available for financing the provision of physical infrastructure students performance in Kenya Certificate of Secondary Education will improve.



## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter contains the research design used in carrying out the research, the target-population, the sample size and sampling procedure, validity and reliability of instruments and data analysis procedures.

#### **3.2 Research Design**

This study applied a descriptive survey design. Mugenda and Mugenda (2003) describe descriptive survey as collecting data in order to test hypothesis or to answer questions concerning the current status of the subject of study. Descriptive survey was chosen because it is appropriate for educational fact-finding and gives a great deal of information which is accurate. It also enables a researcher to gather data at a particular point in time and use it to describe the nature of the existing conditions (Colen 2000).

#### **3.3 Target Population**

Borg and Gall, (1989) defines the target population as the population to which the researcher wants to generalize the result of the study. Mwingi Central District has got 30 public secondary schools, 238 teachers, 2400 form four students. The target population of the study was all the 30 principals 238 teachers and 2400 students.

#### **3.4 Sample Size and Sampling Procedure**

A sample is a subset of the population to which research intends to generalize the results (Wiersma, 1986). From the total population of 2400 form four

students 331 students will be sampled using the Krecjie and Morgan (1970) table. According to Krecjie and Morgan (1970) when the total population is 2400 one can get a sample of 331. The number of teachers sampled were 148 which is 30% of the population. According to Mugenda and Mugenda a sample size of 30% is sufficient. All the 30 principals were sampled when the population is small the whole population is taken as the sample. Simple random sampling was used to get 11 students from every school from the 30 schools.

### **3.5 Research Instruments**

The researcher used three sets of questionnaires, one for the principal, the other for the teachers and another for students. Each questionnaire had two parts. Part one contained questions aimed at obtaining general information about the respondent and the school such as name of school, zone, division, class ,sex ,age etc and the second part contained specific questions related to the objectives of the study which is the influence of physical structures on the performance of examinations. The researcher also used observation checklist.

### **3.6 Validity of the instruments**

Validity indicates the degree to which an instrument measures what it is purports to measure. That is the extent to which differences found in the measuring instrument reflect true differences among those who have been tested Kothari (2004). To ascertain the validity, the instruments were discussed with supervisors. They assessed the relevance of the content used in the instruments, developed and make structural changes for purpose of improvement and reinforcement of the instrument before embarking on actual data collection.

### **3.7 Instrument reliability**

Mugenda and Mugenda, (1999) define reliability as a measure of the degree to which a research instrument yields consistent results or data after repeated trial. To enhance reliability of the instruments, a pilot study was conducted in five public secondary schools in Mwingi Central District. In order to improve the reliability of the instrument, the researcher employed test-retest technique for the questionnaire. This involved administering the same questionnaires twice to the respondents in the pilot sample after two weeks. The Pearson product moment was used to obtain the full reliability of the instrument; the Spearman Brown Formula was used as indicated

Reliability of the entire test  $R^2 = \frac{2 \text{ (Reliability of 0.5 test) } (r)}{1 + \text{ (Reliability of 0.5 test) } (r)}$

A reliability of 0.8 was established . This was deemed reliable. According to Mugenda and Mugenda (2003) a reliability coefficient of 0.7 and above is reliable .

### **3.8 Data collection procedures**

The researcher sought a research permit from the National Council for Science and Technology (NCST) before embarking on the study. The researchers then paid a courtesy call to the District Commissioner and the District Education officer Mwingi Central District and explain her intention to carry out the research. The researcher then made appointment with the public secondary school principals. On arrival at the secondary school on the agreed dates, the researcher created rapport with the principal, teachers and students and explained the purpose of the study and then administered the research instruments to them. The respondents were assured that strict confidentiality was maintained in dealing with their identity. The researcher personally

administered the research instruments to the respondents. The secondary school teachers accompanied the researcher in their classes, introduced her to the students and allowed her to administer the questionnaires. The researcher then collected the questionnaires immediately after they had been filled.

### **3.9 Data Analysis Techniques**

This is the process of summarizing the collected data and putting it together so that the researcher can meaningfully organize, categorize and synthesize information from the data collecting tools. Data gathered was coded for analysis. This was done after editing and checking out whether all questions have been filled in correctly. Quantitative data was analyzed using Statistical Package for Social Sciences and the results was presented using frequency tables, pie charts, bar graphs and percentages to make meaningful conclusions. This is deemed to be easy in interpretation and is convenient in giving general overview of the problem under study. Qualitative data was analyzed by organizing data in to themes, patterns and sub-topics.

## CHAPTER FOUR

### DATA ANALYSIS , INTERPRETATION AND DISCUSSIONS

#### 4.1 Introduction

This chapter discusses the presentation and interpretation of the findings on the influence of provision of school physical infrastructure on students' performance in Kenya certificate of secondary education. The researcher made use of frequency tables and percentages to present data. The findings are presented as follows: Questionnaire response rate, background information of the respondents, effect of classroom size on performance, provision of science laboratory and academic performance, effect of availability of library services on academic performance and the type of waste disposal system and its effect on student's academic performance. The relationship between physical infrastructure and academic performance and finally the summary of the findings.

#### 4.2 Instrument return rate

The returned questionnaires were from 30 headteachers , 148 teachers and 331 students. Analysis and data interpretation was based on these returns. The questionnaire return rate was as shown in figure 4.1.

