

**SELECTED SCHOOL BASED INPUTS AND PROCESSES INFLUENCE  
ON PERFORMANCE IN KENYA CERTIFICATE OF SECONDARY  
EDUCATION IN NYERI AND NYANDARUA COUNTIES**

**GATAMA SAMWEL NJENGA**

**E83/CE/29122/2013**

**A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE  
REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF  
PHILOSOPHY (EDUCATIONAL PLANNING AND ECONOMICS OF  
EDUCATION) IN THE SCHOOL OF EDUCATION AND LIFELONG  
LEARNING OF KENYATTA UNIVERSITY.**

**JUNE, 2023**

## DECLARATION

Student`s declaration: I confirm that this thesis is my original work and has not been presented in any other university/institution for certification. This research thesis has been complemented by referenced sources duly acknowledged. Where text, data, graphics, pictures work tables have been borrowed from other works including the internet, the sources are specifically accredited through referencing using current APA system in accordance with anti-plagiarism regulation.

Signature 

Date 19/6/2023

**Gatama Samwel Njenga (E83/CE/29122/2013)**

Department of Educational Management, Policy and Curriculum Studies,

Supervisors` declaration: We confirm that the work reported in this thesis was carried out by the candidate under our supervision as university supervisors.

Signature 

Date 20/6/2023

**Dr. Mary A. Otieno**

Department of Educational Management,  
Policy and Curriculum Studies,  
Kenyatta University

Signature 

Date 20/6/2023

**Dr. Samuel N. Waweru**

Department of Educational Management,  
Policy and Curriculum Studies,  
Kenyatta University

## **DEDICATION**

This research work is wholeheartedly dedicated to my children Ibrahim, Mary, Michael and David as an inspiration to them to always aim high in their callings in life. To my beloved mother and in memory of my late father, for their immense support in my entire educational endeavors. To all teachers, particularly those who have taught and nurtured me directly from nursery school to university for their priceless contributions. Finally, with all reverence, to the almighty God, the generous giver of all wisdom and Knowledge.

## ACKNOWLEDGEMENTS

Research work of this magnitude would not have been practically possible without the valued support and assistance from innumerable individuals whom I take this opportunity to appreciate. To begin with, I take this foremost chance to acknowledge the invaluable mentorship, constructive criticism of my work and thought-provoking guidance that I consistently received from my two supervisors Dr. Mary A. Otieno and Dr. Samuel N. Waweru both of the department of educational management policy and curriculum studies, School of Education Kenyatta University. Their joint support enabled me to progress from one stage of my research to the next until eventual consummation. Reserved gratitude goes to all my course-work lecturers; Prof. John A. Orodho, Dr. Michael N. Murage (the late), Dr. Mukirae S. Njihia, Dr. Onesmus M. Thuo, Dr. Norbert Ogeta, Dr Thaddaeus O. Rugar, Prof. Grace W. Mbunyi and Dr. George A. Onyango. Their diligent work in the lecture halls indelibly enlightened my world view in the broad areas of education and research. To all my colleague doctoral students in the school-based program- PhD group April 2015 intake, I thank you most profusely for the encouragement we accorded one another in our united academic endeavors. Special note of thanks is extended to all my respondents that included principals, HoDs and teachers in public secondary schools in Nyeri and Nyandarua counties as well as the county quality assurance and standards officers (CQASOs) and County directors of education (CDE) in the two counties that constituted my study locale. I am also greatly indebted to Mr. Kevin Okumu of the world agroforestry (ICRAF) for his kind assistance in statistical data analysis. I would certainly be remiss to fail to acknowledge all the readers who reviewed the initial drafts of this work at both proposal and thesis stage and all panelists at my defenses for a thorough scrutiny of this work and useful suggestions for improvements they offered. To my wife Alice, I cannot thank you enough for the sacrifices, understanding and support that you accorded me in the entire course of this onerous work. In particular, the parental roles must have been more daunting as I got immersed in completing this work - may the almighty God bless you in a special way. Lastly and most critically to everyone else, who in one way or another contributed to the success of this work, kindly accept my sincere gratitude. God Bless you all.

## TABLE OF CONTENTS

<b>DECLARATION .....</b>	<b>ii</b>
<b>DEDICATION .....</b>	<b>iii</b>
<b>ACKNOWLEDGEMENTS .....</b>	<b>iv</b>
<b>TABLE OF CONTENTS .....</b>	<b>v</b>
<b>LIST OF TABLES.....</b>	<b>x</b>
<b>LIST OF FIGURES.....</b>	<b>xiii</b>
<b>ABBREVIATIONS AND ACRONYMS .....</b>	<b>xiv</b>
<b>ABSTRACT .....</b>	<b>xvi</b>

### **CHAPTER ONE: INTRODUCTION AND BACKGROUND TO THE**

<b>STUDY.....</b>	<b>1</b>
1.1 Introduction .....	1
1.2 Background to the Study .....	1
1.3 Statement of the Problem .....	13
1.3.1 Purpose of the Study.....	14
1.3.2 Objectives of the Study .....	15
1.3.3 Hypotheses .....	15
1.4 Significance of the Study.....	16
1.5 Limitation of the Study.....	17
1.6 Delimitation of the Study .....	18
1.7 Assumptions of the Study.....	19
1.8 Theoretical Framework .....	20
1.9 Conceptual Framework .....	21
1.10 Operational Definition of Terms .....	22

### **CHAPTER TWO: REVIEW OF RELATED LITERATURE .....**

2.1 Introduction .....	24
2.2 School Physical Resources Adequacy and Academic Achievement .....	24
2.3 Utilization of school resources and learning achievement .....	30
2.4 Students` cognitive entry behavior and learning achievement.....	32
2.5 Teacher Qualifications and Learning Outcomes .....	35
2.6 Instructional Leadership Practices and Learning Achievement .....	39

2.7	Summary of Literature Review and Gaps Identified.....	43
-----	---	----

**CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY ..... 46**

3.1	Introduction .....	46
3.1.2	Research Design, Study Variables And Methodology .....	46
3.2	Location of the Study .....	50
3.3	Target Population .....	51
3.4	Sampling Techniques and Sample Size.....	51
3.5	Research Instruments.....	53
3.6	Piloting Study .....	54
3.7	Validity of Research Instruments .....	55
3.8	Reliability .....	56
3.9	Data Collection Procedure.....	57
3.10	Method of Data Analysis.....	58
3.11	Logistical and Ethical Considerations .....	61

**CHAPTER FOUR: PRESENTATION OF FINDINGS, INTERPRETATION AND DISCUSSION ..... 62**

4.1	Introduction .....	62
4.2	General and Demographic Information.....	63
4.2.1	Questionnaire Return Rate .....	63
4.2.2	School Category Representation in the Questionnaire Return Rate.....	64
4.2.3	Distribution of schools by student population.....	64
4.2.4	Distribution of Schools by School Type .....	65
4.2.5	Biodata of respondents .....	66
4.2.6	Students` Academic Performance .....	69
4.3	Influence of Adequacy and Utilization of School Physical Resources on Academic Performance .....	71
4.3.1	Science Laboratories .....	72
4.3.2	Library facilities .....	76
4.3.3	Hall/Auditorium facilities.....	79
4.3.4	Classrooms Facilities.....	81
4.3.5	Adequacy of Course Books and Academic Performance.....	84

4.3.6	Adequacy of Teaching Aids and Academic Performance.....	86
4.3.7	Adequacy of Playing Field and Academic Performance.....	87
4.3.8	Adequacy of Co-Curricular Activities Resources and Academic Performance.....	88
4.3.9	Computer Laboratory facilities.....	90
4.3.10	Computer Facilities .....	93
4.3.11	Adequacy of ICT integration auxiliary/support facilities and academic performance.....	95
4.3.12	Average physical resource adequacy for all eleven physical resources combined and academic performance .....	96
4.3.13	Science laboratory utilization extent .....	101
4.3.14	Library Utilization Extent.....	108
4.3.15	Library Condition and Academic Performance.....	109
4.3.16	Extent of School Halls/Auditoriums utilization .....	112
4.3.17	Extent of Classroom utilization .....	112
4.3.18	Extent of Course book utilization.....	115
4.3.19	Extent of Teaching Aids Utilization.....	116
4.3.20	Extent of Playing Field Utilization.....	118
4.3.21	Extent of Participation in inter school Co-curricular activities ...	119
4.3.22	Extent of Computer laboratory utilization.....	124
4.3.23	Extent of ICTs Utilization .....	126
4.3.24	Average level of physical resources utilization (All ten resources combined) and academic achievement .....	129
4.4.	Influence of student's Cognitive entry behavior (KCPE marks) on eventual KCSE performance.....	135
4.5	Influence of Teacher Qualifications on Academic Performance .....	141
4.5.1	Average teacher qualification certificate and academic performance .....	143
4.5.2	Teacher highest qualification certificate and academic performance .....	146
4.5.3	Teacher experience and academic performance.....	150
4.6	Principals` demographic characteristics .....	155
4.6.1	Principals` Instructional leadership and academic performance .	155

4.6.2	Defining School Mission and Communicating to stakeholders versus academic performance.....	159
4.6.3	Managing Instructional Programs and academic performance ..	160
4.6.4	Strategic Resource Provision and academic performance.....	161
4.6.5	Developing teacher quality and motivation versus academic performance .....	163
4.6.6	Leadership beyond school borders and academic performance .	165

## **CHAPTER FIVE: SUMMARY, CONCLUSIONS AND**

### **RECOMMENDATIONS ..... 168**

5.1	Introduction .....	168
5.2	Summary.....	168
5.2.1	Influence of physical resources adequacy and utilization on academic performance.....	168
5.2.2	Influence of students` cognitive entry behavior and academic performance .....	174
5.2.3	Influence of teacher qualifications on academic performance ....	175
5.2.4	Influence of principal`s instructional leadership practices on academic performance.....	176
5.3	Conclusions .....	178
5.4	Recommendations .....	181
5.4.1	Educational Policy Recommendations .....	181
5.4.2	Recommendation Relating to Educational Practice .....	182
5.4.3	Recommendation for Further Research.....	184

### **REFERENCES ..... 185**

### **APPENDICES..... 199**

Appendix I:	Questionnaire for the Principal.....	199
Appendix II:	Questionnaire for HoDs.....	211
Appendix III:	Questionnaire for Teachers.....	224
Appendix IV:	Semi structured Interview schedule for CQASO and TSC CDE .....	234



Appendix V:	Observation Checklist on physical resource availability.....	235
Appendix VI:	Document Analysis Checklist .....	236
Appendix VII:	Letter of Introduction to Respondents .....	237
Appendix VIII:	Additional Consents for Observation Photos Due to Ethical Considerations .....	238
Appendix IX:	List of Public Secondary Schools in Nyeri and Nyandarua Counties .....	239
Appendix X:	Map of Nyeri County Kenya .....	246
Appendix XI:	Map of Nyandarua County .....	247
Appendix XII:	Approval of Research Proposal from Kenyatta University ...	248
Appendix XIII:	Research Authorization Letter from Kenyatta University.....	249
Appendix XIV:	Research License from NACOSTI.....	250

## LIST OF TABLES

Table 1.1:	Performance in KCSE of some public secondary school in Nyeri and Nyandarua counties between 2017-2019.....	12
Table 3.1:	Sampling frame .....	53
Table 3.2:	Sample distribution for School category strata's.....	53
Table 4.1:	Questionnaire Return Rate .....	63
Table 4.2:	School category representation.....	64
Table 4.3:	Distribution of schools by size of their student population.....	64
Table 4.4:	Summary of descriptive statistics of schools average KCSE mean Score .....	70
Table 4.5	Tests of Normality .....	71
Table 4.6:	Summary of Science Laboratory adequacy index descriptive statistics .....	73
Table 4.7:	Kruskal-Wallis $H$ -test summary table comparing Science laboratory adequacy and academic performance .....	74
Table 4.8:	Summary of Library adequacy index descriptive statistics.....	76
Table 4.9:	Kruskal-Wallis $H$ -test summary table comparing library facility adequacy and academic performance .....	78
Table 4.10:	Summary of Hall adequacy index descriptive statistics .....	79
Table 4.11:	Kruskal-Wallis $H$ -test summary table comparing Hall facility adequacy and academic performance .....	80
Table 4.12:	Summary of Classroom adequacy index descriptive statistics.....	82
Table 4.13:	Mann-Whitney U test summary table comparing classroom adequacy and academic performance .....	83
Table 4.14:	Mann-Whitney U test summary table comparing Course books adequacy and academic performance .....	85
Table 4.15:	Mann-Whitney U test summary table comparing teaching aids adequacy and academic performance .....	86
Table 4.16:	Kruskal-Wallis $H$ -test summary table comparing Playing field adequacy and academic performance .....	87

Table 4.17:	Mann-Whitney U test summary table comparing Co-curricular activities resources and academic performance.....	89
Table 4.18:	Summary of Computer Laboratory adequacy index descriptive statistics .....	90
Table 4.19:	Mann-Whitney U test summary table comparing Computer laboratory adequacy and academic performance .....	92
Table 4.20:	Summary of Computer adequacy index descriptive statistics .....	93
Table 4.21:	Mann-Whitney U test summary table comparing Computer adequacy and academic performance .....	94
Table 4.22:	Kruskal-Wallis $H$ -test summary table comparing ICT auxiliary facility adequacy and academic performance .....	95
Table 4.23:	Mann-Whitney U test summary table comparing Overall physical resources adequacy (Average of all eleven resources combined) and academic performance.....	96
Table 4.24:	Summary table of the finding relating to association between academic achievement and various school physical resources adequacy or availability.....	98
Table 4.25:	Kruskal-Wallis $H$ -test summary table comparing Science lab, Library and Hall utilization extent (as perceived by Heads of Departments) and academic performance .....	101
Table 4.26:	Kruskal-Wallis $H$ -test summary table comparing Science Lab Condition and academic performance .....	106
Table 4.27:	Kruskal-Wallis $H$ -test summary table comparing library condition and academic performance .....	110
Table 4.28:	Kruskal-Wallis $H$ -test summary table comparing classroom utilization and academic performance .....	113
Table 4.29:	Kruskal-Wallis $H$ -test summary table showing association between Course books and Teaching Aids utilization extent (as perceived by Heads of Departments) and academic performance .....	115
Table 4.30:	Kruskal-Wallis $H$ -test summary table comparing Playing field utilization and academic performance .....	119

Table 4.31:	Kruskal-Wallis <i>H</i> -test summary table comparing Extent of participation in games and academic performance .....	121
Table 4.32:	Kruskal-Wallis <i>H</i> -test summary table comparing Computer Laboratory utilization (as perceived by Heads of Departments) and academic performance .....	125
Table 4.33:	Kruskal-Wallis <i>H</i> -test summary table comparing ICTs utilization extent and academic performance .....	126
Table 4.34:	Kruskal-Wallis <i>H</i> -test summary table comparing average level of physical resources utilization for all resources combined and academic performance .....	130
Table 4.35:	Summary table of the finding relating to association between Level of physical resource Utilization and academic achievement.....	132
Table 4.36:	Kruskal-Wallis <i>H</i> -test summary table comparing schools` average KCPE entry marks and final KCSE mean score. ....	136
Table 4.37:	Kruskal-Wallis <i>H</i> -test summary table comparing average teacher qualification certificate (ATQ) and academic performance .....	143
Table 4.38:	Kruskal-Wallis <i>H</i> -test summary table comparing teacher adequacy and academic performance .....	145
Table 4.39:	Kruskal-Wallis <i>H</i> -test summary table comparing teacher highest qualification and academic performance .....	146
Table 4.40:	Kruskal-Wallis <i>H</i> -test summary table comparing proportion of experienced teachers and academic performance.....	151
Table 4.41:	Summary of descriptive statistics of principals` instructional leadership dimensions .....	157
Table 4.42:	Kruskal-Wallis <i>H</i> -test summary table comparing Defining School Mission, Managing Instructional Programs, Strategic Resource Provision and academic performance.....	159
Table 4.43:	Kruskal-Wallis <i>H</i> -test summary table comparing Developing Teacher quality and motivation, Leadership beyond School Borders, Overall Instructional leadership Practice and academic performance .....	162

## LIST OF FIGURES

Figure 1.1:	Conceptual Framework .....	21
Figure 4.1:	Distribution of schools by school type .....	65
Figure 4.2:	Gender of principals, HoDs and Teachers.....	66
Figure 4.3:	Age of Principals, HoDs and Teachers.....	67
Figure 4.4:	Respondents highest academic certificate .....	68
Figure 4.5:	Principalship experience, HoDs and Teachers teaching experience.....	69
Figure 4.6:	Distribution of schools average KCSE mean scores .....	70
Figure 4.7:	A teacher conducting a practical demonstration to students during a physics lesson – a practice which is a common alternative to allowing individualized hands-on practical in the laboratory by students themselves. ....	76
Figure 4.8:	A fairly resourced library with a librarian and a conducive reading space (carrels) in one of the secondary schools visited.....	77
Figure 4.9:	A computer laboratory with scarcity of computers in one of the secondary schools visited-Only a small group of less than 10 students could access the computers at a time yet the average class size in the school was 48 students. ....	91
Figure 4.10:	Students actively involved in performing a science practical .....	103
Figure 4.11:	A science laboratory in poor condition-a situation that undermines utilization of the laboratory .....	107
Figure 4.12:	A well-furnished science laboratory -a situation that promotes utilization of the laboratory .....	107
Figure 4.13:	A library facility not in very good condition, stocked with old reading material, lacking a librarian and with evidence of low utilization of the facility. ....	111

## **ABBREVIATIONS AND ACRONYMS**

<b>AMOS</b>	:	Analysis of a Moment Structure
<b>ASER</b>	:	Annual Status of Educational Report
<b>BOM</b>	:	Board of Management
<b>CCAs</b>	:	Co-curricular activities
<b>CCTV</b>	:	Closed-Circuit Television
<b>CDE</b>	:	County Director of Education
<b>CPD</b>	:	Continuing Professional Development
<b>CQASO</b>	:	County Quality Assurance and Standards Officer
<b>DNI</b>	:	Danish Indicator Workgroup
<b>EGMA</b>	:	Early Grade Mathematics
<b>IBM</b>	:	International Business Machines
<b>ICT</b>	:	Information Communication Technology
<b>IIEP</b>	:	International Institute for educational Planning
<b>IME</b>	:	Internal Main Exam
<b>INSET</b>	:	In-service education and Training
<b>KCPE</b>	:	Kenya Certificate of Primary Education
<b>KCE</b>	:	Kenya Certificate of Education
<b>KCSE</b>	:	Kenya Certificate of Secondary Education
<b>K-W</b>	:	Kruskall-Wallis
<b>LIPISs</b>	:	Learning inputs and processes Interview Schedules
<b>LIPQs</b>	:	Learning inputs and processes questionnaires
<b>MED</b>	:	Masters of Education
<b>MLA</b>	:	Monitoring Learning Achievement
<b>MoE</b>	:	Ministry of Education
<b>M-W</b>	:	Mann-Whitney

<b>NACOSTI</b>	:	National Commission for Science, Technology and Innovation
<b>NBER</b>	:	National Bureau of Economic Research
<b>NESSP</b>	:	National Education Sector Strategic Plan
<b>OECD</b>	:	Organisation for Economic Co-operation and Development
<b>PGDE</b>	:	Post Graduate Diploma in Education
<b>PhD</b>	:	Doctor of Philosophy
<b>PIRLS</b>	:	Progress in International Reading Literacy Study
<b>PISA</b>	:	Program for International Student Assessment
<b>SACMEQ</b>	:	Southern and Eastern Africa Consortium for Monitoring Education Quality
<b>SCDE</b>	:	Sub-County Director of Education
<b>SCQASO</b>	:	Sub-County Quality Assurance and Standards Officer
<b>SDGs</b>	:	Sustainable Development Goals
<b>SEPU</b>	:	School Equipment and Production Unit
<b>SPSS</b>	:	Statistical Package for the Social Sciences
<b>SSA</b>	:	Sub Saharan Africa
<b>STEP</b>	:	Skill Towards Employability and Productivity
<b>TPAD</b>	:	Teacher Performance Appraisal and Development
<b>TSC</b>	:	Teachers service Commission
<b>TIMSS</b>	:	Trends in International Mathematics and Science Study
<b>UNESCO</b>	:	United Nations Educational, Scientific and Cultural Organization
<b>UNICEF</b>	:	United Nations Children`s Fund
<b>WI-FI</b>	:	Wireless Fidelity

## ABSTRACT

The study purposed to provide empirical data on the status of some selected school inputs and processes as well as account for their specific influence on academic performance in Kenya Certificate of Secondary Education examination performance in public secondary schools in Nyeri and Nyandarua counties. The concern was the large numbers of students with very low grades and the wide performance disparities between schools even of the same category. The objectives of the study were to: i) determine the influence of adequacy and utilization of school physical resources on academic performance in public secondary schools in Nyeri and Nyandarua counties; ii) establish the influence of students' cognitive entry behavior on academic performance in public secondary schools in Nyeri and Nyandarua counties; iii) establish the influence of teacher qualifications on academic performance in public secondary schools in Nyeri and Nyandarua counties and iv) determine the influence of instructional leadership on academic performance in public secondary schools in Nyeri and Nyandarua counties. The study adopted ex-post facto research design and systems theory using the Context-Inputs -Process-Outputs model to establish the determinants of learning outcomes. The target population for the study was 386 principals ,2316 Heads of Departments and 4160 teachers in 386 schools as well as 2 County Directors of education and 2 County Quality Assurance and Standards Officers. The sample sizes were derived from Kothari formula and constituted 192 principals, 330 Heads of department and 352 teachers in 192 schools as well as 2 County Directors of education and 2 County Quality Assurance and Standards Officers. Main sampling method used were stratified random, Simple random and purposive sampling. Data collection was done by use of Questionnaires and Interview schedules. Qualitative data was analyzed using thematic analysis and mainly presented using narratives while quantitative data was analyzed using descriptive and inferential statistics and was mainly presented using tables and figures. Due to data non-normality and the fact that much of the data was ordinal from Likert scale items, Kruskal-Wallis H- test and Mann-Whitney U-test (non-parametric equivalents of F-test and t-test respectively) were used for testing hypothesis at alpha ( $\alpha$ ) value of 0.05. Key findings were that there was inadequacy or scarcity of critical physical resources in most schools especially libraries, school halls, computer labs and computers. Most resources were not optimally utilized in most schools yet resource utilization invariably provided higher effect sizes than resource adequacy. Student cognitive entry behavior  $H(4, N=172) = 49.64, P < .001$  and instructional leadership  $H(2, N=172) = 28.55, P < .001$  were the strongest variables that explained performance variation with largest effective sizes of  $r^2=0.29$  and  $r^2=0.167$  respectively. Major conclusion is that while schools' inputs like adequacy of physical resources and teachers need urgent fixing, school processes like optimal resource utilization and instructional leadership equally need to be streamlined and intensified for enhanced performance. Major recommendation is that all schools need to be fairly equipped with critical inputs where adequacy is pegged on population of students enrolled and to focus on key processes so that learning quality is standard in all schools.



## CHAPTER ONE

### INTRODUCTION AND BACKGROUND TO THE STUDY

#### 1.1 Introduction

This section lays the backdrop to the study. It is comprised of the study background, problem statement and purpose for the study, objectives and hypotheses, significance, limitation, delimitation and assumption of the study, theoretical framework, conceptual framework and operational definition of terms used in the study.