**Table 4.1 Questionnaire return rate**

	<b>Questionnaires administered</b>	<b>Questionnaires filled &amp; returned</b>	<b>Percentage</b>
Head Teachers	30	30	100
Teachers	148	146	88.33
Students	331	325	92.09
Total response	509	501	90.00

From the data collected, out of the 509 questionnaires administered, 501 were filled and returned. This represented an 90% response rate, which is considered satisfactory to make conclusions for the study. According to Mugenda and Mugenda (2003) a 50% response rate is adequate, 60% good and above 70% rated very good. This also collaborates Bailey (2000) assertion that a response rate of 50% is adequate, while a response rate greater than 70% is very good. This implies that based on this assertion; the response rate in this case of 90% is very good.

This high response rate can be attributed to the data collection procedures, where the researcher pre-notified the potential participants of the intended survey, the questionnaire was self administered to the respondents who completed them and these were picked shortly after.

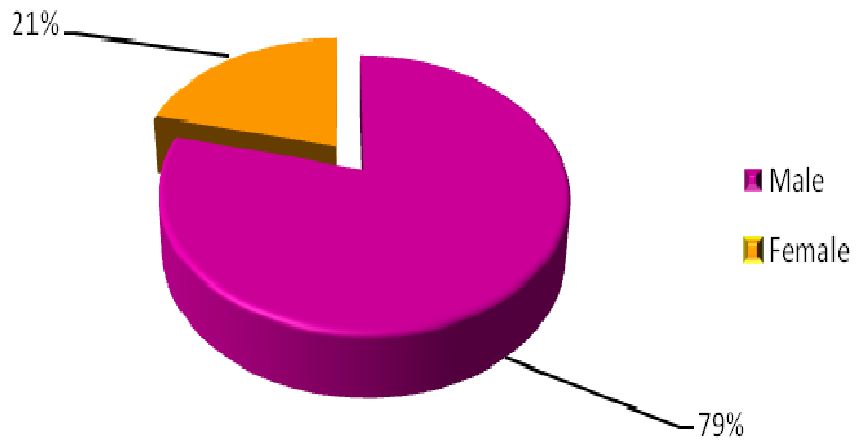
### **4.3 Demographic data**

The respondents were asked to indicate their gender, age, highest academic professional qualification and number of years they have served as teachers and also as head teachers.

#### **4.3.1 Gender of respondents**

Further the study sought to determine the gender of the headteachers in order to establish if there is gender balance in the positions indicated and also to establish which gender is much engaged in school leadership and teaching profession.

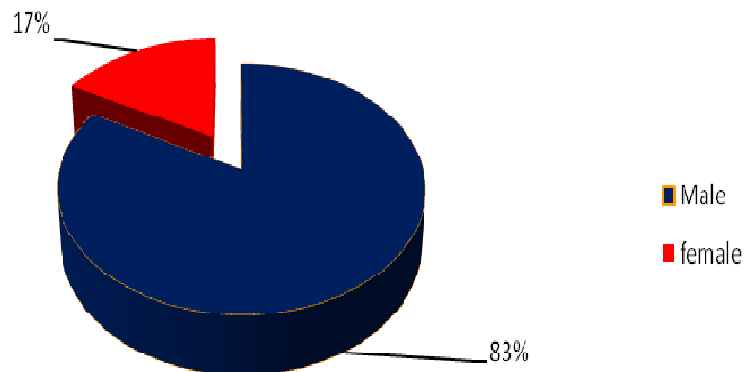
**Figure 4.1 Gender Distribution of head teachers**



From the findings as indicated in Figure 4.1, the majority (79%) were male headteachers . This implies there were more males than female headteachers. The dominance of males may mean that there is a bias in allocation of responsibilities in schools with more males being given responsibilities than females.

Further the study sought to establish the gender of the teachers. The findings were as shown in figure 4.2.

**Figure 4.2 Gender of teachers**



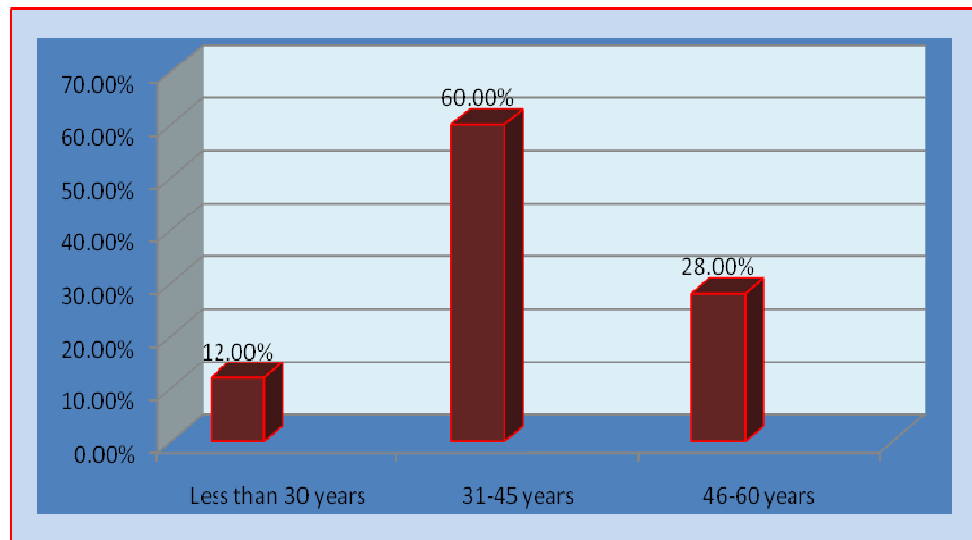
The findings in figure 4.2 revealed that majority of teachers were males constituting 83% while the females were only 17%. This implies that more male teachers were employed to teach in the secondary schools than the female teachers.