#### 1.2 Background to the Study

The post 2015 global education agenda -the education vision 2030 encapsulated in the Sustainable Development Goal- goal number four (SDG4) shifts focus of education aspiration from mere schooling to learning quality and equity in basic education (UNESCO, 2015:1). In particular the agenda underscores the expediency of raising the quality of learning conditions for all students in all schools and addressing the wide learning outcome disparities that reflect Educational Opportunity Equality (EOE) gaps in schooling (UNESCO, 2015). The agenda is at a backdrop where national and international learning assessment studies have highlighted the ``*global learning crisis*'' characterized by a large share of children in low- and middle-income nations (LMICs) that are graduating from basic education institutions having not attained basic minimum set of cognitive skills. (Majgaard and Alaine, 2012; World Bank, 2018)

Crouch, Rolleston & Gustafsson (2021), on a study focusing on ``*global learning crisis*'' underscored the rationale of individual countries in addressing internal barriers relating to inadequacies of school related learning inputs and processes as

well as their unequal distribution. The study while acknowledging that learning achievements may not ideally be expected to be the same (due to students' ability and effort) asserted that achievement disparities need not be explained by variation in school quality and resources as these need to be levelled for all students to ensure the principle of educational opportunities equality. The study observed that low levels of inequality and disparity in school quality translated to high average levels of learning achievement which resonates with education vision 2030 clarion call of "*leaving no one behind*" through ensuring equality of treatment to all learners in all schools in the same level of education in line with the 1960 UNESCO convention against inequality (UNESCO, 2016a; Singh, 2014; UNESCO, 1960).

Owing to the well-established connection between learning achievements and knowledge based economic and human development (Kyriakides, Cremers & Charalambous, 2018:6-8; Hanushek and Woessmann ,2015), the challenge of low and widely differentiated learning achievement and the corollary question of what matters for learning or what elements best predict scholastic performance and by what quantum has persisted and continue to dominate education discourse and research endeavors tracing back from the classical Coleman report of 1966 (Alexander & Morgan, 2016).

Ozoglu (2015) indicate that while Coleman report downplayed the role of schools related factors in favor of students and family related factors in influencing learning, persuasive recent research in many contexts show that school related factors are powerful and potent predictors of learning outcomes and are critical in narrowing the achievement gaps in learning.

Glewwe, Hanushek, Humpage and Ravina 2013 and Hanushek (2020) indicate that despite many research endeavors based on education production function since the Coleman report of 1966, clear answers on learning achievement determinants from the inputs only perspective have been elusive due to mixed findings. The implication being that schools may be inefficient in their processes and not that school inputs do not matter. The situation thus creates a gap that necessitates an empirical study that would incorporate both an inputs and process related perspective to better unravel what constitutes the school based proximate determinants of academic achievement. Owing to the perpetually, low and widely differentiated learning achievement in the national examination performance in the study locale, this study sought to investigate the influence of selected school related learning inputs and processes on examination performance in public secondary schools located within Nyeri and Nyandarua counties in Kenya.

**School based learning inputs** are the resources made available in a school for use in the production of knowledge and may constitute aspects like physical resources including Information Communication Technology (ICT) equipment, and other instructional materials, Students` aptitude or cognitive entry behavior as well as quantity and quality of teachers.

In developed countries, school physical facilities and learning material correlate very modestly with academic performance due to the fact that on average across Organisation for Economic Co-operation and Development(OECD) countries, 65% to 77% of students are in schools which are ``*not hindered at all* '' or are ``*hindered very little* '' by physical facilities or instructional materials in their capacity to provide quality instruction (OECD, 2013:108). While adequacy of physical

infrastructure and other learning and teaching materials do not present a sufficient condition for improved learning outcomes, absence of such resources negatively affects learning. Ideally, educational resources availability should correlate positively with overall academic performance.

There exists a myriad of school physical resources that can potentially support learning but only selected infrastructural and teaching and learning resources will form the primary focus of the current study. This will include *Classrooms* and other *learning spaces* which matter not just in terms of quantity but in terms of condition and their fit for use in relation to learning and teaching activities. Classrooms and other learning spaces should have auxiliary facilities like lighting ,power sockets ,white or smart boards ,acoustics and be spacious ,clean and well maintained .A study by Oloyo (2015) on the ``*Relationship between physical environment and academic achievement in public secondary schools in Nairobi city*'' identified variables like area of school, quality of classrooms and related learning spaces , paintings, sense of security, and noise decibels from neighboring environment to be significantly influencing students' performance. Other physical learning resources that will form the focus of this study will include libraries, science laboratories and computer laboratories.

Addressing the importance of learning and teaching materials in schools, education 2030 framework for action clearly spells out that:

*``Educational institution and programs should be adequately and equitably resourced with books, other learning materials, open educational resources and technology that are non-discriminatory, learning conducive, learner friendly and available for all learners''*

(UNESCO, 2016 a: 33)

The education 2030 framework for actions` position is justified by extant empirical studies done. An analysis of ``*what makes schools successful based on resources policies and practices*'' by OECD (2013) observed that Tunisia registered significant improvement in the Program for International Student Assessment (PISA) performance between 2003 and 2012 and this improvement directly coincided with a sustained improvement in learning environment aspects including improvements in adequacy and diversity of teaching and learning materials. Read and treffgarne (2011) quoted in UNESCO (2019) found that investment in reading books has strong positive correlation to student achievement however studies reviewed by a meta-analysis done by Glewwe, Hanushek and Ravina (2011) indicated mixed findings. Ministry of Education (MoE, 2018) indicate that public secondary schools in Kenya have varying levels of learning resources and although government embarked on an initiative to supply public schools with textbooks, the level of utilization of the books and other learning resources is still unclear.

In regard to Information Communication Technology (ICT) tools. Studies on impact of technology integration on learning outcomes remain mixed in their findings. An OECD (2015) report based on 2012 PISA data indicated that though technology remains a sure way of enhancing learning environment as well as expanding access to education, empirical evidence on their impact on learning outcomes remains mixed at best. Glewwe et al (2011) in their meta-analysis of 20 studies in developing countries involving computers and related electronic media between 1990 and 2010 found only 3 positive and significant studies.

Public secondary schools in Kenya continue to invest in ICT as a pedagogical tool to enhance teaching and learning. Ministry of Education (MoE, 2018) indicate that

overall objective of the ICT investment in Kenyan schools is to seamlessly integrate ICT for administration, and teaching and learning in all levels. Consequently, there has been efforts to deploy ICT infrastructure in school though usage still remain unclear. This current study investigated the level of ICT tools investment in school and the level of usage of these tools and related this to academic performance of school to establish any relationship using Kruskal - Wallis H-test and Mann-Whitney U-test

Basic Education Regulation (2015) asserts that apart from facilities for academic learning, all schools should be equipped with resources to support co-curricular activities so as to complement academic work, as well as nurture and develop talents. While there is consensus on the importance of co-curricular activities in holistic learner development, studies remain mixed on relationship between academic performance and participation of co-curricular activities. Some studies have found significant positive relationship Craft (2012), Sigh (2017) while others have found negative relationship Kimenyi, Kaptala, and Okero (2014). The current study explored the availability and utilization of playground and facilities for games, music and drama in public secondary schools and related this to academic performance.

Another critical but often overlooked input variable relates to composition of students within a school in relation to average cognitive entry behavior. Gibbons and Telhaj (2012), assert that schools seem to be judged more by kind of students they enroll in terms of their average student aptitude proxied by prior performance, or by socio-economic status than in terms of school facilities or teacher quality. This is significant for school choice, student sorting and tracking as well as racial

or economic desegregation and equity policies. There is potential of the student composition in terms of average ability of the peers or classmates to affect both individual and overall learning and performance. Classmates or peers exert externalities on each other, in terms of behavior and learning motivation, they help each other on assignments as well as participate in class discussion. Liu (2014) quoting Perry and Conroy (2010) asserts that effect of school composition is strong and that students tend to perform better if ability of their peers is high. In England public secondary schools, Gibbons and Telhaj (2012) found that average entry performance of students from primary school significantly affected the student performance in secondary school. One standard deviation increase in average cognitive entry behavior of students from primary school was associated with a 0.03 increase in average performance at end of secondary school. In Kenya, A study by Misanya (2013) on *“Influence of Peer group prior achievement on academic performance of girls in Kandunyi sub county”* found that students who were placed in classes with high ability classmates performed well in form one, they seemed to cover topics quickly in class and that the teaching often started at higher base level and went deeper in subject content than in classes with low ability students. The study by Misanya (2013) considered general students’ performance in form one but did not explore the influence of student’s average entry performance from primary to the performance in secondary school national examinations which is the focus of the current study.

In relation to teacher characteristics, most studies consider the teachers to be the cornerstone of learning quality and are key determinants of learning outcomes. The Mc Kinsey report (Barber & Mourshed ,2007) quoted in Hanushek, Piopiunik and

Wielder (2014) asserts that the quality of education cannot exceed the quality of the teachers. Formal education of teachers, the number of years they have been in practice and their participation in professional development activities proxy the Knowledge, skills and experience possessed by teachers and are thus crucial for teaching effectiveness. In New Zealand, a study by Dixon and Ward (2015) on the value of master's study to teachers professional practice found that academic study leads to deepening teachers' knowledge that improve their practice and equips teachers to engage in practitioner research as teaching is being viewed as research and evidence-based profession. The fact that Many Practicing teachers in Kenya are keen on upgrading their qualification by pursuing various degrees beyond their entry qualification into the teaching profession may be significant for learning outcomes (Oyaro ,2013). A study by Susan, Akala and Imonje (2019) on influence of teacher qualification on pupil performance in primary schools in Machakos County found that teacher qualification positively and significantly influences student's performance. The study attributed the positive influence to high self-efficacy in class and better class management skills possessed by teachers with high qualification especially the graduate and postgraduate teachers. The study by Susan et al. (2019) focused on primary school teachers while the current study focuses on public secondary schools. Furthermore, While the variation in teacher qualifications may influence learning outcomes, the quantitative teacher imbalance in schools may also be key as teacher adequacy is determined by the number of teachers available in respect to total number of students enrolled -Teacher Adequacy Index (TAI). The current study therefore did not only determine how highest academic certificate, years of teaching and participation in professional development activities related with learning outcomes but also determined how the



teacher quantity or adequacy in relation to students enrolled influenced academic achievement.

**Schools' internal processes** are the means by which learning inputs in a school are transformed into outputs. While adequacy of school physical resources and teaching materials are learning inputs oriented, their level and strategy of resource utilization so as to optimize students learning represent school related processes (Monk ,2019). Bernhardt (2017) further elucidates that school processes constitute what learning organization and those who work in them do to help students to learn. Instructional leadership practices, School programs, student assessment, pedagogical approaches, and manner of resource utilization are examples of school related processes. Sheerens (2013) uses the term opening the education production `black box` in reference to school processes and asserts that analysis of school processes is critical in devising strategies to address within and between school achievement disparities. OECD (2018) further asserts that the quality of teachers in a school cannot exceed that of the school processes that traditionally define how they work and ways in which they are supported. Studies on effective school processes by Reymond, Teddlie, Chapman & Stringfied (2015), Consolata and Herme (2015), Ndambuki (2020) indicate that instructional leadership practices of a school principal is one of the most critical process variable in creating conditions that support high level learning and students' performance. The current study sought to determine to what extent instructional leadership practices and utilization of school resources influenced performance in the study locale.

In a good number of schools in Kenya optimal learning is still a challenge. A study cited in Republic of Kenya (RoK, 2017) conducted by word bank affiliated

learning assessment agency Monitoring Learning Assessment (MLA) involving form two students in Kenya on *“Factors influencing learning outcomes in mathematics (numeracy) and English (literacy) for the period 2014-2017”* depicted the enormity of the learning challenge. The report indicated that a considerable percentage of form two pupils did not attain the 50% benchmark in math operations and that considerable high number of students failed to attain minimum competency in literacy skills. The report also noted wide disparity in performance between schools in numeracy and literacy. Based on the findings it emerged that the question of adequacy of schools’ related inputs, as well as effectiveness of schools’ internal processes as explanatory factors remained imperative (RoK, 2017:2).

A survey by Nyawira, Gikandi and Kamau (2019) on learning condition in public secondary schools in Nyeri, and other counties in central region titled *“Schools groan under the weight of extra students”* depicted challenges relating to learning spaces and facilities in some public secondary schools in the region. Enrolments in secondary schools had continued to increase in the area yet commensurate expansion of educational resources was not clear. Academic performance in KCSE exams in Nyeri and Nyandarua County was characterized by a huge number of students who scored low quality grades while performance was widely differentiated among schools. Some schools posted high quality grades and high mean scores consistently while many others posted very low grades leading to low mean scores and very high wastage rates. The average mean scores for Nyeri and Nyandarua counties in KCSE between 2017 and 2019 was 4.25 (D+) and 3.86

(D+) respectively against a national average mean score of (4.3 D+) which was also low.

Data from Nyeri and Nyandarua Counties Quality assurance and standards officers indicated that on average, between year 2017 and 2019 only 17.6% of the students from the two counties qualified for university by scoring a C+ grade and above while a paltry 8.0% qualified for direct diploma programs in technical and vocational training colleges which require a grade C. The majority of the students 74.4% scored below grade C meaning they could not join university or do a diploma course directly unless they started at artisan or craft certificate or did a bridging exam. According to Kenya National Examination Council (KNEC, 2018) grades A, A-, B+, B, B- and C+ are above average grades and represent good performance. Grades C (6 points) was the average score while grades D+, D, D- and E were below average and represented low performance. Grade A was the highest award with 12 points while grade E was the lowest award with 1 point. The performance in KCSE also varied widely between schools with low quality grades predominantly arising from sub county schools. In Nyeri and Nyandarua Counties, almost 87% of the schools (335 out of 386) were Sub County schools. The wide variation in learning outcome could be illustrated by a snapshot of some selected public secondary schools within Nyeri and Nyandarua Counties in table 1.1

**Table 1.1: Performance in KCSE of some public secondary school in Nyeri and Nyandarua counties between 2017-2019**

No	School Name (Coded)	2017 mean score	2018 Mean score	2019 Mean score	Average mean scores between 2017-2019	Average % of students scoring below D+
<b>National</b>						
1	MW-1	8.02	7.9	8.96	8.29	0.6
2	NYC-15	7.16	7.40	7.59	7.38	0
<b>Extra County</b>						
3	NS-05	8.04	8.13	8.04	8.06	0
4	NS-01	7.41	7.08	7.53	7.34	3
5	NS-02	5.33	6.16	5.93	5.80	10
6	KP-13	4.63	4.40	5.36	4.79	21
<b>County</b>						
7	KP-4	6.48	6.66	7.38	6.84	0
8	NS-08	4.51	4.54	5.03	4.69	24
9	KP-1	4.00	4.67	4.72	4.46	21
10	NYC-1	1.86	2.08	2.03	1.99	97
<b>Sub County</b>						
11	NS-10	4.0	4.53	4.63	4.38	41
12	KP-24	3.84	4.00	4.37	4.06	38
13	NS-15	2.06	1.77	1.96	1.93	96
14	KP-7	1.84	1.77	1.95	1.85	100
15	NS-13	1.5	1.67	1.83	1.66	99

**Source:** Nyeri and Nyandarua Counties Quality Assurance and Standards Officers (CQASO) records (29<sup>th</sup> March, 2019; 18<sup>th</sup> October, 2020)

According to table 1.1, the sub county schools had the lowest mean score with very high number of students scoring below D+. Disparity in performance within school categories was also evident, yet the schools had comparable student's cognitive entry behavior. School NS05 had an average mean score of 8.06(B-) while another school in the same category school KP-13 had an average mean score of 4.79(C-). School NS10 had an average mean score of 4.38 (D+) while a similar sub county

school NS13 had an average mean score of 1.66(D-). This clearly depicted the challenge of wide learning outcomes disparities.

Nyagosia (2011) conducted a related study on the determinants of differential KCSE performance and school effectiveness within schools in Kiambu and Nyeri County. The study utilized the effective school model by Lezotte but the factors considered only explained 11.5% of the variation in academic performance. The study by Nyagosia (2011) recommended a similar study to establish broader factors that influence quality of learning and performance within secondary schools. The intention of the current study was to fill this identified gap by broadening the scope of learning determinants to include both school learning inputs and processes within the systems approach and determine how these related with academic performance.

### **1.3 Statement of the Problem**

Owing to the multiplicity of both private and public benefits of learning outcomes especially at basic education level, Low and widely differentiated academic achievement have come to be identified as a formidable and contemporary problem facing learning at both national and global scale- *“global learning challenge”* (World Bank, 2018, Steinmann & Olsten, 2022 ).The SDG-4 for example while promoting education for all agenda, shifted the focus from mere access in education to quality of learning condition and achievement while ensuring there is educational opportunity equality-*“no child left behind ”* (UNESCO, 2015).To better address the challenge of low and widely differentiated academic achievement, there is need to understand the context education is being offered and what determinants best explain the observed outcomes. Available answers on what

constitute the proximate determinants of academic achievement in other contexts from extant studies have been beset by mixed findings and thus makes it challenging to generalize in local contexts. Furthermore, the findings from education production function studies are based on inputs only perspective making it essential that process variables to be considered in a holistic study so as to overcome the challenge of omitted variable bias (Glewwe et al. 2013 Hanusheck 2020)

Academic performance in national examinations in public secondary schools in Nyeri and Nyandarua counties was widely differentiated. There was wide performance variation between school even of the same category. Few schools performed highly while majority of the schools recorded low performance leading to low overall performance. The question that lingered was: What was the status of school learning inputs like Physical resources adequacy, students' cognitive entry behavior and teacher qualifications and processes like instructional leadership and level of resource utilization and to what extent were they influencing learning in terms of the achievement gaps and differentiated performance that was being observed?

### **1.3.1 Purpose of the Study**

The purpose of this study was to provide empirical data on the status of school related learning inputs and processes as well as to account for the specific influence of each input and processes variable on academic achievement in Kenya Certificate of Secondary Education in Nyeri and Nyandarua counties. This would not only establish relationships but more fundamentally enable a determination of

availability of equality of educational opportunity in the distribution of the selected inputs and process variables within public secondary schools in the study locale.

### **1.3.2 Objectives of the Study**

- i. To determine the influence of adequacy and utilization of school physical resources on academic performance in Kenya Certificate of Secondary Education in Nyeri and Nyandarua counties.
- ii. To establish the influence of students' cognitive entry behavior on academic performance in Kenya Certificate of Secondary Education in Nyeri and Nyandarua counties.
- iii. To establish the influence of teacher qualifications on academic performance in Kenya Certificate of Secondary Education in Nyeri and Nyandarua counties.
- iv. To determine the influence of instructional leadership on academic performance in Kenya Certificate of Secondary Education in Nyeri and Nyandarua counties.

### **1.3.3 Hypotheses**

- H<sub>01</sub> School physical resources adequacy does not have statistically significant influence on academic performance in Kenya Certificate of Secondary Education in Nyeri and Nyandarua counties.
- H<sub>02</sub> School physical resources utilization does not have statistically significant influence on academic performance in Kenya Certificate of Secondary Education in Nyeri and Nyandarua counties

H<sub>03</sub> Students' cognitive entry behavior does not have statistically significant influence academic performance in Kenya Certificate of Secondary Education in Nyeri and Nyandarua counties.

H<sub>04</sub> Teacher qualifications do not have statistically significant influence on academic performance in Kenya Certificate of Secondary Education in Nyeri and Nyandarua counties.

H<sub>05</sub> Instructional leadership does not have statistically significant influence on academic performance in Kenya Certificate of Secondary Education in Nyeri and Nyandarua counties.

#### **1.4 Significance of the Study**

- i. The findings of this study provide empirical knowledge on the status of school learning inputs and processes and their influence on academic performance in Nyeri and Nyandarua counties. This may provide answers on what is working and what is not and where are the deficiencies in terms of ensuring quality learning conditions for all and minimizing the within and between school's performance differentials.
- ii. The findings may also be significant to school administrators, teachers and other education stakeholders in identifying the linkage between educational inputs and processes and learning achievement.
- iii. Bodies like Kenya Education Management Institute (KEMI) may find the study findings useful in formulating framework for training of educational managers on instructional leadership.
- iv. Information on cognitive entry behavior and teacher qualifications and their influence on learning achievement may be useful in relation to policy on



ideal student admission or distribution criteria as well as in determination of teacher quality variables that matter and how to promote or develop and compensate them.

- v. Education ministry officials at county planning and operational level as well as those operating in bodies like School Equipment Production Unit (SEPU) may benefit from the findings of the study to better plan for school facilities, equipment and human resource allocation and advisory roles to national central government on quality learning gaps and mitigation measures including setting of minimum school quality norms.
- vi. Quality assurance and standards officials may find the findings useful in their school monitoring and assessment roles.

### **1.5 Limitation of the Study**

- i. The study relied in part, on self-reporting from key respondents in the questionnaires and in the interview schedules and therefore the veracity of the research findings depends on how truthful and sincere the respondents were. As a mitigation measure to this short coming as well as to develop some rapport with the respondents, the researcher made efforts where it was possible to distributing the questionnaire in person allaying any fear of reprisal and assuring the respondents that data sought was solely for an educational research and not for any other undisclosed purpose. The researcher also allowed the respondents adequate time to respond to the questionnaires so that the respondents had adequate time to cross -check and think through their responses.

- ii. The study used Mann-Whitney U-test and Kruskal Wallis H-test (the non-parametric t-test and F-test equivalents) which are considered less powerful tools (probability of making type II error) but in case of non-normality and ordinal data they have a higher inferential validity in testing of hypothesis than the parametric tools.
- iii. Owing to the fact that variables in the study were taken as they were in the natural setting without any manipulation nor controlling of other contributing factors points to the need for further validation study of experimental nature to establish strong causality association. The study however, provides a strong preliminary empirical evidence of variables that influence learning achievement and their relative strength in that association.
- iv. Data collection both questionnaire administration and interviewing were quite challenging owing to Corona virus precautionary measures and related protocols that had altered human interactions and even how schools were operating at the time of the study. The researcher however, mitigated this through ensuring that in the conduct of the entire field work research, all precautionary protocols set were strictly observed and that neither the researcher nor respondents' safety was compromised during the interactions.

#### **1.6 Delimitation of the Study**

- i. The study focused on influence of learning inputs and processes on KCSE performance as the proxy for quality of student learning although there were other educational outputs like transition rates, values, and measures of internal efficiency that could also have been used.

- ii. While there were many teaching learning process variables like pedagogical practices and classroom management practices, the study focused on instructional leadership practices and utilization of physical resources in schools as key process variables with greatest school wide impact in influencing quality of learning and academic performance
- iii. The study focused only on public secondary schools within Nyeri and Nyandarua Counties and therefore findings of the study may only be applied with caution to private secondary schools and to secondary schools in other counties. Most secondary schools in Nyeri Nyandarua Counties were public and the few existing private secondary schools were not financed by the governments in terms of inputs provision.

### **1.7 Assumptions of the Study**

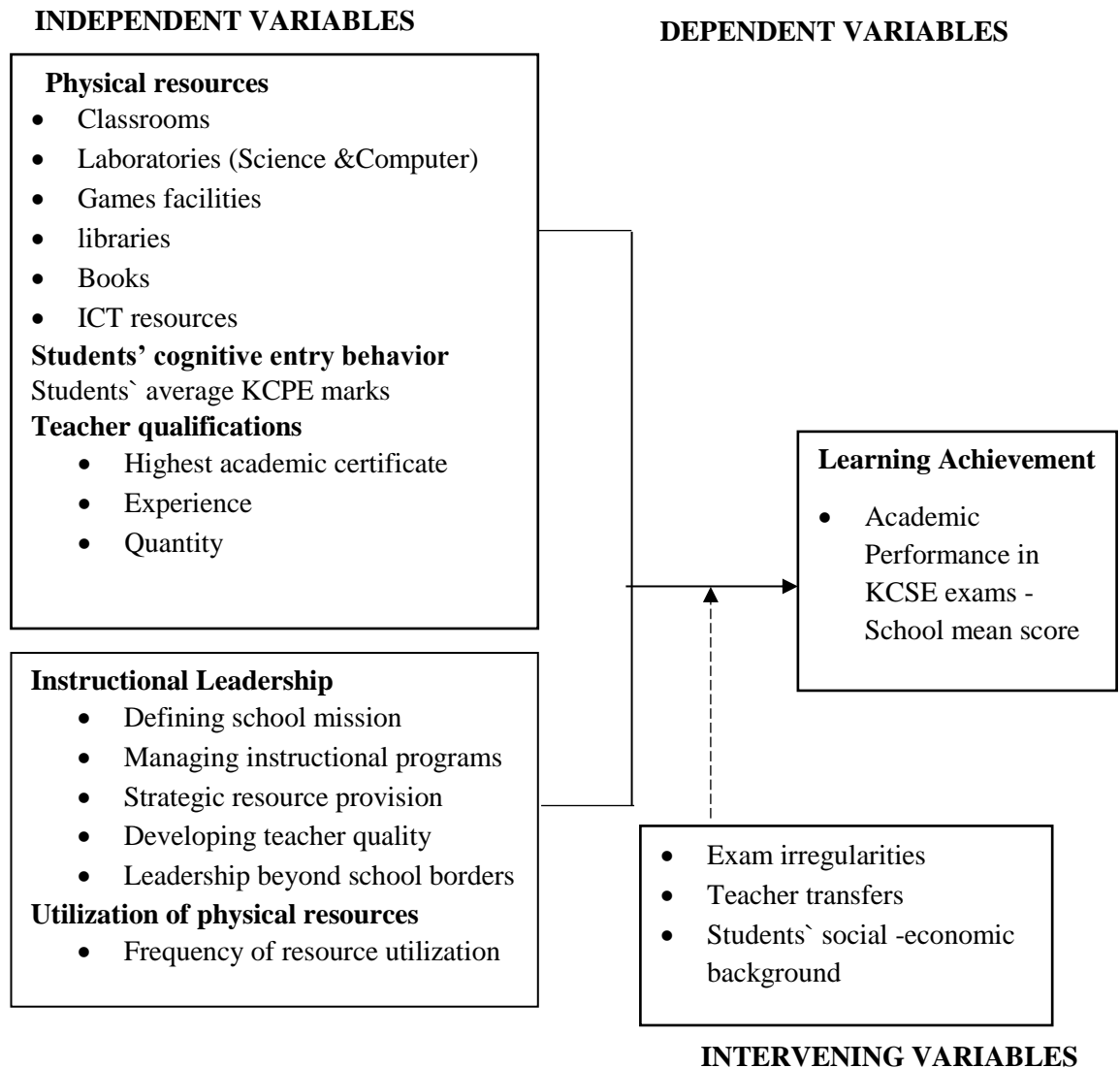
- i. Learning outcomes were defined by the set of inputs and processes in a school and the variation in performance between schools could be explained by analysis of these variables.
- ii. Secondary school teachers were all qualified to teach and role of staffing public schools rested with the Teacher Service Commission (TSC) but individual school supplemented any teacher deficit with teachers employed by Board of management (BOM) as an instructional management priority.
- iii. The study respondents would understand the purpose of the study and cooperate by providing honest and factual information for the study.

## **1.8 Theoretical Framework**

The study was predicated on the general systems theory that was developed by Ludwig Von Bertalanffy in 1930s. According to Von Bertalanffy (1969), a system is a set of interrelated parts that function as a whole to achieve a common purpose with each part having a specific role and contribution to the whole. A system functions by acquiring inputs from the environment, and transforming this input through a process or throughput to outputs which are released back into the environment (Chitegesye, 2018). With reference to school functioning, the study applied the Context – Inputs – Process- Outputs (CIPO) model which was an educational effectiveness model advanced by Jaap scheerens in 1990 from the general systems theory. According to Scheerens (1991) and Scheerens (2013) the systems thinking could be applied in analyzing the education sector and educational institutions as open systems. Context – Inputs – Process- Outputs (CIPO) model functions as an analytic framework through which the quality, equity and productivity of education can be assessed. (Chitegesye, 2018). Learning inputs are the resources that are made available for production of learning and include physical resources, teachers, students personal and background characteristics while the process or throughputs of education are related to *how* the various human and physical resources are brought together and skillfully transformed. Teaching strategies, instructional leadership, school culture and utilization of physical and human resources are processes. Outputs include both the academic and non-academic outputs. These include student’s achievement in standardized assessments as well as developed skills, attitudes and talents. The model was appropriate for the current study as it considered the holistic

determinants of learning outcomes from a systemic approach which were both the inputs and processes related variables.

## 1.9 Conceptual Framework



**Figure 1.1: Conceptual Framework**

Source: Researcher, 2020

As depicted in figure 1.1, this study was conceptualized along the variables used in the objectives. Learning achievement in KCSE exams was the dependent variable of the study. The variables influencing the dependent variable- the independent variables were deemed to be both inputs oriented and process oriented. For this

study, *input variables* considered included the status of school physical resources adequacy, as well as student cognitive entry behavior (represented by schools average mean score in Kenya Certificate of Primary Education (KCPE) of the students enrolled) and teacher qualifications represented by teachers' years of teaching experience and their highest attained academic certificate. The *process variables* considered included instructional leadership practices by principals and level of resource utilization in schools. The identified intervening variables that could have interfered with the relationship between the dependent and independent variable included examination irregularities, teacher transfers, and students' social economic backgrounds. Both school learning inputs and process related variables were considered to be crucial in unravelling the proximate determinants of academic achievement in the study locale in a holistic perspective.

#### **1.10 Operational Definition of Terms**

**Achievement gap:** Wide variations in academic performance between students that attend different schools in relation to the distribution of school learning inputs and processes.

**Digital divide:** wide disparities in learning opportunities and outcomes between schools with adequate and high level of utilization of ICT resources and those that lack such resources or fail to optimally utilize them despite being available.

**Educational Opportunity Equality (EOE):** A normative ideal situation characterized by ensuring even distribution of inputs to all schools as well as ensuring that school processes are optimal and fairly distributed in all schools. In a school equality situation, academic performance is not expected to be explained by

disparity in school inputs and processes but by individual student innate ability and effort.

**Educational outputs:** student academic and achievements

**Effectiveness:** Degree, to which a school meets the goal of facilitating quality learning to all students and can be demonstrated by ensuring all learners attain specified minimum level of cognitive or non-cognitive learning achievement with minimal outcome disparities.

**Learning:** Accumulated knowledge or skills usually by study or schooling. Learning can be categorized into two domains: cognitive and non –cognitive (affective and psychomotor)

**Low academic performance:** Absolute or relative test scores average in KCSE examination that is in the lower a third of the score's distribution. Any score of 4 points(D+) and below out of a possible 12 points (A plain) can be regarded as low academic performance.

**Quality:** Degree of excellence as measured against agreed upon standard

**School's internal processes:** Means, and techniques by which educational inputs are transformed into outputs. An educational process is any action of manipulating the educational inputs (students, teacher and physical resources) so as to achieve intended learning outcome. Instructional leadership and utilization of physical resource are the main process variables in the study.

**School learning inputs:** Resources made available for use in the education production activity. For this study inputs will include school physical resources, students` cognitive entry behavior and teacher qualifications and quantity.

## CHAPTER TWO

### REVIEW OF RELATED LITERATURE

#### 2.1 Introduction

This section contains discussion of reviewed literature on the variables useful to conceptualize the study. The themes and empirical studies reviewed are informed by the objectives and key variables within the conceptual framework which include: School physical resources that incorporate the infrastructural facilities and teaching learning materials (TLMs), students` cognitive entry behavior, teacher qualifications, instructional leadership and utilization of school resources and their influence on academic achievement.

#### 2.2 School Physical Resources Adequacy and Academic Achievement

School physical resources are recognized as important in facilitating quality learning environments and improving learning outcomes. The Dakar Framework for Action for example, cognizant of this reality in its strategy number eight called for unity of stakeholders in education to build environments conducive for learning (UNESCO, 2012).

According to Newbies (2019) cited in (Prosperity, 2019) and Glewwe et al. (2011), School physical resources include the infrastructural facilities or buildings and both instructional and non-instructional materials needed for effective teaching and learning within a school set up. Instructional materials include both book and non-book materials, stationaries, charts, laboratory chemicals and other real-life items (*realias*) and teaching aids including Information and communication technology (ICT) resources. Buildings include all types of building for academic and nonacademic activities including those used in areas of co-curricular activities



(CCAs). Buildings may include classrooms and administration block, libraries, laboratories, workshops, computer labs, sports field, Dining halls, Lyceums, gymnasium, washrooms, Dormitories, staffrooms and staff quarters.

Wodon (2016) asserts that while there is consensus in literature that a better physical resource environment improves learning, the magnitude of impact for different resources on learning improvement differs. The intuitive response of assuring quality learning environment by merely equipping all schools with as many resources as possible is not always possible due to austere budgetary environment that most public-school systems operate hence requiring efficient dispensing of available resources. This makes it necessary to assess which resources would make greatest impact on learning outcomes (are most strategic) and then deploy such resources to all schools in a way that does not contribute to inequality of learning condition to any learner.

Wodon (2016) further indicates that the approach that should be taken by progressive governments is to ensure all schools acquire basic resources with greatest impact on learning so as to guarantee reasonable quality of learning norms. Glewwe et al. (2011) similarly avers that Physical resource provision need to be strategic as resources will have a significant effect on academic performance up to the point this minimum level of diversity, quality and adequacy is attained beyond which there will be the *diminishing rate of return* such that further increase in physical resources does not lead to commensurate learning and performance improvement.

Relating to equality in distribution of school inputs and processes, article 4 (b) of the UNESCO` s convention against inequality and discrimination in education propound that for the attainment of educational opportunity equality (EOE) principle, governments are obligated to;

*``Ensure that the standards of education are equivalent in all public education institutions of the same level and that conditions relating to quality of education are also equivalent``*

(UNESCO, 1960: 6)

Steinmann & Olsen (2022) as well as Nkonge, Nderitu & Njihia (2021) indicates that while learning achievements are not expected to be the same for all students in all schools, educational opportunity equality (EOE) principle dictates that variations in learning achievements should not be significantly associated with physical resources adequacy in schools as these critical resources are supposed to be distributed in a balanced manner in all schools. The current study, thus sought to not only provide the empirical status of physical resource in the study area but also establish the association between physical resources adequacy and academic performance and whether the association represented equality of educational opportunity in learning achievement in the schools within the study locale.

Waweru, Thunguri and Chui (2016), OECD (2019a) and Sangara and Mercedes 2016, assert that all schools should purpose and be equipped to nurture holistic learners as global citizens in the 21<sup>st</sup> century. Basic school amenities must therefore cater for the entire gamut of learning domains both cognitive and non-cognitive that would involve classroom activities and activities outside classrooms –CCAs. Information and Communication Technologies (ICTs) have proved indispensable in facilitating quality learning environments for all students. The

ability to display multimedia information that appeal to various senses, the promotion of constructivist learning and collaboration through creation of a knowledge societies as well as wide array of education materials associated with internet are key in achieving quality learning. To effectively combat ``*digital divide*'', all schools must be equipped with basic amenities to enable ICT integration in teaching and learning. Glewwe, Hanushek Humpage and Ravina (2013) in their review of studies on school resources have already indicated that, while ICT integration in education is being embraced research on the influence of ICT investments on learning outcomes is still limited. Glewwe et. al. (2013) further indicate that though huge amounts of money are spend on educational materials and teachers in many developing countries relatively little is known on how effective such expenditures are to increasing student learning. Furthermore, while research on school improvement, school effectiveness and education production function continue to be done, there is still variation in findings due to differing contexts and estimation problems. Key among this problem being omitted variable bias due to many studies focusing on inputs related variables while overlooking process related variables or the other way around. (Glewwe et. al. ,2013; OECD, 2019a)

In Philippines, Ligaya, Figueroa and Jihyun (2016) conducted a correlational study on the Relationship between school facilities and academic achievement in elementary schools between 2009 and 2012. The study also explored if the effect of these facilities varied with location of school. Eight groups of variables were explored on whether they correlated with high performing schools. These variables included the number of rooms and building, the number of teachers in excess of the

recommended pupil- teacher- ratio (PTR) of 35:1, toilet to pupil ratio, school service variable, a component that included (availability of library, health clinic and canteen), school utilities a component that included (electricity, water, sewage and communication) school accessibility as measured by proximity and condition of road and lastly proximity of school to town Centre. The sample frame for the study constituted 315 schools. The study used Pearson correlation and geographically weighted regression (GWR) to identify significant association between school facility and student performances in Philippines` public elementary school. The findings revealed that all but two variables; school services and proximity of school to town Centre positively and significantly correlated with high performing schools. The study also revealed that rural based schools with adequate physical resources outperformed urban based schools with inadequate resources. The study recommended that since education outcomes (completion rates and learning achievement) for all types of school and in particular remote schools depended heavily on adequate resource provision, government policy should prioritize facilitating schools with the critical inputs identified in the study for enhanced learning and performance. The study by Ligaya et al. focused on elementary school general resources availability but did not disaggregate these resources to curricular, co-curricular and ICT resources to ensure resources in a school meet basic requirement to facilitate holistic quality learning. Furthermore, the study did not include process related factors. The current study sought to fill this gap and went a step further by considering secondary school level and used both Kruskal Wallis (H-test) and Mann- Whitney (U-test) analysis to determine the influence of selected physical resources on learning achievement.

In Kenya, Sessional paper number 1 of 2019 Government of Kenya (GoK, 2019) indicated that secondary school sub-sector has experienced massive expansion both by number of institutions from 151 in 1963 to 10665 in 2017 and in terms of enrollments from 30,000 in 1963 to 2.8 million in 2017. Under cost sharing policy that was introduced in the education sector in the 1980s and 1990s, much of the responsibility of supply of physical resources has been met by parents while government caters for the provision of teachers. This has led to varying levels of school physical resources among schools. Ministry of Education (MoE, 2018:59) indicates that public secondary schools in Kenya differ widely in terms of physical resource availability and adequacy. One challenge facing schools that perform dismally in Kenya has been cited as availability of educational resources (Atieno ,2014; Wanzala ,2019)

The question that begged was whether public secondary school in Nyeri and Nyandarua Counties had adequate physical resources to facilitate quality learning and how resources availability and adequacy relate with learning achievement. In this current study, every school was assessed on its physical resource adequacy based on the approach of basic physical resource required for holistic and quality student learning. This included basic resources for promoting both curricular and co-curricular activities (CCAs) as well as resources necessary for basic ICT integration. The status of these resources was then related with performance of schools in KCSE exams to establish any significant association and the corresponding effect size using Kruskal Wallis (H-test) and Mann- Whitney (U-test).

### **2.3 Utilization of school resources and learning achievement**

While provision of adequate physical and human resources constitutes educational inputs variables, their effective usage would constitute a school internal process variable. A growing mass of empirical evidence show that public provision of school inputs does not always lead to improved learning outcomes especially if such resources are not judiciously and effectively used to improve the teacher – student interactions that facilitate learning (Pervin, Ferdowsh & Munni 2021). For some reasons, inputs shortage only constitutes a small part of the ‘‘learning crisis’’ the other is the failure to judiciously and effective use the available resources to facilitate learning (World Bank, 2018:10)

Failure to take account of how inputs are utilized according to Glewwe et al. (2013) has often led to the variation in estimated coefficient of school inputs and test score leading to studies recording high significance, low significance and sometimes no significance for similar resource inputs. Furthermore, schools with similar levels of resources are often associated with vast difference in learning outcomes in terms of school mean scores.

Usage of inputs is as critical as access and adequacy. In Brazil for example, an ambitious project termed ‘‘one laptop per child’’ initiative was marred by years of delay to be put in place but even after it was implemented a random survey by government revealed that 40% of teachers reported as having never used the gadgets or had rarely used them (Word Bank, 2018).

In Nigeria, Nyimejie (2018) conducted a descriptive survey research on educational resource utilization for effective teaching and learning in public

secondary schools. The study incorporated 407 teachers and 12 principals in public secondary schools in River state. The main thrust of the study was to determine how the utilization of school resources influence teaching and learning and to determine problems inhibiting effective utilization. The study was hinged on Cost Benefit Analysis (CBA). The school resources covered included reference books, school furniture, library, laboratory and related equipment, office rooms, sports ground and related equipment, computers and multimedia devices, teaching models. Descriptive statistics, mainly the means standard deviation and percentages were used for data analysis. The findings revealed that optimal use of school resources enhances teaching and learning and student outcomes. It is not the availability of resources that enhance student learning and performance of a school but the adequate and effective utilization of the resources. Problems identified as inhibiting proper utilization of resources included low staff morale, inadequate time and capacity on usage, mismanagement of resources and poor condition of resources. The study recommended proper supervision of not only the adequacy of school resources but also the optimal usage of such resources. The study by Nyimeji focuses on effect of resource utilization on effective pedagogy but did not relate this to quality of learning outcome in form of performance. The current study sought to bridge this gap.

A similar study by Njuguna (2018) on *“Adequacy and utilization of Instructional resources in teaching of Biology in secondary schools in Dagoretti South Sub County, Nairobi”* arrived at a similar conclusion of low levels of resource utilization and scarcity of some instructional resources. The study however, did not relate the availability or utilization of the resources to performance. The current

study intended to not only determine the availability and adequacy of various school resources but also their level of utilization in teaching and learning. The level of utilization was compared to performance of schools in terms of their mean scores. This was intended to help to determine cases of underutilization of resources that may have constituted a hidden barrier to learning. Moreover, the association between level of physical resource utilization and academic performance also makes it possible to establish whether the distribution of resource utilization as a process variable assures the principal of educational opportunity equality (EOE) in academic achievement within the study locale.

#### **2.4 Students` cognitive entry behavior and learning achievement**

Cognitive entry behavior usually represents a form of pre learning or attainment from a previous level of study into another. Knowledge being cumulative, such foundational learning may be a key variable in determining success in the next level of learning. Studies done to relate learning achievement from one level into another have invariably indicated existence of positive correlation (Zeng, Zhong & Wu,2022).

In Turkey, Caliskan (2014) conducted a relational survey study involving 258 first year student in the faculty of education in Necmettin Erbakan university on ``*Effect of cognitive and affective entry behavior on students` learning levels*``. Data collection tools included a Cognitive entry behavior test, an academic self-efficacy scale and student achievement level in university. Method of data analysis included regression analysis, correlation and t-test to determine whether the correlation was significant. Data analysis used Analysis of Moment Structure (AMOS) 16.0 software. The findings revealed that correlational values for interest and self-



concept were 0.62 and 0.22 respectively, while standardized regression between student university performance and interest, attitude and cognitive entry behaviors were -0.1, 0.3 and 0.23 respectively. Only student cognitive entry behavior's correlation was statistically significant as was examined by t-test. The study recommended similar study that determines sequential relationships of student characteristics be conducted at different levels of education including primary and secondary.

In Nigeria, Komba, Kafanabo, Tryphone & Kira (2013) quoted in Agingu (2018) conducted a study to investigate *“correlation between students` performance in end of form two Secondary Examination (FTSEE) and students` performance in Certificate of Secondary Education Exam (CSEE) administered at end of secondary exams”*. The study found a positive correlation between junior secondary exam and senior secondary exam. The study however considered biology performance only and not all the subjects done.

In Ghana, Baidoo-Anu, Gyamerah & Chanimbe (2023) conducted a qualitative study on the effect of secondary school categorization that assigned students posted in different school categories different quality of peers and learning environment in three different categories of schools. The study found that the learning experience and conditions differed significantly which affected students' academic self-esteem. The study consequently recommended a re-evaluation of the school categorization policy in Ghana to ensure quality learning experiences for all on the basis of equality of learning opportunity in all the school categories. The study by Baidoo-Anu et al. (2023) did not; however, examine how the peer effect of

students in terms of their average cognitive entry behavior influenced academic performance at the end of secondary school which is the focus of the current study.

In Kenya at end of primary level, students sit for a national exam Kenya Certificate of Primary Education and the exam is used to place the students to various categories of secondary school on merit such that those with highest score are placed in National and Extra County while the rest are placed in County schools and Sub- County schools respectively. There exists a strong mediation between KCPE score and learning attainment for instance student who entered school with low marks were found to be slow learners and thus delaying syllabus coverage by teachers. Another mediating effect of entry behavior and student performance is through peer tutoring, having one student tutor another in enhancing quality of academic performance. In peer tutoring, the weaker students experience positive influence from having higher quality peers (Wekesa and Simatwa, 2016)

Careful planning needs to be undertaken in placing students in different schools to ensure equity goes hand in hand with quality learning opportunity for all students. Opinions remain divided on student differentiation based on their ability. OECD (2012) indicates that schools with high concentration of students with low cognitive entry behavior may be sub-optimal for quality learning:

*“The way education system is designed may exacerbate initial inequalities and have negative impact on student motivation and engagement”*

(OECD, 2012:11)

While student of same ability may allow teaching and learning at a uniform pace, OECD (2012), seem to advocate for mixed ability schools where students of

differentiated ability learn together in same set up with same resources while those in need of specialized attention are addressed separately under remedial programs.

Most studies conducted on predictive ability of KCPE on KCSE score have concentrated on individual student performance as opposed to the overall peer effect that average cognitive entry behavior of students in a school may have on learning environment and overall achievement of a school (Agingu,2018).

The current study sought to evaluate the effective size of school's average cognitive entry behavior of students on the KCSE mean score.

## **2.5 Teacher Qualifications and Learning Outcomes**

Most studies regard the teacher as the cornerstone of learning quality- indeed, the ``*global learning crisis*'' has been fundamentally acknowledged as the ``*global teaching crisis*'' (World Bank, 2018). For teachers to teach at high quality level, they must themselves possess high quality education, experience and in-service training that afford them the competencies essential for teaching effectiveness. One classic illustration of the importance of teacher related aspect is that in all the leading education system globally based on PISA ranking (Singapore, Finland, Shanghai-China, Japan and Canada) the main driver of their success has been teacher quality (OECD, 2011; Tucker, 2014; Ustun and Eryilmaz, 2018). In almost all world leading countries in terms of students' achievement, the Teaching profession is very competitive. Teaching profession usually attracts the best brains (*crème de la crème*)- teacher trainees are exclusively recruited from the top third of the secondary school cohorts, in terms of training, teachers in these countries receive high quality training in both subject areas as well as in pedagogy. In

Finland for example, all primary and secondary school teachers are expected to have master's degrees and regular in-service professional development is compulsory to maintain employment. (OECD, 2011a; Tucker, 2014;Ustun and Eryilmaz, 2018).