#### 4.3.2. Age of head teachers and teachers

The headteachers and teachers were asked to indicate their age because according to Hughees (1994), age affects the influency and performance of an individual. Young teachers take time to settle down to their career as they seek for better paying jobs and therefore do not take their responsibilities and duties seriously. They need to be followed by their head teachers.

The results of the head teachers was as shown in figure 4.3. below.

**Figure 4.3 Distribution of headteachers by age**

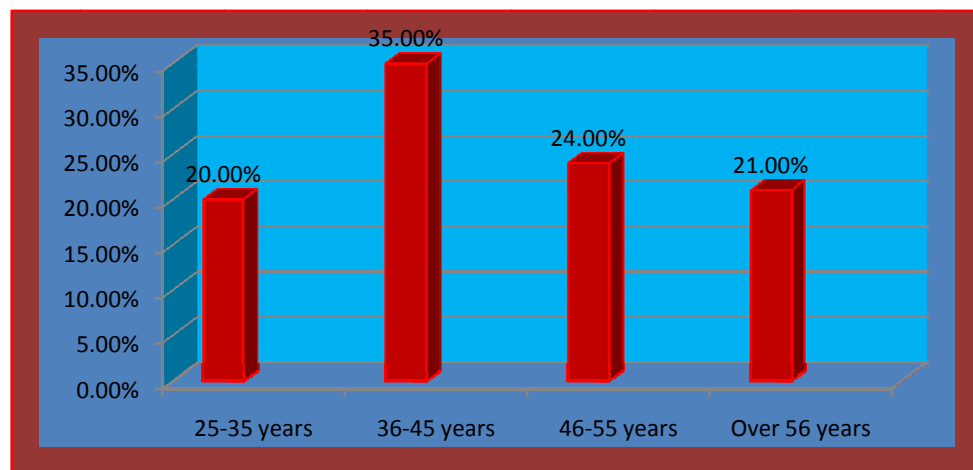


From the findings in Figure 4.3, majority (60%) of headteachers indicated that their age ranged between 31-45 years, followed by those who indicated that they are over 46-60 years with few indicating that they were less than 30 years.



This implies that majority of the headteachers were at their maturity stage and therefore able to handle the school affairs responsibly. Further the study sought to establish the age distribution of the teachers. The results were as shown in figure 4.4.

**Figure 4.4 Age distribution of teachers**

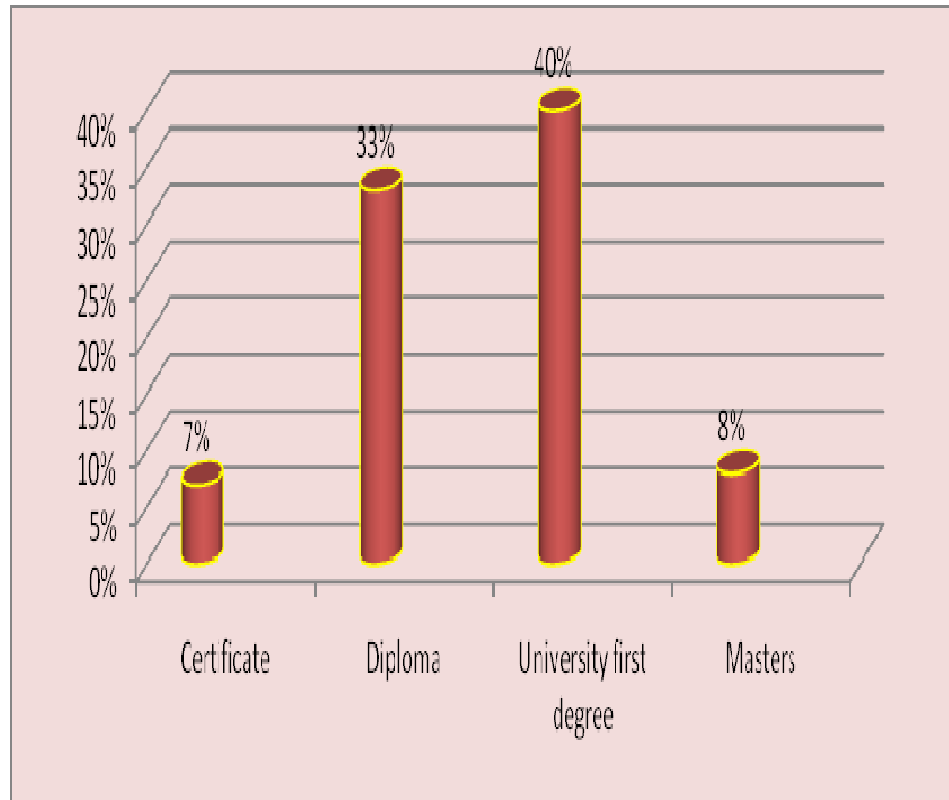


From figure 4.4 many of teachers are in age brackets of 36-45 years. This implies that most of the teachers are old enough and energetic to school activities and they have experience because the more years one teaches the more experience one gets.

### **4.3.3 Level of Education**

It was of paramount importance to determine the headteachers level of education in order to ascertain if they were well equipped with the necessary knowledge and skills for the running and the overall management of the school.

**Figure 4.5 Level of Education of headteachers**



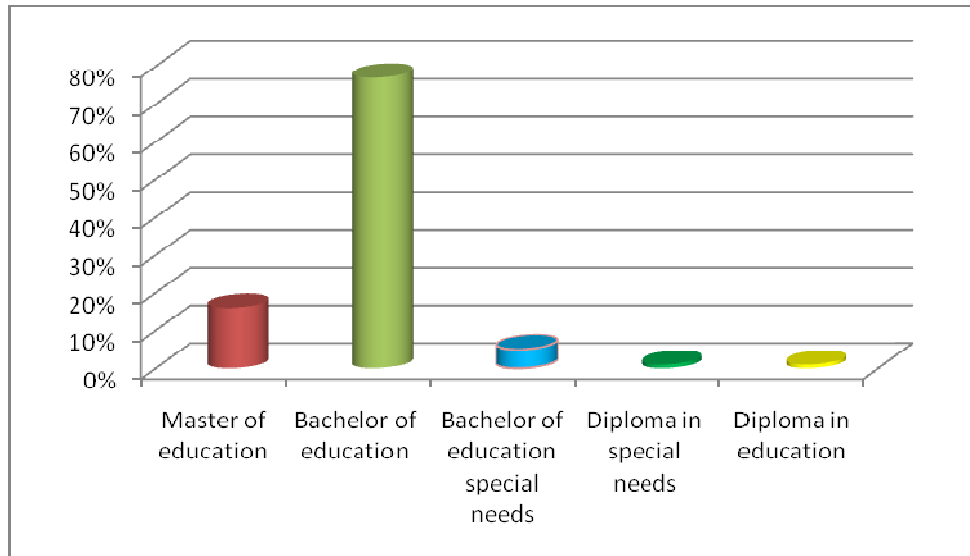
The study found (40%) of the headteachers had university first degree, followed by those who indicated that they had diploma with few indicating that they had masters degree qualification.

The findings therefore indicate that the head teachers have the capacity, skills and management acumen to steer school activities successfully. These skills help them handle and interpret their respective duties and responsibilities and the emerging issues in the school environment to the best level possible.

The study further sought to establish the level of education of the teachers.

The results were as shown in figure 4.6

**Figure 4.6** Leve of education of the teachers

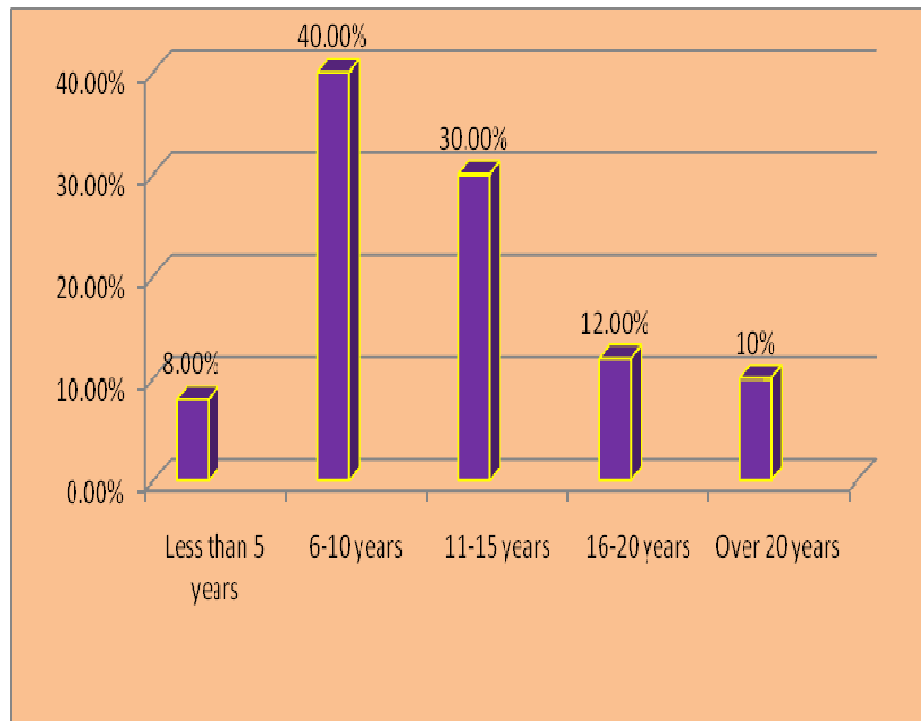


The findings indicated that majority of the teachers were Bachelor of Education degree holders constituting 77 percent, 5 percent had Bachelor of Education with Special Needs, 1percent Diploma in Education with Special Needs, 16 percent Masters of Education and 1 percent Diploma in Education. This implies that most of the teachers in Mwingi Central District are graduates with some having a Degree or a Diploma .

#### **4.3.4 Work Experience of the head teachers**

The study sought to determine how long the head teachers had been in their respective schools, this was to ascertain to what extent the head teachers could be relied upon to make conclusions for the study based on experience.