Andreas Schleicher in OECD (2019b) observes that one hurdle that education systems in the world are facing is to attract teacher applicants with strong background and this is compounded by weak initial teacher education (ITE). Consequently ill –trained teachers lacking in both subject mastery and pedagogy is a common phenomenon in most developing countries.

In Kenya, secondary school teachers are either trained in teacher training colleges (TTCs) where they attain Diploma in education while others pursue education degree from university. Upon completion of studies all teachers are registered by Teachers Service Commission (TSC) and issued a unique registration number called TSC number. Secondary school teacher educational qualification therefore ranges from Diploma in education, Bachelor in education degree holders, Post graduate diploma in education (PGDE), masters and doctorate degree holders.

Studies conducted that relate teacher academic qualification and student's scholastic achievement have often produced inconsistent results with some indicating significant positive influence while others find no significant influence (Graham, White, Cologon & Planta, 2020)

In USA, students with effective teachers advance 1.5 grade levels or more over a single school year compared with just 0.5 grade levels for those with ineffective

teachers. In developing countries teacher effect can matter even more (World Bank, 2018)

Mathya and Akala (2014) in their study on *“Effects of teacher recruitment and utilization policy on quality of secondary schools in Kenya”* found that there was significant difference in KCSE performance of student taught by well qualified or expert teachers compared from results of students taught by non-expert teachers. Similarly, a study conducted by Oguta (2022) on the impetus of teachers` experience on student learning outcomes in 54 public secondary schools in Kenya found that teacher experience was significantly related with academic performance. The studies by Mathya et al. (2014) and Oguta (2022) went as far as establishing a relationship between academic performance and teacher experience but did not provide the strength of this relationship relative to other inputs and process variables which is the gap the current study seeks to address.

The fact that teachers are going back to university to further their academic studies beyond the entry qualification while others are attending in-service training is significant for learning outcomes. (Oyaro,2013; Susan et al., 2019)

While some studies ascribe a positive association between teacher qualification and students` academic performance, other studies arrive at mixed findings.

In Australia, a study by Gore, Rosser, Jeremus, Miller & Harris (2023) on the *“Relationship between years of teaching experience and teaching quality”* that incorporated 512 primary teachers in New South Wales within 2014 and 2021 found no significant difference in teaching pedagogy of the novice and expert teachers. Similarly, Kosgei, Mise, Odhiambo & Ayuga (2013) conducted a study

on *“Influence of teacher characteristics on student academic achievement among secondary schools in Nandi District Kenya”*. The study did not find any statistical difference between performance of students taught by diploma teachers and those taught by graduate teachers. The study however found statistically significant difference between teachers who had experience of three years and above compared to new teachers. Teachers who had been involved in in-service training were also found to be more effective than their peers who had not benefitted from such training. Low student performance was largely attributed to inadequate number of teachers in the schools within the district.

One clear controversy in literature on teacher qualifications and their influence on students’ performance is that some studies ascribe it a positive and significant influence World Bank (2018), Mathya and Akala (2014) while in another study Kosgei et al. (2013) there was no significant influence. The current study endeavors to contribute to the understanding of this relationship between teacher qualification and learning outcomes. While the variation in teacher qualifications may influence learning outcomes the quantitative teacher imbalance in schools may also be key as teacher adequacy is determined by the number of teachers available in respect to total number of students enrolled -Teacher Adequacy Index (TAI). The thrust of the current study was therefore not only to determine how highest academic certificate, years of teaching and participation in professional development activities relate with learning outcomes but was also to determine how the teacher quantity or adequacy in relation to students enrolled-(TAI) equally influenced students’ academic performance.

## **2.6 Instructional Leadership Practices and Learning Achievement**

Instructional leadership is a key educational process related factor. It involves mobilization of required teaching and learning resources and guiding the talents and energies of teachers, students and parents towards a common goal of providing highest possible quality learning opportunities for all students within a school. This is slightly different from generic leadership or school administration and management which mainly involve accomplishment of roles through control and supervision. Instructional leadership calls for principal practices that involve heavy focus on both academic and co-curricular excellence (UNESCO, 2016b). Krasnoff (2015) avers that instructional leader can be related with provision of a sense of vision and direction to the school, participatory management that empowers others by engaging stakeholders in school operations and decision-making process, support and monitoring of instruction in a way as to be aware of what is going on in class and innovative resourcefulness that is able to provide what is needed for teaching and learning. What clearly distinguishes instructional leadership even from general school management is its focus towards improvement in teaching and learning and other educational outcomes (Hallinger and Wen-Chung, 2015; OECD, 2008)

Instructional leadership is viewed to have very great potential to students` learning and is placed second only to teacher quality and effectiveness. Efforts to narrow achievement gaps in education as well as improve school accountability emphasize on the role of instructional leadership. Haim (2018) has however asserted that despite empirical evidence on importance of instructional leadership in improving teaching and learning, many school principals have continued to devote limited

time and efforts on instructional management related roles leading to compromise on quality of students learning.

Based on extensive cross-country research on instructional leadership by OECD (2011b) and distilling from the works of Hallinger and Wen-Chung (2015), the study identified five key instructional leadership dimensions which formed the basis upon which this concept was investigated. These dimensions included:

Firstly, *defining the school mission*. This dimension entails charting a clear direction for the school through strategic micro planning. Delineating clear learning goals and communicating these goals to all stakeholders so as to garner support throughout school and community.

Secondly, *managing instructional programs* Principals have to supervise and evaluate teaching and learning both teachers work and students work. This may involve checking if teachers have schemes of work, lesson plans and updated lesson notes some of which is contained within Teachers Performance Appraisal and Development (TPAD) tools instituted by Teachers Service Commission (TSC). Supervision and support will require gathering and analysis of data as well as monitoring and evaluation. The principal must as well protect learning time or time on task. The role also encompasses instituting an effective internal assessment regime and monitoring of student progress through use of performance data to inform and improve instruction including rewarding outstanding students and instituting intervention for struggling students. In sum this role seems to demand significant visibility of the school principal as an instructional leader within a school.



Thirdly, *strategic resources provision* that focuses on resource provision that is geared towards improving teaching and learning in terms of both curricular and co-curricular activities.

Fourthly, *developing and supporting teacher quality and motivation*. This involves motivating teachers or providing incentives for teaching and catering for teacher welfare needs. Supporting capacity building of the teachers for continuous improvement as well as induction of new teachers into the system. There is also the need, based on their experience, for the principal to frequently get involved in assisting teachers in solving general teaching and classroom management challenges.

Lastly, *Leadership engagement beyond the school borders* Involves partnering with other performing schools and professional bodies. This role may also include strategies to involve parents, guardians on decision making in school leadership and in nurturing of student learning.

Krasnoff (2015) cited a longitudinal study conducted at university of Minnesota and Toronto investigated the connection between instructional management and student performance found that principals are second only to teachers as most critical school level determinants of performance and while instructional leadership can explain about 25% of variation teachers accounted for over 33%. Another school wide research by Branch et al. (2013) quoted in Krasnoff (2015) showed that while teachers affect only their students in the classes that they teach, principals through their policies and influence affect all students in the entire school. They projected that highly effective principals can raise students` score by

10 percentile point on standardized test in a period of one year, help reduce absenteeism and raise graduation rates. They also noted paucity of research based on leadership effectiveness and recommended research focus on this area.

In China, Li, Chan & Hu (2023) conducted a study on influence of instructional leadership on learning achievement. The study used structured equation model and established that instructional leadership influenced academic achievement through the mediation of teacher capacity building. The study by Li et al. (2023) focused on the Chinese context and did not relate the various specific instructional leadership dimensions with academic performance which forms the focus of the current study.

Ndambuki (2020) conducted a mixed methods research to investigate the *“Influence of instructional leadership on academic performance in public secondary schools in Makueni County Kenya”*. The main leadership practices investigated included principal’s role in; setting direction, school climate, teacher capacity building and supervision. The study incorporated 147 head teachers and 357 teachers in the sample frame and used correlation to establish relationship between the independent and dependent variables. The findings revealed that all the four leadership roles were significantly correlated with performance. The study by Ndambuki (2020) went as far as establishing relationship between instructional leadership and performance but did not determine the effective size of instructional leadership as a critical learning determinant in relation to other inputs and process variables. The current study used Kruskal Wallis (H-test) and Mann- Whitney (U-test) to determine the influence and explanatory effect of instructional leadership

on learning achievements of students in public secondary schools in Nyeri and Nyandarua Counties.

## **2.7 Summary of Literature Review and Gaps Identified**

This chapter reviewed the available literature concerning key variables for the study as guided by the objectives.

### **School physical resources adequacy and utilization versus academic achievement**

Studies reviewed acknowledged the importance of physical resources in promoting effective teaching and learning; however, extant research available have considered physical resources availability in a school in a composite approach without disaggregating this resources in terms of those for general curricula, co-curricular and resources for ICTs which is a gap the current study sought to address .The disaggregation creates a clear picture of whether resources available in a school are adequate to offer holistic and quality student learning. The mixed findings on the relationship between physical resources and academic achievements in other contexts made direct application of such studies to the study locale challenging and thus, to better understand a clear relationship of these variables in the study locale, a study was essential. Moreover, research available indicates that while physical resources adequacy is key for learning, failure to optimally utilize available resources may mediate the relationship between physical resources and performance and thus constitute a hidden process variable barrier that limit learning and academic achievement. The level of resource utilization and its association with academic achievement in the study locale was not clear and thus constituted a gap

### **Students` cognitive entry behavior versus academic achievement**

Opinions remain divided on student differentiation based on their ability. While placing students of same ability in same class or school seem to enable use of uniform approach and learning pace, such learning environments are seen as sub-optimal for quality learning and that they engender inequity. Most studies conducted on the association between KCPE and KCSE score have concentrated on individual student performance as opposed to the overall peer effect that average cognitive entry behavior of students in a school may have on learning environment and overall achievement of a school. The current study sought to bridge this gap by establishing to what extent and in which ways average cognitive entry behavior of students in a school influences academic achievement and whether the distribution of average cognitive entry behavior in the schools within the study locale represented equality of educational opportunity.

### **Teachers` qualifications versus academic achievement**

Studies conducted that relate teacher qualification and student scholastic achievement have produced inconsistent findings. The current study sought to fill this gap by contributing in provision of empirical data on this relationship through determining the status and distribution of teacher qualifications within the schools in the study locale as well as the association between this distribution and academic performance. This contribution was essential in establishing the extant determinants of the observed low and widely differentiated status of academic performance in the study locale.

### **Instructional leadership versus academic achievement**

While many studies reviewed indicate that instructional leadership is a significant process variable with potential to influence students' academic performance, academic performance in the study locale had a low and widely differentiated status yet instructional leadership status was not clear and this created a gap that the current study sought to fill. In general, it was apparently clear from the foregoing that a research gap in literature existed for an empirical study that would focus on independent variables that incorporate both educational inputs variables (Physical resources, students cognitive entry behavior and teacher qualifications) and process variables (Instructional leadership practices and level of utilization of school physical resources) and relate this to students' academic achievement as the Dependent variable. There was also a need to established the status of the adequacy and level of utilization of schools` physical resources in the study locale whereby the physical resources were to be clearly disaggregated as general curricular resources, co-curricular resources and ICTs resources.

## CHAPTER THREE

### RESEARCH DESIGN AND METHODOLOGY

#### 3.1 Introduction

This section provides the research design and methodology. In particular, it highlights information for the study regarding; the research design, study variables, research methodology, location of the study, target population, sampling techniques, research instrument, validity, reliability, piloting study, data collection, method of data analysis and logistical and ethical considerations.

#### 3.1.2 Research Design, Study Variables and Methodology

The study adopted the ex-post facto research design which was appropriate in an inquiry where the independent variables was not directly manipulated by the researcher but the outcomes of the dependent variable were considered to have already received the influence from independent variables. The research therefore sought to determine the contribution of some antecedent factors-school learning inputs and processes, to the observed outcome -students' performance (Cresswell, 2014)

The main **study variables** that constituted the basis of data collection and analysis were:

##### **Independent variables**

- a) **Adequacy of school physical resources.** The main indicators were the number of existing facilities both buildings and teaching learning materials in a school in comparison to school's enrolment (Student population). *Facility adequacy index* was worked out as a percentage where by 100% represented perfect sufficiency and 0% represent absence of a resource (Wodon, 2016: 11)

$$\text{Facility Adequacy Index (FAI)} = \frac{C}{P} \times 100\%$$

Where: C is total capacity of a particular facility in a given school and P is the population of students enrolled or expected to use the facility. Science laboratory adequacy index (SLAI), Library adequacy index (LAI), Computer lab adequacy index (CLAI), Hall adequacy index (HAI), Classroom facility adequacy index (CFAI), Computer adequacy index (CAI). The facility adequacy index was used to sort a school as either having adequate resource or inadequate resource for the purpose of hypothesis testing.

- b) **Students` cognitive entry behavior** whose main indicator was average KCPE marks of students whose KCSE exams was being considered.
- c) **Teacher qualifications.** Which include *Highest academic certificate* and *experience in* form of number of years of teaching and capacity building training as well as *quantity* of teachers available in relation to population of students enrolled in a school. Average teacher qualification certificate in a school (ATQ), teacher qualification index (TQI), teacher adequacy index (TAI) as well as proportions of experienced teachers in a school were worked out and related with academic performance.
- d) **Instructional leadership practices** the main indicators were categorized into five dimensions examined through five-point Likert scale items. These were *principal`s focus on defining and communicating school mission (1)*, *managing instructional programs (2)* especially monitoring of students` progress, supervision and evaluation of teaching, learning and assessments activities and maintaining high visibility. The others were *Strategic resource provision (3)*, *developing teacher quality and motivation (4)* that entailed principal practice of

sponsoring teachers for professional development programs and rewarding teacher performance with incentives finally *Leadership beyond school borders* (5) that entailed principal practice of collaborating with parents and other stakeholders .A modified version of the Principal Instructional Management Rating scale (PIMRS) was used to determine principal instructional leadership practices (Hallinger &Wen-Chung, 2015). The questions targeted school principals, heads of departments (HoDs) and teachers.

- e) **Utilization of school resources**, the indicator was the *frequency of use* of available resources in school including laboratory, library, ICT tools, sports field and teaching learning materials. A five-point Likert scale items ranging from Not at all/Almost never to Very large extent/Almost Always were used to determine the extent of utilization of the various resource.

### **Dependent variable**

- a) **Students` academic performance.** the main indicator being school average KCSE mean score in the last three consecutive years (2018-2020)

**Intervening variables** identified that could have interfered with the relationship between the independent and dependent variable included *examination irregularities* especially cheating in exams. From the findings however, it emerged that in all the schools sampled no school reported having had a case of gross examination irregularity or national exam results cancellation. *Teacher transfers* including principal transfers was also considered to be an extraneous variable that could have affected new teachers` perceptions or in case of principals newly appointed principals could not have had ample time to impact their school programs and practices. The study thus targeted not only classroom teachers but



also the HODs to get balanced views and perceptions. From the findings it also emerged that teacher transfers were less rampant and about three quarters of the principals had been principals with an experience of five years and above and had served in their current stations for over three years. *Students` socio-economic status* was also considered to be an extraneous variable in the study however, since all schools were public and students of varying socio-economic status attended all categories of schools the effect was taken to be spread out in all categories of schools though not perfectly.

### **Research methodology**

In terms of **methodology** both quantitative and qualitative approaches were used as the study sought to collect both quantitative and qualitative data. Both data were collected at the same time and accorded equal weight in the analysis. Quantitative methods were appropriate for numerical data while qualitative methods were appropriate for in depth investigation on human related perception, attitudes and ideas (Kothari, 2013). Quantitative data was collected using questionnaires for principals, heads of departments (HODs) and teachers. An observation schedule was used to triangulate data from the questionnaires and a document analysis guide to extract documented information regarding physical resource adequacy and performance. Much of the qualitative data involving school processes will be transformed into quantitative data using rating scale to make it amenable to statistical analysis though some aspect of in-depth school processes and ways educational inputs mediate on teaching and learning activities especially from open ended questionnaire items was analyzed qualitatively. Photographs were also taken to depict natural setting of particular details of the phenomena under study

(Creswell ,2014; Creswell and Plano ,2011). Interviewing was conducted targeting county quality assurance and standards officers, and TSC county directors of education.

### **3.2 Location of the Study**

The study was conducted in public secondary schools within Nyeri and Nyandarua counties, Kenya. Nyeri and Nyandarua counties are neighboring counties located in central part of Kenya. The two counties lie astride the equator between latitude  $00^{\circ} 08' N$  and  $00^{\circ} 50' S$  and between longitude  $35^{\circ} 13' E$  and  $37^{\circ} 20' E$ . Counties constituted the second tier or sub national level of government after the national one and are geographical units for devolved government based on 2010 constitution of Kenya (Makori and Onderi, 2013). Nyeri county was composed of eight Sub counties while Nyandarua county was composed of five Sub counties and all the four categories of schools in Kenya (national, extra-county, county and sub-county) were represented within the two counties.

Academic performance in KCSE exams in Nyeri and Nyandarua County was characterized by a huge number of students who scored low quality grades while overall performance was widely differentiated among schools. Some schools posted high quality grades and high mean scores consistently while many others post very low grades leading to low mean scores and very high wastage rates. The average mean score for Nyeri and Nyandarua counties in KCSE between 2017 and 2019 was 4.25 (D+) and 3.86 (D+) respectively against a national mean score of 4.3 (D+) which was also low

The two counties had also undergone steady increase in the number of secondary schools going age population (14-17 years old) from 56,288 in 2009 to 132,350 in

2018 and the figure was projected to increase to 158,211 by 2022. A survey by Nyawira et al. (2019) on learning condition in public secondary schools in Nyeri and other counties in central region titled *Schools groan under the weight of extra students* had depicted a severe challenge on learning spaces in public secondary schools in the region. The demand for secondary school places had continued to increase in the area against a backdrop of scarce educational resources however while the question of the adequacy of available resources to support quality learning existed, focus had begun changing on ways in which internal school processes like instructional management and efficient utilization of available resources could have been integral in raising learning achievements and reducing inefficiencies in learning that translate to low learning outcomes, wastage and dropouts. In Nyandarua county for instance, the dropout rate in secondary school was estimated at 5.8% (Muturi, 2015, The County Government of Nyeri, 2018, The County Government of Nyandarua, 2018)

### **3.3 Target Population**

The target population for the study included 386 principals and 2316 Heads of Departments (HODs), and 4160 teachers in 386 schools. 2 County Quality Assurance and Standards Officer (CQASO) and 2 County Directors of Education (CDE) were targeted as a senior educational official.

### **3.4 Sampling Techniques and Sample Size**

Orodho (2012) asserts that choice of a suitable sampling technique depends on several factors for instance the size of the target population, homogeneity, and research design adopted. In this study, schools were sampled using stratified random sampling so that all four school categories (nationals, extra- County,

County and sub-county) were included in the study. Simple random sampling was then used to select specific schools within a specified category. Simple random sampling was also used to select teachers in a given school once their school had been included in the sample as most of their characteristics was randomly distributed. The HODs and principals were purposively sampled as their position made them form critical respondent group with specific information.

Sample size for the study was arrived at using Kothari (2013) formula for sample size determination when the size of population is finite. Kothari argues that to facilitate inferential statistics where sample statistic is used to estimate population parameters, the sample size must be reliable and representative and consequently proposes the formula:

$$n = \frac{Z^2 \cdot p \cdot q \cdot N}{e^2(N - 1) + Z^2 \cdot p \cdot q}$$

Where: n = sample size, Z= Z-score at 0.05 level of significance or 95% confidence level which is equivalent to 1.96, p= proportion in the population assumed to contain characteristic of interest and since no estimate was available 50% or (0.5) was assumed which usually gives the highest sample size, q = (1-p), e = margin of allowable error, which in this study was taken as 5%.

Sample size (n) for the schools from a target population of 386 schools

$$n = \frac{1.96^2 \cdot 0.5 \cdot 0.5 \cdot 386}{0.05^2(386-1) + 1.96^2 \cdot 0.5 \cdot 0.5} = 192$$

By use of the same formula, the sample size (n) for the teachers from a target population of 4160 gives 352. HODs, principals, county directors of education

(CDE) and county quality assurance and standard officers (CQASOs) were purposively sampled.

**Table 3.1: Sampling frame**

<b>Respondent</b>	<b>Sampling technique</b>	<b>Population</b>	<b>Sample size</b>	<b>Sample %</b>
principals	Purposive	386	192	49.7
HODs	Purposive	2316	330	14.2
Teachers	Simple random	4160	352	24.9
CQASOs	Purposive	2	2	100.0
TSC CDE	Purposive	2	2	100.0
Schools	Stratified random	386	192	49.7
<b>Total</b>		<b>7252</b>	<b>1070</b>	<b>14.7</b>

Source: Nyeri and Nyandarua counties directors of education records. (October, 2020)

Random stratified sampling method for the various categories of schools yielded 4 national schools, 18 extra county schools, 26 county schools and 144 sub county schools out of the 192 schools.

**Table 3.2: Sample distribution for School category strata's**

<b>Category</b>	<b>Sampling technique</b>	<b>Population</b>	<b>Sample size</b>	<b>Sample %</b>
National	purposive	4	4	100.0
Extra County	Simple	22	18	81.8
	Random			
County	purposive	36	26	86.6
Sub County	Simple	324	144	51.6
	Random			
<b>Total</b>		<b>386</b>	<b>192</b>	<b>49.7</b>

### 3.5 Research Instruments

The main instrument for data collection included **questionnaires** for principals, HODs and teachers. Questionnaires were preferred because of the large group of

respondents involved as well as the quantitative nature of most information required. The questionnaires were also easy to analyze and they afforded respondent adequate time to give well thought out and reliable responses (Kothari 2013). **Interview schedules** was used targeting the County quality assurance and standard officers (CQASOs) and TSC county directors of education (TSC CDE). Interview schedules were essential in getting deeper information on inputs and process factors and how they mediate on learning. **Observation Schedule** was used to extract important information on physical environment facilities and resources related to quality of academic and co-curricular provision. **Document Analysis Guide** was used to extract documented information on performance, teachers` qualifications and students` KCPE mean score as well as school resources availability from inventories.

Questionnaires and interview schedules were distributed as follows:

**Learning Inputs and processes Questionnaires (LIPQs)**

For 1) Principal, 2) HODs, 3) Teachers

**Learning inputs and processes Interview Schedules (LIPSs)**

1. For County Quality Assurance and Standards Officer (CQASO)
2. Teachers Service Commission County Directors of Education (TSC CDE)

**3.6 Piloting Study**

To ensure that the instruments were workable and questions were clear to respondent and thence yielded expected responses, the instruments were pre tested. One school from each of the four school categories were picked from the study locale for the exercise. A total of 8 principals, 16 HODs and 16 teachers were involved in the exercise. The researcher used the insights from the pilot exercise to

improve the clarity and quality of the final instruments and in logistical planning for the actual questionnaire administration in the actual field work. Determination of validity and reliability of the study instruments preceded the Piloting study.