**Figure 4.7 Work experience of head teachers**

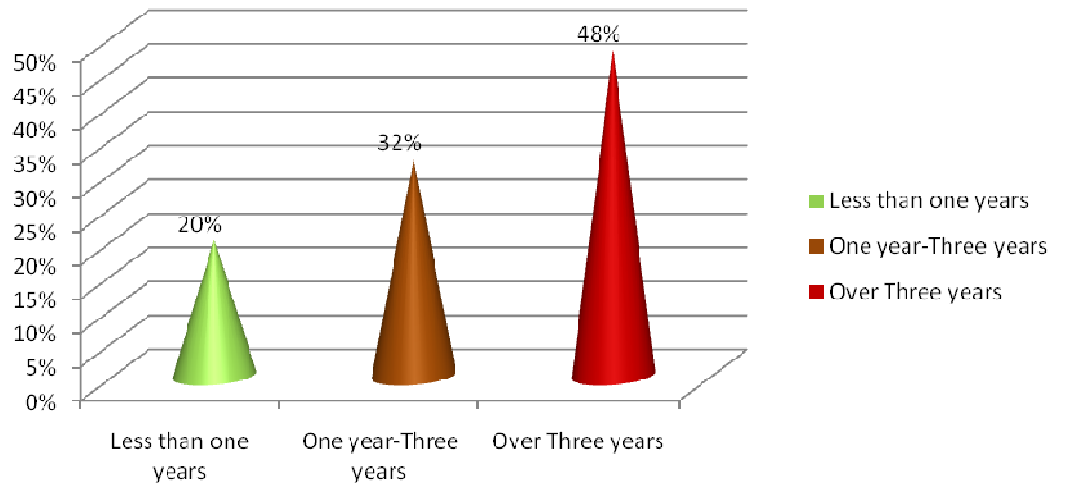


From the study findings as indicated in Figure 4.7, of the head teachers indicated that they had been in their position for a period ranging from 6-10 years followed by those who indicated that they had been in the school for a period of 11-15 years. This means that they would invest time and effort to make sure they succeed. It may also imply that work related experiences are important in developing motivation for becoming good in school management. The study therefore observes that the respondents are experienced people who are in their respective schools for the long haul. Longevity at the school therefore becomes a trait that ensures continuity and perpetuation of the vision of a school.

The study further sought to establish the work experience of the teachers .

The findings were as shown in figure 4.8.

**Figure 4.8 Work experience of the teachers**



From the responses, the highest number of the teachers had teaching experience of over 3 years which constituted 48 percent. Therefore the findings unveiled that most of the teachers had long teaching experience and therefore had more knowledge and therefore their information can be relied upon to make the study conclusions.

#### **4.4 The influence of class size on students' performance**

One of the objectives of the study was to establish the effect of class size on students' performance in examinations. The respondents were asked to indicate the measurements of class size. This was with the aim of establishing whether the school uses the ministry of education guidelines when building the classes. The study established that the class sizes are on average below the recommended class size. Most of the classes measured 17

by 35 feet against the recommended 20 by 40 feet. On the number of students in class the study established that there are 55 students in one class compared to the recommended 40 students in class as recommended by the ministry of education. Most of the classes were not well ventilated. The large number of student in the class made the classes congested making checking of work at the back of the class by the teachers difficult.

This is an indication that the number of students in classes is more than the recommended number of students in class. This affects learning and teaching because the teachers get overwhelmed by the number of students especially when marking the assignments given in classes. Upon more probing the teachers said that when the number of students in class is more than the required number, teachers hardly get time to pay attention to academically weak students in schools.

The study sought to establish the number of students per class in different schools. The results were as shown in Table 4.2.

**Table 4.2 Average number of students in a class in different schools**

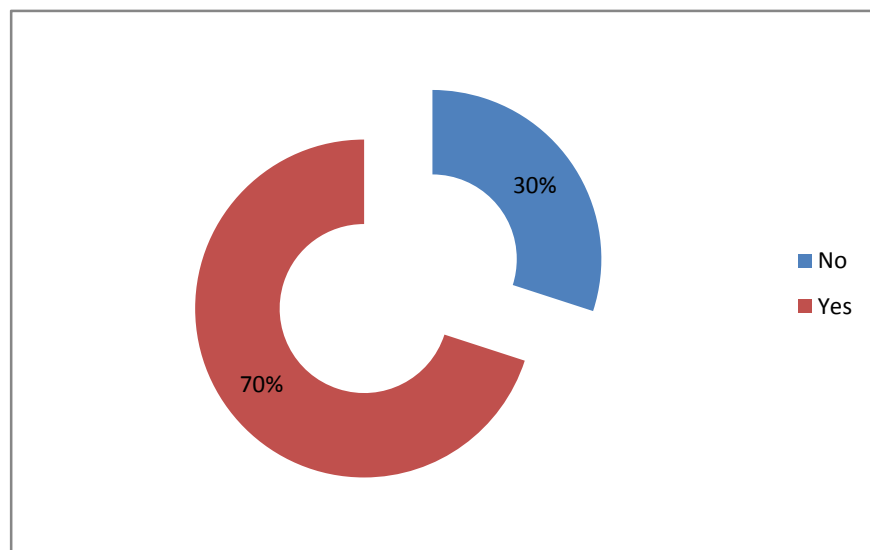
<b>Schools</b>	<b>Total population</b>	<b>Minimum No. of students per class</b>	<b>Maximum No. of students per class</b>
A	320	45	60
B	280	46	55
C	540	48	60
D	720	55	62
E	420	52	58
F	288	42	49
G	120	45	48
H	500	50	65
I	335	44	55
J	420	42	60
K	290	45	56
L	413	48	54
M	320	41	56
N	580	55	62
O	240	43	58
P	378	48	55
Q	440	45	61
R	320	44	54
S	290	43	60
T	366	46	58
<b>TOTAL</b>	<b>7760</b>	<b>Average</b>	<b>Average</b>
		46.35	56

Table 4.2 shows that the average maximum number of students in classrooms is 56 which is way above the recommended number of 40-45. Surprisingly enough there are some classes with as high as 65 of students. This number is too high to be accommodated in a class where there can be an effective teaching.

#### **4.5 The influence of provision of science laboratory on students performance**

The other objective of the study was to establish the effect of provision of science laboratory on students performance in examinations. The respondents were asked to indicate whether there are science laboratories in their schools. Majority said that there were laboratories in their schools. This is as presented in figure 4.6 .

**Figure 4.9 Headteachers response on presence of science laboratories in schools**



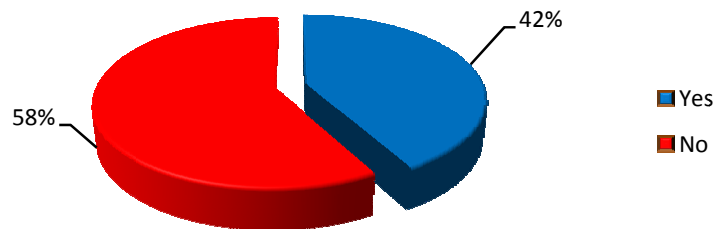
As indicated in figure 4.9, 30 % of the schools do not have science laboratory.



This severely affects the national examination because it denies students exposure to use the laboratory equipments which are used in national examinations.

The study sought to establish the teachers opinion on the presence of science laboratories in schools. The results were as shown in figure 4.9.

**Figure 4.10 Teachers response on presence of science laboratories in schools**



From figure 4.10 majority 58% of the teachers indicated that there was presence of laboratories in their schools. However, a large number 42% of the teachers indicated that there are school which lacked science laboratories. This could adversely affect students performance in KCSE. According to Ango(1986) laboratory work stimulates learners' interest as they are made to personally engaged in useful scientific activities and experiments.

Further the study sought to establish whether the schools which had science laboratories were adequate. The head teachers were asked to indicate the number of laboratories that their schools had. The results are as presented in table 4.4 .

**Table 4.3. The number of science laboratories in schools**

<b>Category population</b>	<b>Total</b>	<b>Number of laboratories</b>	<b>K.C.S.E Mean 2012</b>
Schools			
A	320	1	4.2
B	280	0	4.5
C	540	2	6.5
D	720	3	7.5
E	420	1	6.5
F	288	0	3.5
G	120	0	N/A
H	500	2	6.8
I	335	1	5.2
J	420	2	5.6
K	290	1	5.2
L	413	2	7.2
M	320	1	4.5
N	580	3	8.2
O	240	1	3.8
P	378	2	7.2
Q	440	2	7.6
R	320	1	4.8
S	290	1	4.2
T	366	2	6.8
<b>TOTALS</b>	<b>7760</b>	<b>29</b>	<b>5.5</b>

Table 4.3 shows that there are schools which do not have adequate laboratories, on average the results indicated that most of schools have 1 (One) science laboratory. Upon further probing the teachers said that the numbers of laboratories are not adequate hence affects their teaching of science subjects. However, in some schools the study shows that they have laboratories for subjects such as chemistry, Physics and biology.

#### 4.6 The influence of school library services on students' academic performance

The study sought to establish the influence of school library services on academic performance. The results were as indicated in table 4.5 below.

**Table 4.4 KCSE performance and school library.**

School category	Library	K.C.S.E Mean 2012
A	0	4.2
B	0	4.5
C	1	6.5
D	1	7.5
E	1	6.5
F	0	3.5
G	0	N/A
H	1	6.8
I	1	5.2
J	1	5.6
K	1	5.2
L	2	7.2
M	1	4.5
N	3	8.2
O	1	3.8
P	2	7.2
Q	2	7.6
R	1	4.8
S	1	4.2
T	2	6.8
<b>TOTALS</b>	<b>24</b>	<b>5.5</b>

On the availability of library, the study established that schools have libraries performed better in K.C.S.E than school without libraries. The study shows that the libraries were only stocked with course book materials and there are no reference materials. This affects the preparation of the students in examination. Earlier studies have shown that library is an essential factor in teaching-learning process. It forms one of the most important educational services. The educational process functions in a world of books. The chief purpose of a school library is to make available to the pupil, at his easy convenience, all books, periodicals and other reproduced materials which are of interest and value to him but which are not provided or assigned to him as basic or supplementary textbooks.

#### 4.7 The influence of solid waste disposal on students' academic performance

The other objective of the study was to establish the measures taken by the schools to dispose solid waste. The findings were as shown in Table 4.6

**Table 4.5 Influence of solid waste disposal on students academic performance**

<b>School category</b>	<b>Appropriate means of waste disposal</b>	<b>K.C.S.E Mean 2012</b>
A	No	4.2
B	No	4.5
C	Yes	6.5
D	Yes	7.5
E	Yes	6.5
F	No	3.5
G	No	N/A
H	Yes	6.8
I	Yes	5.2
J	Yes	5.6
K	Yes	5.2
L	Yes	7.2
M	Yes	4.5
N	Yes	8.2
O	Yes	3.8
P	Yes	7.2
Q	Yes	7.6
R	Yes	4.8
S	Yes	4.2
T	Yes	6.8
<b>TOTALS</b>	<b>24</b>	<b>5.5</b>

The findings of the study shows that schools with proper solid waste disposal performed better in K.C.S.E than schools without proper waster disposal.