### **3.7 Validity of Research Instruments**

To ensure high *content validity* for the questionnaires, the content domain for the items will was guided by the objectives and variables within the conceptual framework. The instruments were then given to five validators, two content experts (University lecturers in the faculty of education) and three lay expert (a Principal, a HOD and an ordinary classroom Teacher) who were drawn from the study locale. The views from the validators on how essential and precise the various items were in relation to generating data to meet the objectives and test hypothesis for the study were incorporated in improving the final quality of the questionnaire items. In relation to overall *face validity* and other qualitative aspect of the instruments, the views by the validators in regards to clarity, wordings, structure and length of questionnaire were also taken into consideration to ensure the final quality of all instruments was high. Any item viewed as unnecessary was dropped while unclear items were modified and paraphrased. In relation to ascertaining the *Construct validity* which measures the degree to which an instrument measures the trait or theoretical Construct it intends to measure, the study had clearly defined variables. To investigate instructional leadership variable for instance, most Items were drawn from an already validated rating scale - Principal Instructional Management Rating scale (PIMRS) (Hallinger, Wen-Chung, 2015). Generally, construct validity was enhanced by testing the hypothesis logically and empirically as underpinned by the guiding theory in this study (Mogaka, 2020)

### 3.8 Reliability

To test for the reliability of the instruments, eight schools, were used, four from each county so that all school categories could be represented. Split half technique that required only one testing was applied to test the extent the tools could yield consistent result after repeated trial or indicate if the study could be reproduced under similar condition and methodology elsewhere. Sum of scores for even and odd questions was worked out for each of the three questionnaires classified as Learning Inputs and Processes Questionnaires (LIPQs) and a correlation coefficient worked out to get the coefficient of reliability for half of the items.

The Spearman-Brown prophecy formula was eventually used to compute the numeric value that represented the complete questionnaire reliability. (Royal,

2017)

$$r_{\text{complete}} = \frac{2 \times r_{\text{half}}}{1 + r_{\text{half}}}$$

Where:  $r_{\text{complete}}$  represents the internal consistency or reliability of the entire questionnaire, and  $r_{\text{half}}$  represents reliability of half the questionnaire items obtained from the correlation of sum of scores of odd and even questions.

The Spearman-Brown prophecy formula yielded a reliability coefficient of 0.89, 0.92 and 0.87 for Principals` questionnaire, HODs` questionnaire and Teachers` questionnaire respectively. Royal (2017) asserts that an instrument with a reliability of below 0.70 is limiting in its application, between 0.70 and 0.79 is Adequate, between 0.80 and 0.89 is Good while that with 0.9 and above is Excellent. The questionnaires were thus regarded as appropriate for data collection with respect to computed reliability coefficients.



### **3.9 Data Collection Procedure**

Upon approval by Kenyatta University to conduct the research, the researcher applied for the research permit from National Commission for Science, Technology and Innovation (NACOSTI). Data collection exercise then proceeded as outlined below;

Stage 1 Questionnaire administration: The study locale spanned two counties that is Nyeri and Nyandarua counties. The experience from pilot study on how much time on average a school required to fill the questionnaire and other logistics was utilized. Distribution of questionnaire was mainly done by the researcher in person by use of a motorcycle (boda-boda) that made it possible to traverse even the most interior schools. At the school level the questionnaires were given to the principal or deputy principal who assisted in coordinating the filling of the three types of questionnaires (principal, HoDs and teachers). The questionnaire distribution exercise lasted about three weeks for the two counties. The schools were allowed about a week to complete the filling of the questionnaires as schools were in session and teachers were quite busy. Questionnaire collection was much easier exercise as the researcher was able to be notified by the principals or deputy principals to collect the questionnaires once filling in was completed. Two research assistants in both counties assisted the researcher in this exercise which speeded up the exercise considerably.

Stage 2 Conducting Interviews. After the questionnaire distribution and collection, the researcher arranged for interviews and booked appointments with county directors of quality assurance and standards officers and teachers service commission county directors for the interviews which lasted about 45 minutes.

Stage 3 Conducting observations. Observation for some selected schools entailed visiting the schools and taking notes of prevailing condition within the school both in terms of physical condition of resources availability and utilization. Evidence from documents like strategic plans, school admission registers and teachers mark books or computer printouts were checked to triangulate data from the filled in questionnaires. Observation checklist was used to ascertain availability of critical facilities and teaching learning materials. The main purpose for document analysis and observation was to triangulate data collected from questionnaire in terms of validity and integrity but also it afforded the researcher a chance to take photographs of particular aspect of the different phenomena under study in their natural setting.

### **3.10 Method of Data Analysis**

The study collected both quantitative and qualitative data. Quantitative data was analyzed in two main stages. The first stage involved collation and summary of data from each school into a single data set that was representative of each school along dependent and independent variables of the study. The researcher worked out the status of each school in terms of physical resource adequacy status, teacher characteristics, and nature of instructional leadership and level of physical resource utilization. This mainly involved use of descriptive statistics including measures of central tendency, dispersions, ratios and percentages. Most information in the data was ordinal data from five-point Likert scale, for comparability much of data was classified into groups to make it amenable to statistical analysis.

The second stage involved establishing relationship between independent variable both inputs and processes and the dependent variable.

Due to data non-normality and the fact that most data were ordinal or classified in groups, Kruskal-Wallis Analysis of Variance or H-test (a non-parametric equivalent of one-way analysis of variance or F-test) and Mann-Whitney U-test (a non-parametric equivalent of independent samples t-test) were used to compare the independent samples in the study. Effect sizes were also computed to determine the strength of the association between the dependent and independent variable as well as determine what proportion of variance in the dependent variable each independent variable contributed (Orcan, 2020)

### **The Mann-Whitney U-test (Independent samples U-test)**

$$U_i = n_1.n_2 + \frac{n_i(n_i+1)}{2} - \sum R_i$$

Where:  $U_i$  is the test statistic for the sample being considered,  $n_i$  is the sample size of the sample being considered,  $n_1$  is the sample size of the first sample,  $n_2$  is the sample size of the second sample and  $\sum R_i$  is the total of ranks of the sample being considered. The smaller calculated value between  $U_1$  and  $U_2$  is the one compared with critical values of U-test. (Corder and Foreman,2009)

### **Effect sizes for Mann-Whitney U-test**

$$r^2(\eta^2) = \frac{Z^2}{n}$$

Where:  $Z$  is standardized U- value,  $n$  is the total sample size,  $r^2(\eta^2)$  the effect size index assumes values from 0-1 and multiplied by 100%, indicates the amount of variance in the dependent variable explained by the independent variable. Interpretation can be 0.01 - < 0.06 (Small effect), 0.06 - < 0.14 (Moderate Effect),  $\geq 0.14$  Large effect (Corder and Foreman,2009; Tomczak& Tomczak, 2014)

### **Kruskal-Wallis H-test (One-way analysis of variance H-test)**

$$H = \frac{12}{N(N+1)} \sum_{i=0}^n \frac{Ri^2}{ni} - 3(N + 1)$$

Where N is the overall sample size, from all samples combined, Ri is the total of ranks from a particular sample, n is the number of values from corresponding rank total and degrees of freedom (df) is number of groups less one (K-1), K being the number of groups. The H-test is usually equivalent to  $X^2$  with K-1degrees of freedom. (Corder and Foreman,2009)

### **Effect size for Kruskal-Wallis H-test**

$$r^2(\eta^2) = \frac{H}{(n^2-1)/n+1}$$

H -the Kruskal Wallis H-statistic, n- total number of observations,  $r^2 (\eta^2)$  the effect size index assumes values from 0-1 and multiplied by 100%, indicates the amount of variance in the dependent variable explained by the independent variable. Interpretation can be 0.01 - < 0.06 (Small effect), 0.06 - < 0.14 (Moderate Effect),  $\geq 0.14$  Large effect (Corder and Foreman,2009, Tomczac& Tomczak, 2014)

**Qualitative data** from open ended questions and from interviews was analyzed using content analysis. According to Mugenda and Mugenda (2012), thematic analysis involves identifying meaningful categories or themes in written text, conversations or dialogues. The process involved transcribing all information into text. This was followed by coding which is segmenting portions of text and writing a word or phrase indicating how the text informs the objective. Emerging ideas were then used to develop themes and concepts that helped to address the research

questions. Some of the data was also reported in words using researcher's interpretation of a particular issues and direct quotations of the respondent 'voices' in verbatim was also included to give credence to the report.

### **3.11 Logistical and Ethical Considerations**

All information that was reviewed and whose ideas shaped this study has been properly acknowledged consistent with student declaration requirement to cite all such information both in text and provide reference list as per latest American Psychological Association (APA) guidelines. This is also in regard to academic anti plagiarism requirement. Respondents have been treated with utmost respect and their privacy rights respected. They were made aware of what the research was all about and assured that information sought would be used for academic research purpose only and not for any other undisclosed use. Names and identity of respondents were not asked for so that respondent could enjoy the liberty of remaining anonymous. All individual respondents or schools directly featured in this report have been appropriately coded to avoid any infringement of their anonymity rights. Permission to conduct research in public secondary schools and in any other education office within the study area was sought through appropriate letter including signing of additional consent to include observation photos appearing in this work. This also included acquisition of introduction letter from the school of education and from NACOSTI. Deliberate willingness to participate and quit participation at any time remained a communicated right to all respondents in the study.

## CHAPTER FOUR

### PRESENTATION OF FINDINGS, INTERPRETATION AND DISCUSSION

#### 4.1 Introduction

This chapter presents the data obtained from the fieldwork, analysis interpretations and discussions within the context of the study's main purpose, objectives and hypotheses. To elucidate this, the main purpose of this study was to provide empirical data on the status of learning inputs and processes within public secondary schools in Nyeri and Nyandarua counties, as well as account for the specific influence of these learning input and processes on academic performance.

The objectives that guided this study were to;

- i. Determine the influence of adequacy and utilization of school physical resources on academic performance
- ii. Establish the influence of students' cognitive entry behavior on academic performance
- iii. Establish the influence of teacher qualifications on academic performance
- iv. Determine the influence of instructional leadership on academic performance

The following Null hypotheses guided the bivariate statistical analysis;

H<sub>0</sub>1: School physical resources adequacy does not have statistically significant influence on academic performance

H<sub>0</sub>2: School physical resources utilization does not have statistically significant influence on academic performance

H<sub>0</sub>3: Students' cognitive entry behavior does not have statistically significant influence academic performance

H<sub>0</sub>4: Teacher qualifications do not have statistically significant influence on academic performance

H<sub>0</sub>5: Instructional leadership does not have statistically significant influence on academic performance

## 4.2 General and Demographic Information

### 4.2.1 Questionnaire Return Rate

The return rate of questionnaires was excellent as the study targeted 896 respondents out of which 860 returned the filled in questionnaires.

**Table 4.1: Questionnaire Return Rate**

<b>Respondent</b>	<b>Sample</b>	<b>Returned</b>	<b>%</b>
Principals	192	172	89.6
HODs	352	344	97.7
Teachers	352	344	97.7
<b>Total</b>	<b>896</b>	<b>860</b>	<b>96.0</b>

Source: Data from questionnaires (2021), SPSS analysis.

Table 4.1 indicates that the questionnaire return rate for all the three types of questionnaires was above 89%. Mugenda and Mugenda (2009) guides that a return rate of about half (50%) can suffice, 60% is good while that above 70% is excellent for statistical analysis.

#### 4.2.2 School Category Representation in the Questionnaire Return Rate

**Table 4.2: School category representation**

School Category	Sample	Returned	%
National Schools	4	3	75.0
Extra-County Schools	18	13	72.2
County Schools	26	21	80.8
Sub-County Schools	144	135	93.8
<b>Total</b>	<b>192</b>	<b>172</b>	<b>89.6</b>

Source: Data from questionnaires (2021), SPSS analysis.

Table 4.2 indicates that schools of all categories (National, Extra- County, County and Sub- County) were adequately represented in the questionnaires that were returned. In absolute terms, the sub-county category schools were the majority (about 78%) while the national school's category were the minority (about 2%)

#### 4.2.3 Distribution of schools by student population

The study sought to determine the population of students within the public secondary schools in the study locale.

**Table 4.3: Distribution of schools by size of their student population**

Student Population	Streams	N	%
0-180	1	31	18
181-540	2-3	81	47.1
541-900	4-5	41	23.9
901-1260	6-7	11	6.4
1261-1620	8-9	6	3.5
1621-1980	10-11	2	1.1
<b>Total</b>		<b>172</b>	<b>100.0</b>

Source: Data from questionnaires (2021), SPSS analysis.

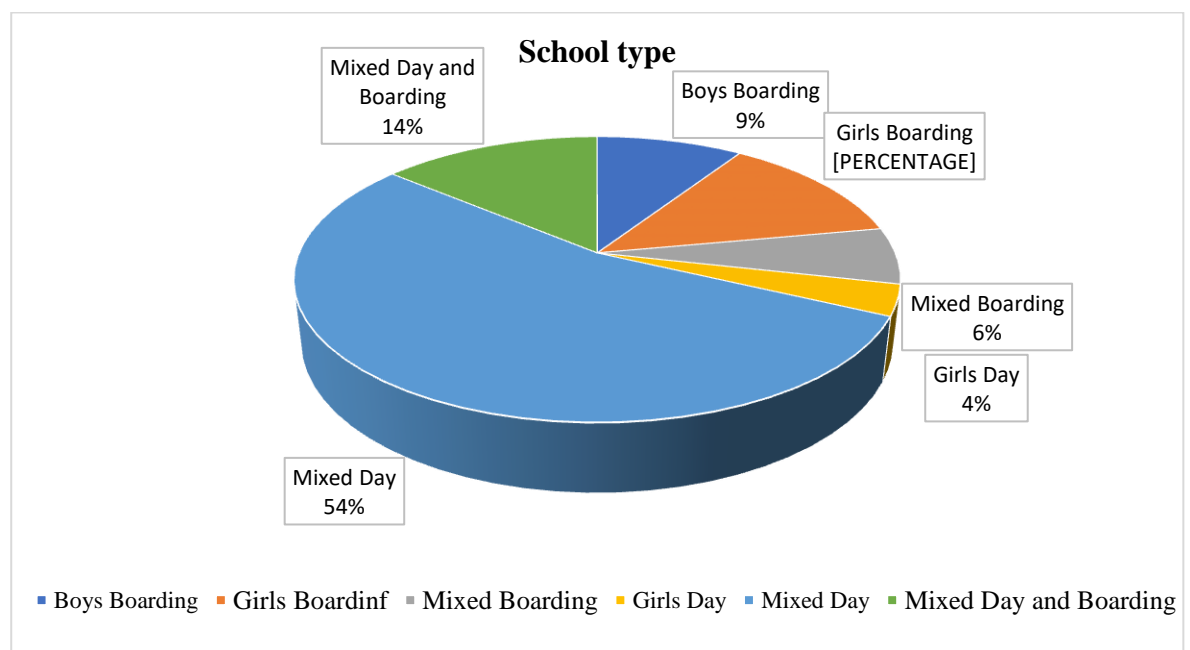


Student population in the schools covered was very varied such that the smallest school had only 74 students while the school with the largest students` population had 1778 students. Table 4.3 indicates that nearly half (47%) of the schools fell between 2 to 3 streams. Large schools with 6 and above streams constituted about 11%. Student population is a very critical factor that influences the resource adequacy or scarcity. Most schools had experienced exponential growth in the size of their population yet the infrastructural and other resource capacity had not expanded commensurately leading to huge resource adequacy imbalances among schools.

#### 4.2.4 Distribution of Schools by School Type

The study sought to determine the distribution of schools within the study locale based on the school type. There were six school types in total.

**Figure 4.1: Distribution of schools by school type**



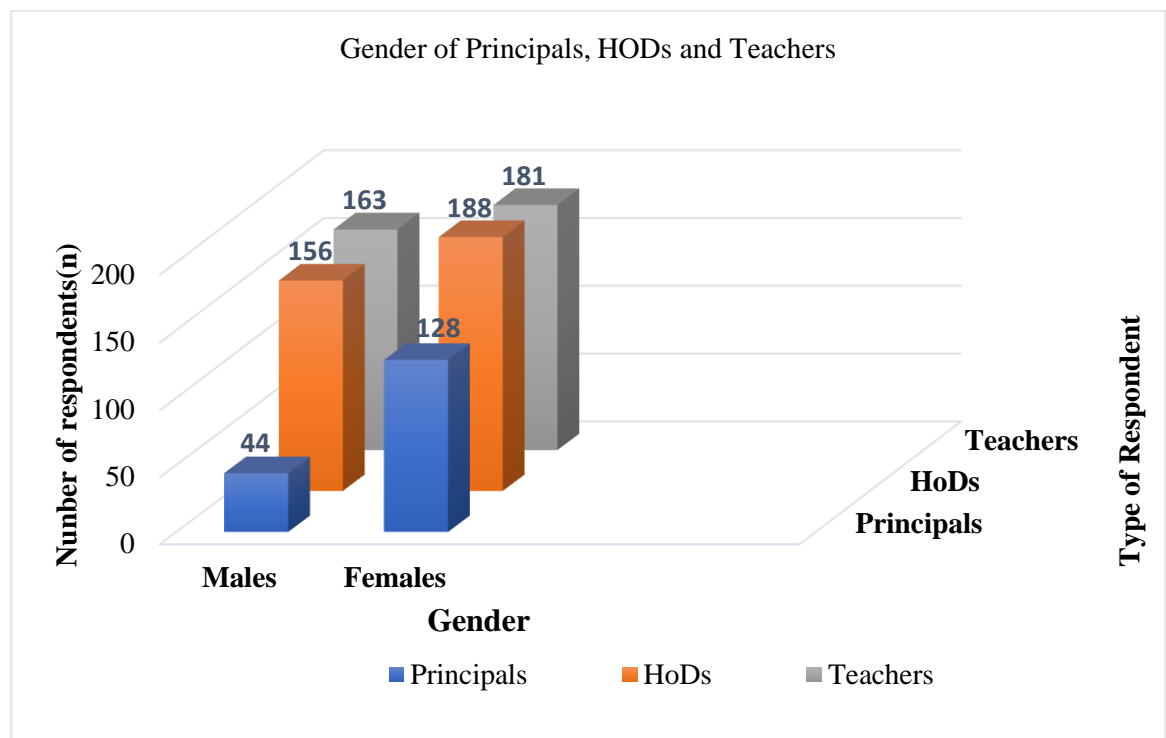
Source: Data from questionnaires (2021), SPSS analysis.

Figure 4.1 indicate that slightly more than two-fifth of the schools (42%) were boarding schools or had boarding options while most of the other schools (about a two-thirds) were either day schools or had day schooling options. There were more girls only schools 28 (17%) compared to boys only schools 16 (9%). Slightly more than half (54%) of the schools were mixed day schools of the sub-county category.

#### 4.2.5 Bio data of respondents

The study sought to determine the bio data of respondent ranging from gender, age, highest academic qualification and work-related experience.

**Figure 4.2: Gender of principals, HoDs and Teachers**

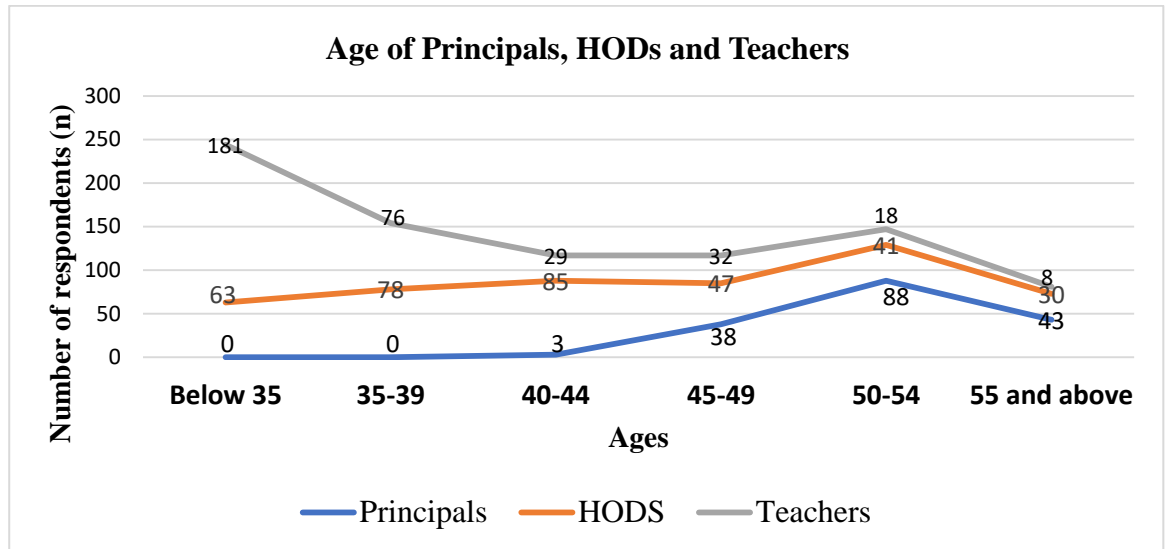


Source: Data from questionnaires (2021), SPSS analysis.

Figure 4.2 indicates that there were more female principals, HoDs and Classroom teachers than male counterparts. The difference in numbers was however not so much except for the principals where about three quarters of the principals were female. The imbalance in gender relating to school leadership may have been

contributed in part by the high number of girl schools than boys' school in the study area.

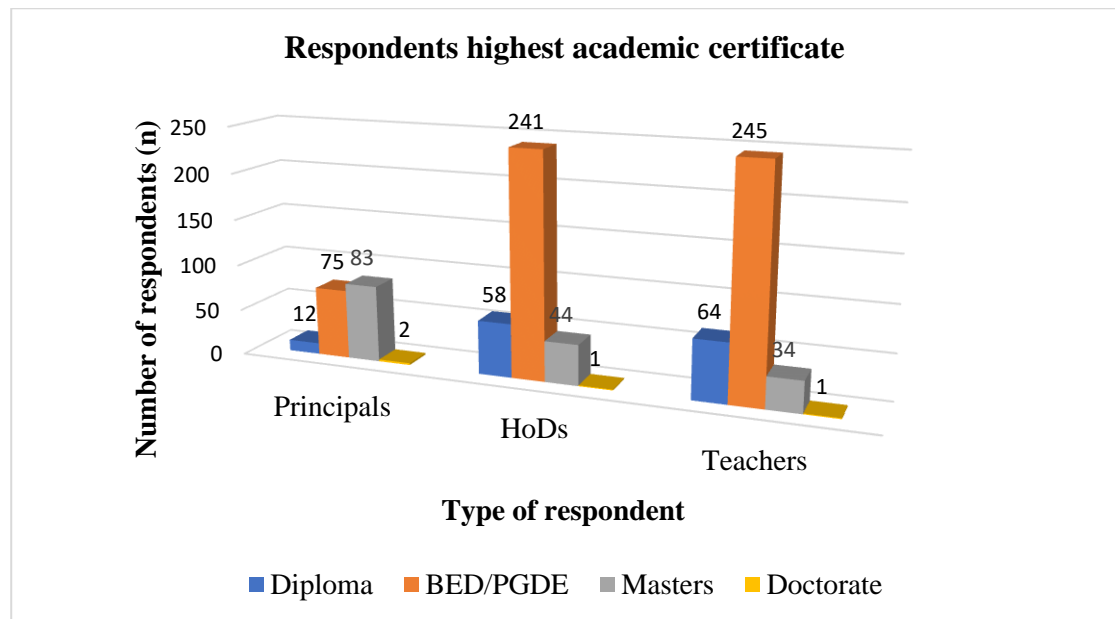
**Figure 4.3: Age of Principals, HoDs and Teachers**



Source: Data from questionnaires (2021), SPSS analysis.