The disposal of solid waste if not well done may affect the envitonment hence making it uncodusive for the learning activities. The teachers were asked to indicate how they dispose solid waste. The response from the respodents shows that some schools have a well elaborate means of disposing solid waste. An indication that solid waste disposal is well done and it does not affect leaning environment. This implies that the envorinmen is clean and allows learning activities to take place.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter focuses on the summary of the study, conclusions and recommendations for further research.

#### **5.2 Summary of the Study**

The study sought to determine the situation of the physical facilities in schools to ascertain their contribution to the academic performance more so in KCSE examination. From the study findings majority of the respondents on average indicated that all the mentioned physical facilities are not adequate, averagely adequate or they were not sure about the situation of the adequacy of the situation in their respective schools.

The study further sought to determine the availability of physical facilities in schools from teachers. From the study findings majority 32(48.48%) of the respondents indicated that there is adequate improved teaching aids, majority 35(53.03%) also indicated that there is adequate teachers preraring teaching aids. Majority 40(60.06%) further indicated that there is inadequate text books, 45(68.18%) of the respondents indicated inadequate excercise books and 32(48.48%) of the respondents indicated than other apparatus are inadequate. The inadequace of textbooks may may be due to increased number of transition rate from primary to secondary therefore the ratio of students to textbooks widens up which may affect students academic performance.



### **5.3 Conclusion of the findings**

From the study findings the study interprets that schools do not have adequate physical facilities. Such physical facilities includes classrooms, laboratories, library, desks, toilets and other apparatus which negatively impacts on their academic performance. However on availability of teaching facilities in schools teachers indicated that there is adequate improved teaching aids, adequate teachers preparing teaching aids, inadequate text books, inadequate exercise books and other respondents indicated that other apparatus are also inadequate. The inadequacy of textbooks may be due to increased number of transition rate from primary to secondary therefore the ratio of students to textbooks widens up which may affect students academic performance. Students also indicated that their respective schools do not have adequate learning facilities which is a factor they considered most affecting their academic performance.

### **5.4 Recommendations of the study**

From the study findings the study recommends that:-

- i. Schools should be sensitized to lobby for resources to acquire physical facilities that are important for the success of schools in academic performance.
- ii. The study further recommends that teachers should prepare teaching aids frequently depending on syllabus changes in order to meet the changing needs in educational curriculum to improve academic performance among the students in their respective schools.

## **5.5 Suggestion for further research**

Based on the findings of the study the researcher makes the following suggestions for further research:

- i. A research needs to be carried out on the influence of provision of school physical infrastructure on students' performance in Kenya Certificate of Secondary Education in other districts in Kenya inorder to compare the results since every district may be experiencing unique factors.
- ii. There is need to carry out a study on the influence of provision of school physical infrastructure on students' performance in Kenya Certificate of Secondary Education in Kenya.

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## APPENDICES

### APPENDIX I

#### LETTER OF INTRODUCTION

Lois Musyoka

University of Nairobi

P.o Box 478 -90400

Mwingi

5th May,2013

Headteachers,

Dear Sir/Madam,

#### **RE: REQUEST TO PARTICIPATE IN A RESEARCH**

I am a post graduate student at the University of Nairobi pursuing a masters degree in education. I am carrying out a research on the **influence of physical structures on performance of KCSE in Mwingi Central**. Your school has been sampled for the study and you have been selected as a respondent. The information gathered will be for research purpose and your identity will remain confidential . Please answer the questions as truthfully as possible.

Yours Faithfully,

Lois Musyoka

### APPENDIX II



## HEAD TEACHERS' QUESTIONNAIRE

The purpose of this research is purely academic. Kindly take your time to answer the questions as honestly and truthfully as possible. The information collected in this questionnaire will be used solely for the intended purpose and therefore any responses or information given will be treated with utmost confidence. Respond to all items by ticking (✓) the correct option or providing the accurate information.

### PART I: Information about the Head teacher

1. Indicate your Gender.

Male ..... [   ]

Female ..... [   ]

2. Indicate your age in the appropriate box

(a) Less than 30 ..... [   ]

(b) 31 – 45..... [   ]

(c) 46 – 60..... [   ]

3. What is your highest Academic qualification?

(a) KCSE / KCE ..... [   ]

(b) Diploma ..... [   ]

(c) B.Ed ..... [   ]

(f) Other (specify..... [   ]

4 What is your highest professional qualification?

a.       ATS 4 ..... [    ]

b.       ATS 3 ..... [    ]

c.       ATS 2..... [    ]

d.       ATS 1..... [    ]

e.       G.Tr. II ..... [    ]

f.       G.Tr. 1 ..... [    ]

g.       SNR G.Tr. I ..... [    ]

5. How long have you been a Head teacher?

Less than 5 yrs ..... [    ]

6 – 10 yrs ..... [    ]

11- 15 yrs ..... [    ]

16- 20 yrs ..... [    ]

Over 20 yrs ..... [    ]

6. How long have you been in this school?

Less than 3 yrs ..... [    ]

4 - 6 yrs ..... [    ]

7 – 9 yrs ..... [    ]

10-12 yrs ..... [    ]

Over 12 years ..... [    ]

**PART II: Information about the Institution**

DISTRICT..... DIVISION .....ZONE .....SCHOOL

7. Please indicate the mean grade for your school in the following years

YEAR	2007	2008	2009	2010	2011	2012
Mean grade						

8. Physical facilities

Indicate the appropriate situation of the physical facilities in you schools

Facility	Very Adequate	Adequate	Not Sure	Inadequate	Very Inadequate
(a) classrooms					
(b) desks					
(c) Tables					
(d) Chairs					
(e) Offices					

(f) Staffroom					
(g) Staffroom chairs tables /desk					
(h) School kitchen					
(i) Toilets					

9. Please comment on the availability of instructional materials in your school

### APPENDIX III

#### TEACHERS' QUESTIONNAIRE

Please complete this questionnaire as truthfully as possible. The information given will purely be used for the purpose of this study and will be treated with the strictest confidence.