Figure 4.3 indicates that all 172 principals that participated in the study were aged 40 years and above whereby about half were aged between 50-54 years. The ages distribution for principals show that they had been teachers for a considerable time before they were promoted into school headship where long teaching experience may be very critical in shaping one's instructional leadership approach and other conventional management related duties. The ages for HODs and classroom teachers was not so much varied except that a narrow majority (53%) of ordinary teachers were youthful (below 35 years) while about half of HODs lay within the age brackets of between 35-39 and 40-44.

**Figure 4.4: Respondents highest academic certificate**

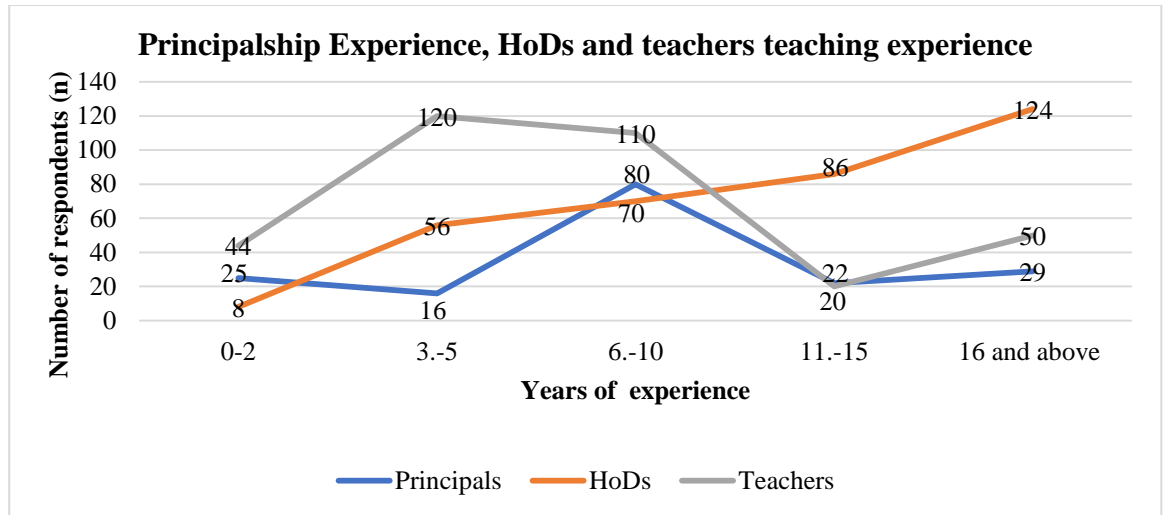


Source: Data from questionnaires (2021), SPSS analysis.

Figure 4.4 indicates that distribution of highest academic certificate earned vary across the three respondent types (Principals, HoDs and teachers) and within respondent type. In particular, Principals had the lowest number 12 (7%) of Diploma certificates holders and the highest number of master's degree holder 83 (50%). This indicates that either their higher qualification earned them career progression or they felt the need to acquire this advanced qualification while already in leadership. Furthermore, owing to their age, they may have had the time and resource advantage to enroll and complete in post graduate programs compared to other teachers and HoDs. Bachelor degree in education or its postgraduate diploma equivalent was held by seven out of ten (70%) of teachers and about two-thirds (70%) of HoDs hence it was the most prevalent academic certificate. Considering all types of respondents, there were only 4 doctorate

degree certificate held implying that PhD certificate was the scarcest academic certificate among the entire teacher fraternity in the study locale.

**Figure 4.5: Principalship experience, HoDs and Teachers teaching experience**



Source: Data from questionnaires (2021), SPSS analysis.

Figure 4.5 indicates that about three quarters (76%) of the principals sampled were experienced principals who had been in school headship for more than five years. Principalship experience may be instrumental in influencing instructional leadership approach taken by experienced principals compared to novice principals. A vast majority (about 80%) of HoDs sampled had teaching experience of five years and above compared to ordinary teachers where only about half (53%) had taught for over five years. This indicates that teaching experience may have been a prerequisite consideration used in appointing teachers as heads of department (HoDs) among other considerations.

#### **4.2.6 Students` Academic Performance**

The study was interested with schools` output as the dependent variable in form of Students` Academic Performance. Schools` average Kenya Certificate of

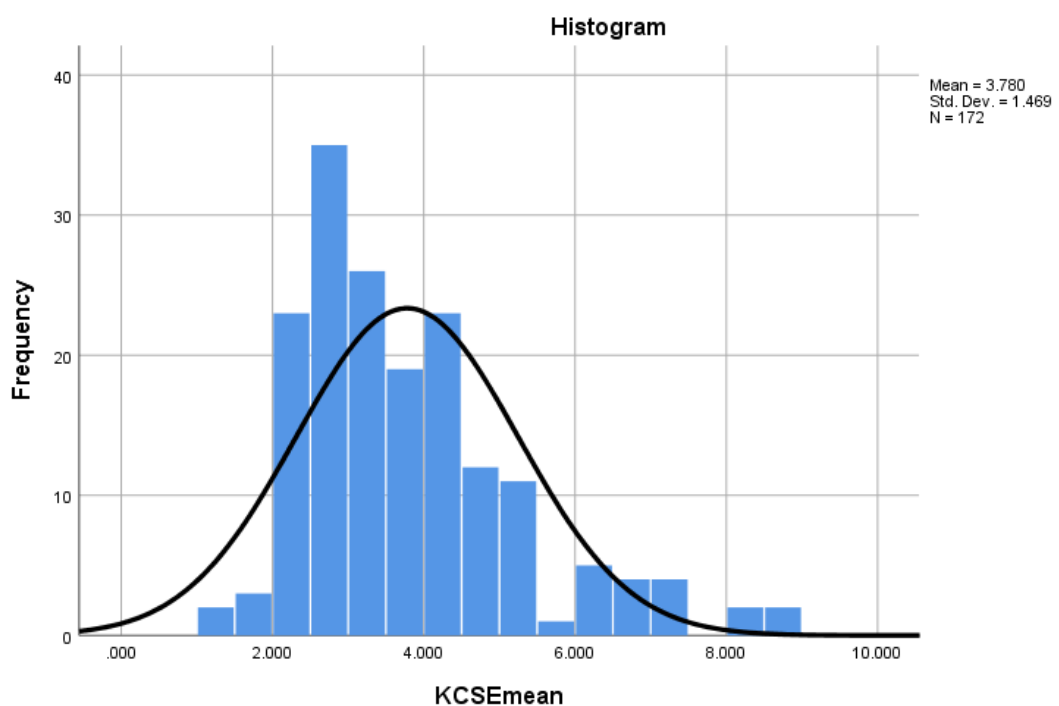
Secondary Examination (KCSE) mean score in three consecutive years (2018,2019 and 2020) for each of the 172 schools was considered and the average worked out.

**Table 4.4: Summary of descriptive statistics of schools average KCSE mean Score**

<b>N</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Skewness</b>	<b>Kurtosis</b>
Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
172	1.3	8.783	3.78	1.469	1.236	.185
						Std Error
						1.496
						Std Error
						.368

Table 4.4 shows that the average KCSE mean score of schools that were sampled was 3.78 with a standard deviation of 1.469. The performance was also moderately positively skewed due to large number of schools that had low mean scores especially the sub county schools.

**Figure 4.6: Distribution of schools average KCSE mean scores**



**Normality test result of average KCSE mean score**

Kolmogorov Smirnov and Shapiro -Wilk tests of normality were used for the formal testing of normality

**Table 4.5 Tests of Normality**

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
KCSE mean	.135	172	.000	.903	172	.000

a. Lilliefors Significance Correction

In table 4.5, Shapiro Wilk and Kolmogorov-Smirnov represent the correlation between a given data set and its corresponding normal curve data however the null hypothesis is stated that the data does not deviate from the normality hence a statistically significant value indicate that normality is not met (Garson, 2012). The test showed that the normality was violated in the data as it was positively skewed due to high number of schools with low mean scores. Hence the data analysis was done using the non-parametric statistical analysis (Orcan, 2020)

### **4.3 Influence of Adequacy and Utilization of School Physical Resources on Academic Performance**

The first objective of the study was;

Objective 1: To determine the influence of adequacy and utilization of school physical resources on academic performance in the study area.

The objective constituted two parts firstly, to establish the adequacy status of physical resources in the study area and its influence on academic performance and secondly to determine the status of resource utilization in the study area and its influence on academic performance. Two hypotheses were generated from this objective, one underpinning the association between resource adequacy or availability in school and academic performance (inputs only approach) and the

other underpinning the association between level of utilization of available physical resource on academic performance (process approach)

The first hypothesis of the study linked to the first objective was:

*H<sub>01</sub>: School physical resources adequacy does not have a statistically significant influence on academic performance*

To test this hypothesis the study considered eleven specific physical resources :(1) science labs, 2) libraries, 3) halls/auditoriums, 4) classrooms, 5) course books, 6) teaching aids, 7) Playing field, 8) facilities for games, drama and music activities, 9) Computer labs, 10) computers, 11) ICT support/auxiliary facilities. The adequacy status of each of the eleven physical resources was first established (what was the status of the resource adequacy?) and the relationship between the adequacy status and academic performance established (How did the resource adequacy relate with academic performance?). An overall finding considering the average adequacy of all the eleven physical resources combined in a school and its relationship with academic performance was then presented.

#### **4.3.1 Science Laboratories**

##### **a) Adequacy of science laboratories**

To establish the status of adequacy (availability and sufficiency) of science laboratories in a school, The principals were asked to indicate the total combined capacity of all the labs available (Physics, Chemistry, Biology & General sciences) and total number of students enrolled. Science laboratory facility Adequacy Index was then computed for all the 172 schools.

(Wodon, 2016: 11)

Science Laboratory Adequacy Index(SLAI) =  $\frac{C}{P} \times 100\%$



Where: C is total capacity of all laboratories available in a school, and P is the total population of students enrolled in a school.

**Table 4.6: Summary of Science Laboratory adequacy index descriptive statistics**

<b>N</b>	<b>Min</b>	<b>Max</b>	<b>Median</b>	<b>Mean</b>	<b>Std Dev</b>
Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
172	.00	42.8	19.9	20.47	7.92

Table 4.6 shows that Science laboratory adequacy index was quite varied with a large range (43) between the scarcest capacity school of 0% and most sufficient capacity school 43%. The index was also generally low as on average, the science laboratory adequacy index of the schools within the study area was about 20%. Schools' registration guidelines (MoE, 2021:12-15) indicates that at bare minimum, a school is expected to have a science laboratory adequacy index of about 25% (science lab capacity of 45 students for a one streamed school of 180 students). Alarmingly, some schools completely lacked a laboratory facility. The standard deviation of 8 clearly indicated the wide variations between schools in their science laboratory facility access.

**b) Association between Science Laboratory adequacy and academic performance**

To determine the influence of science laboratory adequacy on academic performance, the Science laboratory adequacy index was used to sort the schools into three groups; Not available, available but inadequate and those with adequate science lab facility.

**Table 4.7: Kruskal-Wallis  $H$  -test summary table comparing Science laboratory adequacy and academic performance**

Groups	n	Mean Rank	Df	H	P-value	$r^2$
Not Available	5	53.00				
Inadequate	61	83.34				
Adequate	106	89.90				
Total	172		2	3	.223[NS]	.012

Note: \*Significance attained at  $p < .05$  level, \* \* Significance attained at  $p < .001$  Level  
[NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

A K-W H-test was performed to explore whether there was an effect of science laboratory adequacy on academic performance.

The null hypothesis for K-W test was that there was no statistically significant influence between physical resources and academic performance and therefore the mean ranks on academic performance was the same across the three groups.

Table 4.7 shows non-significant difference between the groups ( $X^2 (2, N=172) = 3, P=.223$ ). A mild direct or positive relationship was evident as mean ranks were increasing with higher order of adequacy though it was not significant and the effect size ( $r^2 = .012$ ) was negligible. We therefore fail to reject the null hypothesis ( $P=.223$ ) and conclude that the groups were not statistically different.

The findings corroborated those arrived at in a survey study by Pareek (2019) on availability of science laboratory for teaching and learning in sciences in government secondary schools in Rajasthan state district in India. The lab facilities were alarmingly inadequate. Only 1 out of 21 school covered had an ideal and fully functional lab facility the rest did not either have a laboratory or they used an improvised lab. The study did not find significant association between adequacy of

lab facility and student performance. Positive but insignificant association between laboratory adequacy in terms of space available or capacity of the lab and academic performance in the current study did not imply that laboratory adequacy was not important but rather it suggested that there may have been mediating covariates that were critical. The current study has focused on a further analysis of this possible mediating covariates in a subsequent analysis namely level of lab utilization and condition of the laboratory and related them with academic performance to determine if they significantly related with academic performance. A study by Achimugu (2017) on *Availability and utilization of instructional materials for teaching chemistry in senior secondary schools in Kogi State Nigeria* found that a good number of schools did not utilize the laboratory facility oftentimes while teaching science related subjects, consequently laboratory apparatus, reagents, chemicals and other instructional materials were found to be available but not adequately utilized and hence did not contribute much in improving learning achievement in most of the schools considered. In the current study area, a large number of schools (66) out of 172 had challenges with laboratory facility in the study locale and thus there was a need to urgently fix the laboratory adequacy situation so as to boost laboratory utilization.



**Figure 4.7: A teacher conducting a practical demonstration to students during a physics lesson – a practice which is a common alternative to allowing individualized hands-on practical in the laboratory by students themselves.**

Source: Researcher’s observation photo, school NS-05

### 4.3.2 Library facilities

#### a) Adequacy of Library facilities

To establish the status of adequacy (availability and sufficiency) of library facility in a school, The principals were asked to indicate the total capacity of all the library space available and total number of students enrolled. Library facility Adequacy Index was then computed for all the 172 schools. (Wodon, 2016: 11)

$$\text{Library Adequacy Index(LAI)} = \frac{C}{P} \times 100\%$$

Where: C is total capacity of library space available in a school, and P is the total population of students enrolled in a school.

**Table 4.8: Summary of Library adequacy index descriptive statistics**

N	Min	Max	Median	Mean	Std Dev
Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
172	.00	69.0	2.6	6.6	9

Table 4.8 shows that Library adequacy index was quite varied with a large range (69) between the scarcest capacity school of 0% and most sufficient capacity school 69%. The index is also low with a small mean of 7 and a large standard deviation of 9 which indicated wide disparities between schools.



**Figure 4.8: A fairly resourced library with a librarian and a conducive reading space (carrels) in one of the secondary schools visited**

Source: Researcher's observation photo, school NC-01

#### **b) Association between Library adequacy and academic performance**

To determine the influence of library adequacy on academic performance, the library adequacy index was used to sort the schools into three groups; Not available, available but inadequate and those with relatively adequate library facility.

**Table 4.9: Kruskal-Wallis  $H$  -test summary table comparing library facility adequacy and academic performance**

Groups	n	Mean Rank	Df	H	P-value	$r^2$
Not Available	78	72.91				
Inadequate	70	97.85				
Adequate	24	97.54				
Total	172		2	10.631	.005*	.062

Note: \*Significance attained at  $p < .05$  level, \* \* Significance attained at  $p < .001$  Level [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

A K-W H-test was performed to explore whether there was an influence of library adequacy on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources and academic performance and therefore the mean ranks on academic performance was the same across the three groups.

Table 4.9 shows a significant difference between the groups ( $X^2$  (2,  $N=172$ ) =11.631,  $P=.005$ ). the effect size ( $r^2 =.062$ ) was moderate. We therefore reject the null hypothesis( $P=.005$ ) and conclude that the groups are statistically different. A pairwise post -hoc Dunn`s test with Bonferroni correction revealed a statistically significant difference ( $P=.007$ ) only between the inadequate group which had higher ranks than not available group This implied that availability of library facility was what mattered for high academic performance not necessarily the adequacy of the facility.

The research findings echoed a descriptive study done by Befii-Nwile & Amie-Ogan (2021) on ``Classroom and library provision as a determinant of students`

*academic performance in public junior secondary schools in Rivers State, Nigeria.*” The study found positive and significant influence of library provision on students’ academic achievement. Similarly, a study by Ayaz, Nasir, Abdul, Rooh & Mati (2017) that related library facility availability with students’ academic achievement in government secondary schools in Pakistan found significant impact between library availability and students’ academic performance. Similar positive and significant findings were arrived at by Mogaka (2019) in a study that focused on *“Availability and utilization of library facility and learning achievement in public day secondary schools in Kisii county, Kenya.”*

### **4.3.3 Hall/Auditorium facilities**

#### **a) Adequacy of Hall/Auditorium facilities**

To establish the status of adequacy (availability and sufficiency) of Hall facilities in a school, The principals were asked to indicate the total capacity of all the Hall space available and total number of students enrolled in their school. Hall Adequacy Index was then computed for all the 172 schools. (Wodon, 2016: 11)

$$\text{Hall Adequacy Index(HAI)} = \frac{C}{P} \times 100\%$$

Where: C is total capacity of Hall space available in a school, and P is the total population of students enrolled in a school.

**Table 4.10: Summary of Hall adequacy index descriptive statistics**

<b>N</b>	<b>Min</b>	<b>Max</b>	<b>Median</b>	<b>Mean</b>	<b>Std Dev</b>
Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
172	.00	181.8	63.2	59.5	46.7

Table 4.1 shows that Hall/Auditorium was quite a varied facility with some schools completely lacking the facility (0%) while others had more than one

hall/Auditorium facility 182%. The wide variability of the facility adequacy is also evidenced by the large standard deviation of 47. This highlights the need to ensure that fair distribution of resources is achieved for equitable and quality education provision.

**b) Association between Hall/Auditorium adequacy and academic performance**

To determine the influence of Hall adequacy on academic performance, the Hall adequacy index was used to sort the schools into three groups; Not available, available but inadequate and available and adequate.

**Table 4.11: Kruskal-Wallis *H* -test summary table comparing Hall facility adequacy and academic performance**

Groups	n	Mean Rank	df	H	P-value	r <sup>2</sup>
Not Available	42	68.39				
Inadequate	99	90.57				
Adequate	31	98.05				
Total	172		2	7.88	.019 *	.05

Note: \*Significance attained at  $p < .05$  level, \* \* Significance attained at  $p < .001$  Level [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

A K-W H-test was performed to explore whether there was an effect of hall facility adequacy on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources and academic performance and therefore the mean ranks on academic performance was the same across the three groups.



Table 4.11 shows a significant difference between the groups ( $X^2$  (2, N=172) =7.88, P=.019). The effect size ( $r^2$  =.012) was moderate. We therefore reject the null hypothesis(P=.019) and conclude that the groups are statistically different. A pairwise post-hoc Dunn`s test with Bonferroni correction revealed a statistically significant difference between two pair of groups inadequate group which had higher ranks than not available group (P=.047) and adequate group which also had higher ranks than not available group (P=.036) This implied that availability was what mattered for high academic performance irrespective of whether the facility was adequate or not.

These findings were consistent with a descriptive study conducted by Ali, Khan & Ahmed (2020) on ``*Effects of school building on academic achievement of secondary school students in Pakistan*``. The study involved 12 secondary schools and established a close association and interdependence between academic achievement and adequacy of school buildings. The study went further to illustrate that school building makes teaching learning process complete and that buildings are instrumental in attracting and retaining highly qualified and talented teachers. Jonah (2014) asserted that school halls or auditorium are critical learning spaces as they can be used for teaching and learning of large student groups, formal assemblies, indoor co-curricular activities including music and drama practice.

#### **4.3.4 Classrooms Facilities**

##### **a) Adequacy of Classrooms facilities**

To establish the status of adequacy (availability and sufficiency) of classrooms in a school, The principals were asked to indicate the number of classrooms available

and total student population enrolled, Classroom facility Adequacy Index was then computed for all the 172 schools. (Wodon, 2016: 11)

$$\text{Classroom Facility Adequacy Index(CFAI)} = \frac{C}{P} \times 100\%$$

Where: C is total capacity of classrooms available in a school, and P is the total population of students enrolled in a school. To get the capacity of classrooms in a school the total number of classrooms was multiplied by 45 students which is the maximum recommended class size (MoE, 2021:12).

Classroom adequacy index was worked out as a percentage where by 100% indicated that classrooms available in a school was able to sufficiently serve all the students enrolled within recommended average class size of 45. A score of less than 100% indicated inadequate class spaces and congestion in classrooms (average class size of more than 45) while a score of more than 100% indicated excess classroom capacity and average class size of less than 45.

**Table 4.12: Summary of Classroom adequacy index descriptive statistics**

<b>N</b>	<b>Min</b>	<b>Max</b>	<b>Median</b>	<b>Mean</b>	<b>Std Dev</b>
Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
172	60.58	156.5	102.9	105.53	23.44

Table 4.12 shows that Classrooms spaces are quite varied with a large range (100) between the scarcest capacity school of 61% and most sufficient capacity school 157%. The existence of such scenario of scarcity coexisting with excess capacity points a need to better plan classroom facility distribution in the study area.

### b) Association between classroom adequacy and academic performance

To determine the influence of classroom adequacy on academic performance, the classroom adequacy index was used to classify schools into two groups-those with adequate classroom facility and those with inadequate classroom facility. Mann-Whitney(M-W) *U* -test was used to test the null hypothesis that there was no statistically significant influence between physical resources adequacy and academic performance and therefore the two groups represent stochastic homogenous population distributions based on their mean ranks.

**Table 4.13: Mann-Whitney U test summary table comparing classroom adequacy and academic performance**

Groups	N	Mean Rank	U	Z	P-value	r <sup>2</sup>
Adequate	142	77.78				
Inadequate	30	127.77				
Total	172		892	-4.996	<.001**	.145

Note: \*Significance attained at  $p < .05$  level, \* \* Significance attained at  $p < .001$  Level [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

Table 4.13 indicate a significant lower mean ranks of schools with adequate classrooms (77.78) compared to those with inadequate classroom capacity (127.77). This yielded an effect size of 14.5 which according to Cohen (1988) is moderate. The larger mean rank of schools with inadequate classroom facility implied that high performing schools were having class sizes of larger than 45 students than ideally required. Classroom facility adequacy therefore acted as a moderator variable in the study locale with performing schools being comparatively disadvantaged.

Classroom adequacy is clearly manifested by average class sizes, in the study locale, the maximum average class size was about 70 students per class and smallest class size was about 29 students per class meaning inadequacy of classroom resources in some schools and excess supply in others-poor planning. Glewwe et al. (2013) indicates that from meta -analysis of research analyzed, the influence of class size on learning outcome is still mixed. Barret, Treves Diego & Ustinova (2019) quoting *'The Education Endowment Foundation Toolkit'* (2017) indicates that to fundamentally influence learning outcomes and enable child-centered teaching practices, classes need to consist of 15-20 students per class. Finland motivated by belief of small groups to maximize teacher-student interactions and maximum realization of every student potential has a national average class sizes of 19 students per class. Finland is one of the best performing countries globally in academics (Barret et.al. ,2019:7)

#### **4.3.5 Adequacy of Course Books and Academic Performance**

Schools were asked to indicate their status in terms of whether available course books were generally adequate or not adequate based on their own internal assessment. Consequently, schools were sorted into two groups, those with reported adequate course books and those with inadequate course book resources. Mann-Whitney(M-W) *U* -test, was used to test the null hypothesis that there was no statistically significant influence between physical resources adequacy and academic performance and therefore the two groups represent stochastic homogenous population distributions based on their mean ranks.

**Table 4.14: Mann-Whitney U test summary table comparing Course books adequacy and academic performance**

Groups	n	Mean Rank	U	z	P-value	r <sup>2</sup>
Inadequate	14	70.61				
Adequate	158	87.91				
Total	172		1328.5	1.246	.213[NS]	.009

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

Table 4.14 indicate a non-significant lower mean ranks of schools with inadequate course books resources (70.61) compared to those with adequate course books (87.91). This yielded a negligible effect size ( $r^2 = .009$ ). We consequently fail to reject the null hypothesis and conclude that the groups were not significantly different.

The findings of insignificant association between adequacy of course books and academic performance may be attributed in part by the fact that most schools have improved their availability of books as government of Kenya has been involved in direct distribution of text books to public secondary schools in Kenya. The findings concurs with those of a randomized control experiment conducted by Maria & Marie-Anne (2013) who investigated circumstances under which textbooks significantly affected performance based on 11 Sub-Saharan African countries pupil performance in Southern and Eastern African Consortium for Monitoring Education Quality (SACMEQ) survey. They concluded that ownership alone did not influence performance but it was the utilization of the text books through

reading together and sharing the books that had positive externalities that improved test score. Glewwe, Kremer and Moulin (2009) Quoted in Glewwe et. al., (2013) had arrived at a similar conclusion in a randomized experiment in Kenya.

#### 4.3.6 Adequacy of Teaching Aids and Academic Performance

Schools were asked to indicate their status in terms of whether available teaching aids were generally adequate or not adequate based on their own internal assessment. Consequently, schools were sorted into two groups, those with reported adequate teaching aids and those with inadequate teaching aids resources. Mann-Whitney(M-W) *U* -test, was used to test the null hypothesis that there was no statistically significant influence between physical resources adequacy and academic performance and therefore the two groups represented stochastic homogenous population distributions based on their mean ranks.

**Table 4.15: Mann-Whitney U test summary table comparing teaching aids adequacy and academic performance**

Groups	n	Mean Rank	U	z	P-value	r <sup>2</sup>
Inadequate	92	78.29				
Adequate	80	95.94				
Total	172		4435.5	2.319	.020*	.03

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level,

[NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

Table 4.15 indicate a statistically significant ( $P = .020$ ) lower mean ranks of schools with inadequate teaching aids resources (78.29) compared to those with adequate teaching aids resources (87.91). The effect size ( $r^2 = .03$ ) was however small but

the association was statistically significant. We consequently reject the null hypothesis and conclude that the groups are significantly different.

The study findings were in concurrence with a related study by Jagero (2014) on *“influence of inputs to learning quality in day schools in Kenya”*. that found positive and significant influence of teaching aids adequacy on academic performance.

#### 4.3.7 Adequacy of Playing Field and Academic Performance

Schools were asked to indicate their status in relation to whether the playing field was either not available, available but inadequate or available and adequate. This was intended to enable exploring whether playing field adequacy had an influence on academic performance

**Table 4.16: Kruskal-Wallis  $H$  -test summary table comparing Playing field adequacy and academic performance**

Groups	n	Mean Rank	df	H	P-value	$r^2$
Not Available	5	38.4				
Inadequate	69	80.41				
Adequate	98	93.24				
Total	172		2	7.5	.024*	.04

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level,

[NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

A K-W H-test was performed to explore whether there was an effect of playing field adequacy on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources and

academic performance and therefore the mean ranks on academic performance was the same across the three groups.

Table 4.16 shows a significant difference between the groups ( $X^2$  (2, N=172) =7.5, P=.024). The effect size ( $r^2$  =.04) was small. We therefore reject the null hypothesis(P=.024) and conclude that the groups are statistically different. A pairwise post -hoc Dunn`s test revealed a statistically significant difference (P=.016) only between the adequate group which had higher ranks than not available group This imply that for playing field to influence performance significantly adequacy is important.

#### **4.3.8 Adequacy of Co-Curricular Activities Resources and Academic Performance**

Schools were asked to indicate their status in terms of number of co-curricular activities not just offered but those that were offered and there were adequate resources for students to participate in the activities. Schools selected these co-curricular activities from a list containing fifteen sporting activities recognized by Kenya Secondary Schools Sports Association (KESSSA) including music and drama. Any school with at least eight sporting activities and at least offered either drama or music was considered to have adequacy of co-curricular activities resources.

Schools were sorted into two groups, those with adequate and those with inadequate co-curricular activities resources. Mann-Whitney(M-W)  $U$  -test, was used to test the null hypothesis that there was no statistically significant influence between physical resources adequacy and academic performance and therefore the



two groups represented stochastic homogenous population distributions based on their mean ranks.

**Table 4.17: Mann-Whitney U test summary table comparing Co-curricular activities resources and academic performance**

<b>Groups</b>	<b>n</b>	<b>Mean Rank</b>	<b>U</b>	<b>z</b>	<b>P-value</b>	<b>r<sup>2</sup></b>
Inadequate	78	77.79				
Adequate	94	93.73				
Total	172		4345.5	2.09	.037 *	.03

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

Table 4.17 indicates a significant lower mean ranks of schools with inadequate co-curricular activities resources (77.8) compared to those with adequate Co-curricular activities (93.7). This yielded a moderate effect size ( $r^2 = .03$ ). We consequently reject the null hypothesis and conclude that the groups were significantly different and that adequacy of co-curricular resources significantly influenced academic performance.

The findings of positive and significant association between adequate co-curricular activity resources including playing field are in agreement with other related studies done including Adede (2012), Mokaya (2013) and Asiago (2018). The study found that adequacy of playing field and other co-curricular resources including those for sports, music and drama are instrumental in ensuring holistic and balanced development of the learner through cognitive, affective and psychomotor growth.

### 4.3.9 Computer Laboratory facilities

#### a) Adequacy of Laboratory facilities

To establish the status of adequacy (availability and sufficiency) of Computer laboratory facilities in a school, the principals were asked to indicate the total capacity of all the computer laboratory space available and total number of students enrolled in their school. Computer laboratory Adequacy Index was then computed for all the 172 schools. (Wodon, 2016: 11)

$$\text{Computer Laboratory Adequacy Index(LAI)} = \frac{C}{P} \times 100\%$$

Where: C is total capacity of library space available in a school, and P is the total population of students enrolled in a school.

**Table 4.18: Summary of Computer Laboratory adequacy index descriptive statistics**

<b>N</b>	<b>Min</b>	<b>Max</b>	<b>Median</b>	<b>Mean</b>	<b>Std Dev</b>
Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
172	.00	14.4	2.5	3.32	3.9

Table 4.18 shows that Computer Laboratory was quite a scarce facility with most sufficient capacity school only able to cater for only about 15% of its student population. The mean and median were also quite low at 3 and 2.5 respectively. This indicates that there is a dearth of Computer lab facility in the schools within the study locate and investment in this area is quite urgent.



**Figure 4.9: A computer laboratory with scarcity of computers in one of the secondary schools visited-Only a small group of less than 10 students could access the computers at a time yet the average class size in the school was 48 students.**

Source: Researcher's observation photo, school NS-22

**b) Association between Computer Lab adequacy and academic performance**

To determine the influence of Computer laboratory adequacy on academic performance, the library adequacy index was used to sort the schools into two groups; Not available and available but inadequate.

Mann-Whitney(M-W)  $U$  -test, was used to test the null hypothesis that there was no statistically significant influence between physical resources adequacy and academic performance and therefore the two groups represented stochastic homogenous population distributions based on their mean ranks.

**Table 4.19: Mann-Whitney U test summary table comparing Computer laboratory adequacy and academic performance**

Groups	n	Mean Rank	U	z	P-value	r <sup>2</sup>
Not Available	75	71.35				
Available but Inadequate	97	98.72				
Total	172		4774	3.509	< .001* *	.072

Note: \*Significance attained at p < .05 level, \* \* Significance attained at p < .001 Level,

[NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

Table 4.19 indicates a significant lower mean ranks of schools without Computer lab facilities (71.35) compared to those with Available but inadequate Computer lab facility (98.72). This yielded a moderate effect size ( $r^2 = .072$ ). We consequently reject the null hypothesis and conclude that the groups were significantly different.

The findings were in agreement with a related study conducted by Adede (2012) on *Impact of school infrastructure on provision of quality education in public secondary school in Nyakach district of Kenya*. The study related adequacy of several physical facilities including Computer and science laboratories, library, co-curricular facilities with academic performance and found that the facilities were positively and significantly associated with academic performance.

### 4.3.10 Computer Facilities

#### a) Adequacy of Computer facilities

To establish the status of adequacy (availability and sufficiency) of Computers in a school, the principals were asked to indicate the total number of computers accessible to student for teaching and learning and the total number of students enrolled in their school. Computer Adequacy Index was then computed for all the 172 schools. (Wodon, 2016: 11)

$$\text{Computer Adequacy Index(CAI)} = \frac{C}{P} \times 100\%$$

Where: C is total number of computers accessible to students a in a school, and P is the total population of students enrolled in a school.

*Note:* Computer Adequacy Index (CAI) is similar to Computer Student Ratio (CSR) expressed as a percentage.

**Table 4.20: Summary of Computer adequacy index descriptive statistics**

N	Min	Max	Median	Mean	Std Dev
Statistic	Statistic	Statistic	Statistic	Statistic	Statistic
172	.00	14.9	1.8	2.4	3.1

Table 4.20 shows that computers are quite scarce in schools, the school with the highest relative sufficiency can only cater for 15% of its student's population at a go. The mean percent of 2.4 imply that on average there are about 3 computers for every 100 students within schools in the study locale or one computer is serving about 33 students on average -Computer student Ratio is (1:33). This highlights the dire need of increasing the provision of computers in school within the study locale towards the actualization of ICT integration in teaching and learning policy imperative.

### b) Association between Computer adequacy and academic performance

To determine the influence of Computer adequacy on academic performance, the computer adequacy index was used to classify schools into two groups; Available but inadequate and not available. There were no schools that could be rated as having adequate computer numbers based on computer adequacy index.

Mann-Whitney(M-W) *U* -test, was used to test the null hypothesis that there was no statistically significant influence between physical resources adequacy and academic performance and therefore the two groups represented stochastic homogenous population distributions based on their mean ranks.

**Table 4.21: Mann-Whitney U test summary table comparing Computer adequacy and academic performance**

Groups	n	Mean Rank	U	z	P-value	r <sup>2</sup>
Not Available	68	64.41				
Available but Inadequate	104	100.94				
Total	172		5038	4.704	p < .001 *	.13

Note: \*Significance attained at p < .05 level, \*\* Significance attained at p < .001 Level,  
[NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

Table 4.21 indicate a significant lower mean ranks of schools without Computers (64.41) compared to those with Available but inadequate Computers (100.94). This yielded a moderate effect size ( $r^2 = .13$ ). We consequently reject the null hypothesis and conclude that the groups were significantly different.

The findings concur with those arrived at by Ntawiha (2016) who investigated how inputs affected learning outcomes in 21 secondary schools in Nyarusange and

Nyamasheke districts in Rwanda. The study found that computer student ratios were positively correlated with high academic achievement.

#### 4.3.11 Adequacy of ICT integration auxiliary/support facilities and academic performance

Owing to the importance of ICT integration in teaching and learning and its potential to affect performance. Schools were rated on a scale of one to five with respect to whether the following five auxiliary facilities were present or not. Electricity and lighting in all rooms, internet facility, Digital content for use in teaching and learning, Sockets in classrooms and Dustless Whiteboards or Smart Boards.

**Table 4.22: Kruskal-Wallis  $H$  -test summary table comparing ICT auxiliary facility adequacy and academic performance**

Groups	n	Mean Rank	df	H	P-value	$r^2$
One or Two facilities out of five	34	67.53				
Three facilities out of five	86	88.16				
Four facilities out of five	47	93.15				
Five facilities out of five	5	124.4				
Total	172		3	8.765	.033 *	.051

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level,

[NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

A K-W H-test was performed to explore whether there was an effect of ICT auxiliary facilities adequacy on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources and academic performance and therefore the mean ranks on academic performance was the same across the four groups.

Table 4.22 shows a significant difference between the groups ( $\chi^2 (2, N=172) = 8.765, P=.033$ ). The effect size ( $r^2 = .051$ ) was moderate. We therefore reject the null hypothesis ( $P=.033$ ) and conclude that the groups are statistically different.

#### **4.3.12 Average physical resource adequacy for all eleven physical resources combined and academic performance**

The average adequacy for all eleven physical resources was worked out since each school's adequacy status (Not available, Available but Inadequate or Available and Adequate) for each of the eleven considered resources was already known. Mann-Whitney U test was used to

test whether there was an effect of average (overall) physical resource adequacy on academic performance. The null hypothesis was that there was no statistically significant influence between physical resources adequacy and academic performance and therefore the two groups represented stochastic homogenous population distributions based on their mean ranks.

**Table 4.23: Mann-Whitney U test summary table comparing Overall physical resources adequacy (Average of all eleven resources combined) and academic performance**

Groups	N	Mean	U	Z	P-	$r^2$
--------	---	------	---	---	----	-------



		<b>Rank</b>	<b>value</b>			
Adequate (For most resources)	48	113.46				
Inadequate (For most resources)	124	76.06				
Total	172		168	-	<.001*	.11
			2	4.418	*	3

Note: \*Significance attained at  $p < .05$  level, \* \* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

The table 4.23 indicate a significant lower mean ranks of schools with overall inadequate physical resources (76.06) compared to those with overall adequate physical resources (113.46). The difference was significant at  $p < .001$  and this yielded an effect size of .113 which according to Cohen (1988) is moderate. Conclusion was that there was a positive and significant influence between overall school physical resources adequacy and academic performance in the study area.

### **General summary of the association between school physical resources adequacy and academic achievement**

**Table 4.24: Summary table of the finding relating to association between academic achievement and various school physical resources adequacy or availability**

School Physical Resources	Negative Insignificant	Negative Significant	Zero relation	Positive Insignificant	Positive Significant	Effect Size (R <sup>2</sup> )
<i>General Curricular</i>						
1 Science laboratories				√		.012(Negligible)
2 Libraries					√	.062(Moderate)
3 Halls/Auditoriums					√	.050(Small)
4 Classrooms		√				.145(Strong)
5 Course books				√		.009(Negligible)
6 Teaching Aids					√	.030(Small)
<i>Co-curricular</i>						
7 Playing field					√	.040(Small)
8 Facilities for games, music and drama activities					√	.030(Small)
<i>ICTs</i>						
9 Computer Labs					√	.072(Moderate)
10 Computers					√	.130(Moderate)
11 ICT auxiliary/support facilities					√	.051(Small)
12 Overall physical resources(Combined)					√	.113(Moderate)

√ -Outcome of statistical test relating physical resource adequacy in a school and academic achievement. R<sup>2</sup> is the strength of association between dependent and independent variable (multiplied by 100 it gives the percentage of change in academic performance associated with adequacy of the specific physical resources)

The main hypothesis for the study that was being tested was that;

*H<sub>01</sub>: School physical resources adequacy does not have statistically significant influence on academic performance*

The findings as summarized in table 4.24 indicated that almost all of physical resources considered, eight out of eleven, were related in a positive and significant way with academic achievement. Two of the remaining resources (science laboratories and course books) were also positively related to academic performance but the association was not significant. The only physical resource that was related in a negative and significant way -which was unanticipated, was classroom resources indicating that most high performing schools had large student populations, large class sizes, and therefore inadequate classrooms facility compared to less performing school. The overall physical resources adequacy that considered the average adequacy of all physical resources combined for a school was also positively and significantly related with academic performance with a moderate effective size ( $r^2 = 0.113$ ), implying that the variance in performance explained by overall physical resources adequacy was 11.3%. (OECD 2013:108) asserts that in developed countries, school physical resources adequacy correlate very modestly with academic performance and the association is largely insignificant since adequacy of physical resources is attained for most of the physical resources including ICT related resources. In the study area only course books adequacy was nearly attained in most of the schools implying that adequacy of all the other physical resources considered was a situation that needed urgent mitigation in the study locale.

## **Educational opportunity equality (EOE) and distribution of physical resources adequacy in the study locale**

The principle of educational opportunity equality (EOE) dictates that in the ideal scenario, variation in students' academic performance should mainly be a function of student's efforts and innate ability and thus should not be significantly related with school inputs distribution since this should be evenly distributed in all schools as per the number of enrolled students (Nkonge et al.2021; UNESCO,2016a; Lazenby,2016; Sign, 2014; UNESCO, 1960).The distribution of physical resources in the study locale thus indicates that it was only science laboratories, libraries and course book distribution that met the expectation of equality of educational opportunity principle. The distribution of all the other physical resources was significantly related with academic performance implying that the physical resources adequacy was skewed in favor of better performing schools. This therefore raises equality concerns that should be addressed.

### **Extent of physical resources utilization and academic performance**

The second hypothesis of the study linked to the first objective was;

*H<sub>02</sub>: School physical resource utilization does not have statistically significant influence on academic performance*

To test this hypothesis, the study sought the perceptions of Heads of Departments on the extent of utilization of 1) Science Laboratories, 2) Libraries, 3) Halls/Auditoriums, 4) Classrooms, 5) Course books and 6) Teaching aids, 7) Playing field, 8) Participation in inter school co-curricular activities 9) Computer Laboratories and 10) Computers and related auxiliaries. Five Point Likert scale questionnaire items (ranging from 1-Not at All /Almost Never to 5-Almost Always

/Very large Extent) were used to determine the extent of resource utilization for each physical resource in a school which was then related with academic performance for the purpose of testing the hypothesis. Overall level of physical resources utilization for all resources considered combined was also determined for every school and related with academic achievement.

**Table 4.25: Kruskal-Wallis  $H$  -test summary table comparing Science lab, Library and Hall utilization extent (as perceived by Heads of Departments) and academic performance**

	Science lab		Library		Hall	
Group	n	Mean rank	n	Mean rank	n	Mean rank
Not at all	5	53	78	72.91	41	69.189
Rarely	29	77.98	22	88.98	28	75.86
Occasionally	76	84.51	36	105.58	73	101.55
Often	56	89.99	30	91.25	24	79.73
Almost Always	6	148.25	6	115.83	6	93.58
Total	172		172		172	
<b>Test statistics</b>		H=12.735 df=4 $r^2=0.0874$		H=13.51,df=4 $r^2=0.079$		H=13.079 df=4 $r^2=0.076$
<b>P -Value</b>		0.013*		0.009*		0.11*

Note: \*Significance attained at  $p < .05$  level, \* \* Significance attained at  $p < .001$  Level,

[NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

#### 4.3.13 Science laboratory utilization extent

The science laboratory utilization ranged from Not at all as some schools did not even have a science lab to almost always. Within the study area, 34(17%) of the schools had the lowest extent of utilization of either not at all or rarely. Science lab

utilization had a mean of 3.17 (SD=0.85) implying on average the facility was occasionally utilized in most of the schools.

### **Science laboratory utilization extent and academic performance**

A K-W H-test was performed to explore whether there was an effect of science laboratory utilization on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources utilization and academic performance and therefore the mean ranks on academic performance was the same across the five groups.

Table 4.23 shows a significant difference between the groups ( $X^2$  (4, N=172) =12.735, P=.013). The effect size ( $r^2$  =.0874) was moderate. We therefore reject the null hypothesis(P=.013) and conclude that the groups are statistically different.

The positive and significant findings between laboratory utilization and students' academic performance was corroborated by most research findings reviewed including Nyakua (2017), a study that explored the effect of laboratory exposure and academic performance in Wakio district of Uganda. The study found that students who lacked laboratories or in schools that were not frequently or efficiently utilizing the laboratories had very low performance in sciences. Similar findings were arrived at in other studies including Jagero (2014) and Mogaka (2019). The study was however in discordance with a study by Solomon & Ndididi (2014) that explored *Resources utilization as a correlate of students' academic achievement in Ohafia educational zone of Abia state Nigeria*'. The study found insignificant correlation between science lab utilization and students' academic achievement. The study further found that the reason was not that labs did not

matter but that the laboratories were adequately provided and adequately utilized and the distribution was even in all schools



**Figure 4.10: Students actively involved in performing a science practical**

Source: Researcher's observation photo, school KI-12

When asked to indicate Key challenges that hinder optimal (Often/Almost Always) use of the science labs in an open-ended question, The HoD sciences responses were varied but converged into three themes:

**(i) Complete absence of the labs or inadequacy of the available laboratories**

"There is no science lab in our school, The one currently improvised is a room converted into a mobile lab."

(HoD Sciences, school NC-16)

" We do not have a science laboratory in the school, Experiments are usually carried out by demonstration in the classrooms by the teacher "

(HoD sciences, School ME-08)

Inadequacy of the science labs due to high overall student population compared to the existing laboratory capacity:

"The high population in our school has led to inadequate resources due to swelling of students yet laboratory resources have remained the same, for instance, the population of our school has tremendously increased in the last three years from 400 to 700 students currently".

(HoD sciences, school KL-

02)

Owing to the challenge of inadequate facilities many Sciences HoDs decried the fact that double lessons that are allocated to teachers to enable teachers to expose students to practical in the lab usually end up colliding in the time table reducing their effectiveness.

"The school has 17 classes and two labs only; we always have our science double lessons colliding when we want to use the science laboratory"

(HoD sciences, school KI-29)

There was also an attendant challenge to the high population of the students and limited existing lab capacity-the congestion in the science laboratories;

"Our science laboratory can only accommodate a few students at a time compared to the number of students in a class."

(HoD sciences, school MU-02).

In the study locale, there was wide disparity in terms of average class sizes. Some schools had very small population of students compared to existing resources and very small class sizes while others were over populated (smallest average class size was 19 while largest was 74). schools with overpopulation and large class sizes usually faced the challenge of congestion in the labs limiting optimal laboratory utilization.



MoE (2021:45) Indicate that a recommended science lab should provide at least 2.4 M<sup>2</sup> space per learner translating into a standard science laboratory space of 12metres by 9metres for 45 learners which is the maximum recommended class size.

**(ii) Poor condition of the science laboratory or lack of required apparatus, reagents/chemicals**

One of the sciences HoDs got very particular with laboratory condition and how it influences laboratory utilization

"The condition of the lab is a critical matter and sometimes if not taken carefully it can even be a health hazard. Chemistry lab for instance need fume chambers, flowing water, gas piping, air conditioner, fire extinguisher, showers and the appropriate apparatus and reagents if some of these requirements are lacking it may lead to negligence of science practical by teachers that may hurt laboratory utilization."

(HoD sciences, School NS-38)

**Science Lab Condition and academic performance**

To determine the exact condition of the laboratories in the schools within the study area, HoD sciences in all the 172 schools were asked to indicate the condition of their science labs in relation to whether they had the required apparatus and reagents, proper lighting, gas pipping, flowing taps/ water points and fume chambers .Their responses depending on how many items were missing was used to classify the laboratory condition into poor (missed most items),fair (missed few items), good (had all the asked items)

A K-W H-test was performed to explore whether there was an influence of science lab condition on academic performance.