1. Indicate your gender. Male.... [  ], Female .... [  ]

2. What is your highest academic qualification?

i. DIPLOMA ----- [  ]

ii. B.Ed----- [  ]

iii. M.A ----- [  ]

iv. OTHERS (Specify) ----- [  ]

v. Others (specify ----- [  ]

4. Indicate your professional qualification. (Tick as appropriate)

a. ATS 4 ..... [  ]

b. ATS 3..... [  ]

c. ATS 2 ..... [  ]

d. ATS 1 ..... [  ]

e. G. Tr II ..... [  ]

f. G.Tr I ..... [  ]

g. Snr. Gtr. I ..... [  ]

5. How long have you been a teacher?

Less than 2 years [ ] 3 – 4years [ ] 5 – 7 years [ ] over 8 years [ ]

6. How long have you been teaching mathematics and science?

1. less than 2 years [ ] 3. 5 – 6 years [ ]

2. 3 – 4 years [ ] 4. Over 7 years [ ]

7. Indicate the pupils' performance in mathematics or science

8. What instructional materials are available in your school for teaching/  
learning (a) Science

	Very adequate	Adequate	Not sure	Inadequate	SeriouslyInade quate
Improved teaching Aids					
Teachers prepared teaching Aids					
Text books					
Exercise books					
Other apparatus					

9. Indicate the class size in terms of the number of students
10. Indicate the measurements of class size
11. In your own opinion, is the class size enough to accommodate all the students 1) Yes 2. No
12. If no give reasons
13. How many science laboratories do you have in your school
14. in your own opinion, are they adequate for teaching science subjects 1) yes  
2) No
- 15 If no to question 14, give reasons
16. does your school have a library 1)yes 2 No
17. If no give reason
18. explain how the school handles solid waste in school

**APPENDIX IV**  
**STUDENTS' QUESTIONNAIRE**

You are kindly requested to answer the following questions as honestly as possible. Do not write your name anywhere on this paper.

**Part I: Personal Information**

1. Tick your gender      Male...{...}      Female .....{    }

2. Indicate your age

a. 13-15 years

b. 16- 18 years

c. over 19

**Part II School information**

3. (a) How big is your class? Boys \_\_\_\_\_ Girls \_\_\_\_\_ Total  
\_\_\_\_\_

4. Which of the following physical infrastructure are available in your school?

1. Laboratory      (    )

2. Library      (    )

3. Classroom      (    )

4. Toilets      (    )

5. Bathrooms      (    )

**APPENDIX V**



# LETTER OF AUTHORIZATION

REPUBLIC OF KENYA



## NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone: 254-020-2213471, 2241348, 254-020-2673532  
Mobile: 0711 786 787, 0735 404 245  
Fax: 254-020-2213215  
E-mail: [ncst@ncst.go.ke](mailto:ncst@ncst.go.ke)  
[secretary@ncst.go.ke](mailto:secretary@ncst.go.ke)

P.O. Box 30621-00100  
NAIROBI-KENYA  
Website: [www.ncst.go.ke](http://www.ncst.go.ke)

Our Ref: **NCST/RCD/14/013/833**

Date: **24<sup>th</sup> May 2013**

Lois Musyoka  
University of Nairobi  
P.O Box 30197-00100  
Nairobi.

### RE: RESEARCH AUTHORIZATION

Following your application dated 17<sup>th</sup> May, 2013 for authority to carry out research on "*Influence of provision of school physical infrastructure on students' performance in Kenya Certificate of Secondary Education in Mwingi Central District, Kenya.*" I am pleased to inform you that you have been authorized to undertake research in Mwingi Central District for a period ending 30<sup>th</sup> July, 2013.

You are advised to report to the District Commissioner and District Education Officer, Mwingi Central District before embarking on the research project.

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

  
**DR. M. K. RUGUTT, PhD, HSC.**  
**DEPUTY COUNCIL SECRETARY**

Copy to:  
The District Commissioner  
The District Education Officer  
Mwingi Central District

APPENDIX VI

RESEARCH PERMIT

PAGE 1

THIS IS TO CERTIFY THAT  
Prof. Dr. Mr. Mrs. Miss/Institution  
Lou Maszoka  
of (Address) University of Nairobi  
P.O. Box 29197-00100, Nairobi  
has been permitted to conduct research on

	Location
Mwingi Central	District
Eastern	Province

on the topic: Influence of provision of school  
physical infrastructure on students' performance  
in Kenya Certificate of Secondary Education  
Mwingi Central District, Kenya

for a period ending: 31<sup>st</sup> July, 2013.

PAGE 2

Research Permit No. NCST/RCD/1407/033  
Date of issue 24<sup>th</sup> May 2013  
Fee received KSh. 1000



Applicant's  
Signature

*[Handwritten Signature]*  
Secretary  
National Council for  
Science & Technology