The null hypothesis for K-W test states that the Mean ranks on academic performance are the same across the three groups.

**Table 4.26: Kruskal-Wallis  $H$  -test summary table comparing Science Lab Condition and academic performance**

Groups	n	Mean Rank	df	H	P-value	$r^2$
Not Available	5	53.00				
Poor Condition	38	70.14				
Fair Condition	94	92.19				
Good Condition	35	93.77				
Total	172		3	8.335	.04*	.049

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

Table 4.24 shows a significant difference between the groups ( $X^2$  (3,  $N=172$ ) =8.335,  $P=.04$ ). The effect size ( $r^2 =.04$ ) was small. We therefore reject the null hypothesis( $P=.04$ ) and conclude that the groups are statistically different. This implied that laboratory condition was a mediating covariate that positively and significantly influenced performance in schools within the study locale.

## Condition of Science Laboratories



**Figure 4.11: A science laboratory in poor condition-a situation that undermines utilization of the laboratory**



**Figure 4.12: A well-furnished science laboratory -a situation that promotes utilization of the laboratory**

Source: Researcher's observation photo, school KL-16 & NS-01

### **(iii) Other factors**

What was considered in the study as other factors included those that indicated that in their school there was lack of a policy to promote optimal utilization of science labs and those that cited time factor or limited time as a barrier to lab utilization.

In relation to promotion of sciences in secondary schools Kenya Institute of Curriculum Development, (KICD,2017) indicates that for Kenya to meet its manpower needs for the realization of vision 2030, more schools need to be well equipped with relevant infrastructure and human capital to be able to support students to pursue Science Technology Engineering and Mathematics (STEM) pathways since the required career path proportions should be 60% STEM related

pathways, 25% Social sciences related pathways and 15% Talent related pathways. Currently the bulk of students are in Social Sciences which poses a great challenge. The current study indicates that to effectively promote learning achievement including science subjects. Schools need not just be equipped with science laboratory infrastructure but the available resources need to be optimally utilized and be in good condition.

#### **4.3.14 Library Utilization Extent**

The library utilization extent, ranged from Not at all (as some schools did not even have a library) to Almost always (Implying that library was adequately used). Within the study area, 100(58%) of the schools had the lowest extent of library utilization of either not at all or rarely. In general library utilization had a mean of 2.2 (SD=1.28) implying on average the facility was rarely utilized in most of the schools.

#### **Library utilization extent and academic performance**

A K-W H-test was performed to explore whether there was an effect of Library utilization on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources utilization and academic performance and therefore the mean ranks on academic performance was the same across the five groups.

Table 4.23 shows a significant difference between the groups ( $X^2$  (4, N=172) =13.51, P=.009). The effect size ( $r^2$  =.079) was moderate. We therefore reject the null hypothesis(P=.009) and conclude that the groups are statistically different.

The finding of significant and positive association between library use and academic performance are echoed by several other related studies. These include Srivatsava & Srivatsava (2018) a study that related level of library usage by first year medical students in a government medical college and found that those students who used library often outperformed their peers that did not frequently utilize library facility. The students that frequently used the library also improved rather than dropped comparing their entrance performance and end of semester performance. Other studies that also concur with the finding include Befii-Nwile & Amie Ogan (2021) and Mogaka (2019)

When HoDs were asked to indicate the challenges that hinder or limit use of library resources in their respective schools in an open-ended question, the responses were varied. Some indicated challenges like complete lack of a library facility, Lack of seats and other furniture in the library, lack of proper reading spaces or carrels in the library, lack of a designated library assistant or a librarian, shortage or lack of current, up-to-date and relevant reading materials including books and digital content in their library. Others also cited limited time owing to tight school programs and the fact that students generally had a diminished reading culture. A general observation in most libraries was the lack of access to computers connected to the internet that students would make use in their research and information search that would supplement and complement the books.

#### **4.3.15 Library Condition and Academic Performance**

To determine the exact condition of the library facilities in the schools within the study area, HoDs in all the 172 schools were asked to indicate the condition of their library in terms of painting and general maintenance and whether the libraries

had the following essentials; relevant and current subject specific books and other reading materials, a designated librarian, lighting and a reading space. Their responses depending on how many items were missing was used to classify the laboratory condition into poor (missed most items), fair (missed few items), good (had almost all the asked items)

A K-W H-test was performed to explore whether there was an effect of Library condition on academic performance.

The null hypothesis for K-W test states that the Mean ranks on academic performance are the same across the four groups.

**Table 4.27: Kruskal-Wallis H -test summary table comparing library condition and academic performance**

Groups	n	Mean Rank	df	H	P-value	r <sup>2</sup>
Not Available	82	73.52				
Poor Condition	29	93.05				
Fair Condition	47	96.14				
Good Condition	14	116.57				
Total	172		3	12.937	.0095*	.076

Note: \*Significance attained at  $p < .05$  level, \* \* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Table 4.25 shows a significant difference between the groups ( $X^2 (2, N=172) = 12.937, P=.005$ ). The effect size ( $r^2 = .076$ ) was moderate. We therefore reject the null hypothesis ( $P=.095$ ) and conclude that the groups are statistically different.



**Figure 4.13: A library facility not in very good condition, stocked with old reading material, lacking a librarian and with evidence of low utilization of the facility.**

Source: Researcher's observation photo, school NS-31

Owing to the importance of library utilization and the fact that there are many hindrances that prevent optimal library utilization, the researcher asked the HoDs whether in their school a clear policy was in place that was specific on promotion of library utilization. Many HoDs admitted that such a policy was not in place. However, some school had such a policy in place. Some policy measures outlined included:

"Stocking library with as many relevant educational materials to the point that library becomes a resource center or an information hub and ensure that students in all classes must access the library twice a week as an official requirement and students are encouraged to visit the library on their own as many other times as is possible".

(HoD , school MW-08)

Having a library lesson per week for every class (HoD , School TE-04)

"Speedy loaning of student with library books and other learning materials and ensuring that students return these materials after use through the use of a bio-metric kit and cataloguing system".

(HoD, School TE-01)

#### **4.3.16 Extent of School Halls/Auditoriums utilization**

The school halls/Auditoriums utilization extent ranged from Not at all as some schools did not have the facility to almost always. Within the study area, 69(40%) of the schools had the lowest extent of halls utilization of either not at all or rarely. In general halls utilization had a mean of 2.57 (SD=1.1) implying on average the facility was nearly occasionally utilized in most of the schools.

#### **Halls` utilization extent and academic performance**

A K-W H-test was performed to explore whether there was an effect of Hall facility utilization on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources utilization and academic performance and therefore the mean ranks on academic performance was the same across the five groups.

Table 4.23 shows a significant difference between the groups ( $X^2$  (4, N=172) =13.079, P=.011). The effect size ( $r^2$  =.076) was moderate. We therefore reject the null hypothesis(P=.011) and conclude that the groups are statistically different.

This finding corroborates those obtained by a related study by Manyaka (2019) on *Effect of physical resources utilization on students' academic performance in public secondary schools in Marani sub county Kenya*'. The study found High utilization of physical resources including school halls or auditoriums significantly improved academic performance.

#### **4.3.17 Extent of Classroom utilization**

While classroom utilization (hours students spent in classrooms) on weekdays during official working hours were not so much differentiated, classroom



utilization during weekends (Saturdays and Sundays) and on weekdays during early mornings before eight O`clock and after four O`clock in the evening were seen to vary widely. Schools were asked to indicate the hours students spent in class beyond the official working hours and the average hours per class per week was used to sort schools in five ordinal groups ranging from very low to very high classroom utilization groups. The mean of classroom utilization was 2.56 (SD=0.81). Moreover, within the study area 87 (51%) schools had either very low or low classroom utilization.

**Table 4.28: Kruskal-Wallis *H* -test summary table comparing classroom utilization and academic performance**

Groups	n	Mean Rank	df	H	P-value	r <sup>2</sup>
Very low Utilization	9	62.78				
Low Utilization	78	83.76				
Moderate Utilization	69	83.76				
High Utilization	11	125.50				
Very high Utilization	5	132.40				
Total	172		4	13.586	.009 *	.079

Note: \*Significance attained at  $p < .05$  level, \* \* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

### **Classroom utilization extent and academic performance**

A K-W H-test was performed to explore whether there was an effect of Classroom utilization on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources utilization and academic performance and therefore the mean ranks on academic performance was the same across the five groups.

Table 4.26 shows a significant difference between the groups ( $X^2$  (2, N=172) =13.586, P=.009). The effect size ( $r^2 =.079$ ) was moderate. We therefore reject the null hypothesis(P=.009) and conclude that the groups are statistically different.

This finding corroborated a related study by Manyaka (2019) that found that High utilization of physical resources including classrooms significantly improved academic performance. The finding was however in dissonance with a study by Solomon and Ndidi (2014) which found that physical resource spaces over utilization may cause stressing and unpleasant learning ambiance that may manifest in dismal academic performance.

**Table 4.29: Kruskal-Wallis  $H$  -test summary table showing association between Course books and Teaching Aids utilization extent (as perceived by Heads of Departments) and academic performance**

<b>Group</b>	<b>Course Books</b>		<b>Teaching Aids</b>	
	<b>n</b>	<b>Mean rank</b>	<b>n</b>	<b>Mean rank</b>
Small Extent (Rarely)	30	69.10	50	70
Moderate Extent (Occasionally)	96	87.56	84	87.25
Large Extent (Often)	41	89.40	29	102.71
Very Large Extent (Almost always)	5	146.70	9	118.78
<b>Total</b>	<b>172</b>		<b>172</b>	
<b>Test statistics</b>		H=11.15 4, df=3, $r^2=0.065$		H=12.34 3, df=3 $r^2=0.072$
<b>P -Value</b>		0.011*		0.006*

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level,

[NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

#### **4.3.18 Extent of Course books utilization**

The course book utilization extent ranged from Rarely to Almost always. Within the study area, 30(17%) of the schools had the lowest extent of utilization of rarely as there was no school that completely lacked course books. In general, course book utilization had a mean of 3.12 (SD=0.72) implying that on average the facility was occasionally utilized in most of the schools

### **Course books utilization extent and academic performance**

A K-W H-test was performed to explore whether there was an effect of Course book Utilization on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources utilization and academic performance and therefore the mean ranks on academic performance was the same across the four groups.

Table 4.27 shows a significant difference between the groups ( $X^2$  (4, N=172) =11.154, P=.011). The effect size ( $r^2$  =.065) was moderate. We therefore reject the null hypothesis(P=.003) and conclude that the groups were statistically different.

#### **4.3.19 Extent of Teaching Aids Utilization**

The Teaching Aids utilization extent ranged from Rarely to Almost always. Within the study area, 50(29%) of the schools had the lowest extent of utilization of rarely as there was no school that completely lacked teaching Aids. In general, Teaching Aids utilization had a mean of 2.98 (SD=0.82) implying on average the facility was nearly, occasionally utilized in most of the schools

### **Extent of Teaching Aids Utilization and Academic Performance**

A K-W H-test was performed to explore whether there was an effect of teaching aids Utilization on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources utilization and academic performance and therefore the mean ranks on academic performance was the same across the four groups.

Table 4.27 shows a significant difference between the groups ( $X^2$  (3, N=172) =12.343, P=.006). The effect size ( $r^2$  =.072) was moderate. We therefore reject the null hypothesis(P=.006) and conclude that the groups are statistically different.

The finding concurs with those of Tulumur & Chemwei (2015) that found that instructional materials are critical in enabling the teacher to avoid rote- leaning and recitation in a lesson delivery. Quoting Sampath (1990) the study illustrated that teaching aids stimulates hearing seeing and doing that maximizes learning and recall and that the following percentage of learning are usually realized by stimulating the respective senses (taste 1%, touch 1.5%, smell 3.5%, hearing 11. % And sight 83%). Recall would generally be maximized by allowing students to hear, see, say and do. The findings were also in concurrence with a quasi-experimental study by Adalikuwu & Isaac (2013) which investigated the *“Influence of teaching aids on student scores in chemistry”*. The experimental group taught using teaching aids significantly outperformed the control group students taught without teaching aids. Teaching aid were seen to enhance student mastery and internalization of chemistry concepts.

The HoDs were asked in an open-ended question to indicate how in their views or teaching experience, availability and adequacy of teaching aids in their school affected teaching and learning. The answers were varied but converged into one statement that teaching aids are very essential for effective teaching and learning. One of the HoD was very precise on the importance of teaching aids to teaching and learning.

"Teaching aids enhance quality of teaching and makes teaching easier by simplifying concepts and lowering the level of ambiguity. If you fail to use teaching aids properly, abstract concepts do not come out clearly to learners due to lack of visualization this may slow your teaching pace and syllabus coverage. If you are handling slow learners, you need to use even more varied teaching aids to enhance internalization than with high ability learners ".

(HoD, School ME-07)

#### **4.3.20 Extent of Playing Field Utilization**

The playing field utilization ranged from Not at all as some schools did not even have a playing field to almost always. Within the study area, 49(29%) of the schools had the lowest extent of utilization of either not at all or rarely. In general, playing field utilization had a mean of 3.09 (SD=0.96) implying that on average the facility was occasionally utilized in most of the schools

**Table 4.30: Kruskal-Wallis  $H$  -test summary table comparing Playing field utilization and academic performance**

Groups	n	Mean Rank	df	H	P-value	$r^2$
Almost Never	5	38.40				
Low Utilization(rarely)	44	75.86				
Moderate Utilization (Occasionally)	67	81.89				
High Utilization (Often)	43	108.83				
Almost Always	13	90.73				
Total	172		4	15.964	.003*	.093

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

### **Playing field Utilization and academic performance**

A K-W H-test was performed to explore whether there was an effect of Playing field Utilization on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources utilization and academic performance and therefore the mean ranks on academic performance was the same across the five groups.

Table 4.28 shows a significant difference between the groups ( $X^2$  (4, N=172) =15.964,  $P=.003$ ). The effect size ( $r^2 =.093$ ) was moderate. We therefore reject the null hypothesis ( $P=.003$ ) and conclude that the groups are statistically different.

#### **4.3.21 Extent of Participation in inter school Co-curricular activities**

The study sought to establish the extent to which schools participated in inter school competitions in sports, music and drama with interest on highest level the school participated in these co-curricular activities from zonal level (lowest) to

national level (highest). The variation in level of participation was used to sort schools into four groups.

The school's participation in inter school co-curricular activities ranged from Sub County level to National level. Within the study area, 87 (51%) schools either did not participate or participated at the lowest level of Sub County. Extent of inter schools' co-curricular participation had an overall mean of 2.67 (SD=0.816) implying that in general most schools participated at county and Sub County level.

### **Extent of Participation in inter school Co-curricular activities and academic performance**

A K-W H-test was performed to explore whether there was an effect of Participation in interschool Co-curricular activities at various levels on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources utilization and academic performance and therefore the mean ranks on academic performance was the same across the five groups.



**Table 4.31: Kruskal-Wallis  $H$  -test summary table comparing Extent of participation in games and academic performance**

Groups	n	Mean Rank	df	H	P-value	$r^2$
Sub County/ Did Not Participate	87	79.77				
County	61	89.52				
Regional	17	91.79				
National	7	137.43				
Total	172		3	9.581	.022 *	.060

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

Table 4.29 shows a significant difference between the groups ( $X^2$  (3, N=172) =9.581, P=.022). The effect size ( $r^2$  =.060) was moderate. We therefore reject the null hypothesis (P=.022) and conclude that the groups are statistically different.

The positive and significant association between participation in co-curricular activities and enhanced students' academic achievement are in agreement with other related studies like Kamau (2021), an ex-post facto research that compared secondary school students in terms of self-esteem, discipline and academic achievement. The study found that students that had participated in regional championship in sports, music and drama in central Kenya had higher self - concept, were more disciplined and had better academic performance that their counterparts that did not take part in the competitions. Similar finding was arrived at by a related study by Kapeliyang (2018) a study that explored ``*Influence of co-curricular activities on students' academic achievement in 5 secondary schools in Kapenguria division of West Pokot County*'' .The study found that co-curricular activities promoted academic performance. The findings were however in

dissonance with an experimental study by Suleman, Termit & Zeesham (2014) that found that over involvement of co-curricular activities had inverse relation with student academic performance in secondary school students of Kohat division in Pakistan.

HoDs were asked in an open-ended question to indicate whether in their view and opinion student participation in co-curricular activities (sports, drama and music) influenced performance positively or negatively. Apart from a very few HoDs who expressed some indifference stating that the influence was relative, an overwhelming majority of HoD views were positive that co-curricular activities participation works to complement academic performance.

"Games tap excess energies in students, help them to relax and distract them from indiscipline behaviors. In games there is team work and socialization gained which is useful in group work in learning. Active involvement demanded in games may enhance learners thinking capacity and their commitment in games can also be extended to commitment in academic work"

(HoD, school MU-02)

"After playing students get refreshed and are able to concentrate in class. Playing also help to improve good health, physical fitness and boosts self-esteem -a healthy body and soul means a healthy mind. This positively influences students` academic performance".

(HoD, School TE-24)

"In our schools to be allowed to participate in inter school co-curricular activities you must have attained a certain grade or position in academic performance. This condition makes students with co-curricular aspirations to carry academic work in their strides as well. "

(HoD, School NS-02)

### **Challenges limiting school to participate in co-curricular activities**

The HoDs were asked to outline in an open-ended question the major challenges in their school that prevented optimal participation in co-curricular activities in their school

Some of the identified causes included

- i. The lack of playing or practicing field or inadequate playing field due to very small school compound. ``*Registration guidelines for basic education institutions*'' (MoE 2017:29) indicate that all educational institutions are mandated to have a playing field not less than a minimum dimension of 90 meters by 120 meters and if not, available leasing can be done within a radius of 200 meters from the school.
- ii. Inadequate games, music and drama equipment due to large population of students and poor condition of existing ones.
- iii. Inadequate financing and other facilitation or goodwill from administration due to over emphasis on curricular activities relative to co-curricular activities
- iv. Limited time for practice due to tight academic calendar and collision between curricular and co-curricular activities. ``*Basic education regulations*'', 2015 GoK (2015) section 11 stipulates that all students must be accorded the opportunity to participate in co-curricular activities from institutional to national level. In terms of official school hours, the regulations in section 84 provides 3:30 pm to 4:45 pm as the time for co-curriculum activities from Monday to Friday.
- v. Inadequate training and coaching skills in co-curriculum activities by teachers
- vi. Lack of commitment and willingness to participate by some teachers and students.
- vii. Recent Covid 19 pandemic restrictions and other associated protocols.

### **Policy for co-curricular promotion in schools**

HoDs were asked if their school had a clear policy that was specific on co-curricular activities promotion. The HoD responses revealed that not all schools had such a policy apart from scheduling physical education (PE) lesson in the timetable in all classes. For those who had a policy some mentioned the following

"In our school it is mandatory for all students to participate in co-curricular activities unless a student has underlying medical condition. The activities are held from 4:30pm -5:30pm every week from Monday to Friday"

(HoD, School KP-37)

"Students in our school are given games uniform and are all expected to participate in co-curricular activities every Tuesday and Thursday 4:00pm-5:00pm. We usually also hold annual sports day and outstanding students in various co-curricular activities are awarded. "

(HoD, School MW-05)

#### **4.3.22 Extent of Computer laboratory utilization**

The computer laboratory utilization ranged from Not at all as some schools did not even have a computer lab to almost always. Within the study area, a whopping 110(64%) of the schools had the lowest extent of computer lab utilization of either not at all or rarely. In general, Computer lab utilization had a low mean of 2.0 (SD=1.02) implying on average the facility was rarely utilized for computer aided instruction in most of the schools.

**Table 4.32: Kruskal-Wallis  $H$  -test summary table comparing Computer Laboratory utilization (as perceived by Heads of Departments) and academic performance**

Groups	n	Mean Rank	df	H	P-value	$r^2$
Not at All (Almost Never)	75	71.35				
Low Utilization(rarely)	35	88.51				
Moderate Utilization (Occasionally)	50	105.24				
High Utilization (Often)	12	93.82				
Total	172		3	14.64	.002 *	.086

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level,

[NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

### **Computer laboratory utilization extent and academic performance**

A K-W H-test was performed to explore whether there was an effect of Computer Laboratory utilization on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources utilization and academic performance and therefore the mean ranks on academic performance was the same across the four groups.

Table 4.30 shows a significant difference between the groups ( $X^2$  (3, N=172) =14.64, P=.002). The effect size ( $r^2$  =.086) was moderate. We therefore reject the null hypothesis(P=.002) and conclude that the groups are statistically different.

This finding corroborates those obtained by a related study by Munyaka (2019) who related physical resources utilization with students' academic performance in public secondary schools in Marani sub county Kenya. The study found High utilization of physical resources including computer labs significantly improved academic performance.

#### 4.3.23 Extent of ICTs Utilization

General ICTs utilization ranged from Not at all to Almost Always. Within the study area, 83(48%) of the schools had the lowest extent of utilization of either not at all or rarely. In general ICTs utilization had an overall mean of 2.6 (SD=0.82) implying on average the facility was nearly occasionally utilized in most of the schools.

**Table 4.33: Kruskal-Wallis *H* -test summary table comparing ICTs utilization extent and academic performance**

Groups	n	Mean Rank	df	H	P-value	r <sup>2</sup>
Almost never	12	41.67				
Low Utilization(rarely)	71	89.76				
Moderate Utilization (Occasionally)	64	86.30				
High Utilization (Often)	25	99.26				
Total	172		3	11.675	.009 *	.068

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

#### ICTs Utilization extent and academic performance

A K-W H-test was performed to explore whether there was an effect of Classroom utilization on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources utilization and academic performance and therefore the mean ranks on academic performance was the same across the four groups.

Table 4.31 shows a significant difference between the groups ( $\chi^2$  (3, N=172) =11.675, P=.009). The effect size ( $r^2$  =.068) was moderate. We therefore reject the null hypothesis(P=.009) and conclude that the groups are significantly different.

The finding was in agreement with a number of related studies including Simoes, Oliveira & Nunes (2022) that explored ``*Frequency of computers and related ICTs usage and students' academic performance among secondary school students in grade 10,11 and 12 in Portugal*'' . In Makueni county in Kenya, Mwiluli (2018) arrived at a similar finding of positive association between academic performance and level of ICT integration. Similar findings of positive and significant influence of ICT use on students' academic achievement were arrived at in an experimental study by Judith (2018) that found that students from an experimental group taught chemistry through computer aided instruction (CAI) outperformed a control group taught chemistry through conventional instructional method (CIM) in four secondary schools in Tharaka -Nithi county in Kenya.

The finding were however in dissonance with a study by Sun, Kelly& Michael (2013) on ``*School computer and related ICT use and student academic achievement in secondary schools*'' . The study considered 15-year-old United States of America (USA) students that participated in 2003 PISA assessment. The study found that though students that reported having never been taught using computer and related ICTs had the lowest scores in the assessment, students who reported moderate use of computers and related ICTs outperformed those that reported use of computers and related ICTs almost always in mathematics, science and reading. The study found that ICT integration should be innovative and not

supplant but supplement the teachers' pedagogical practices to improve students learning achievement.

### **Leverage of ICT use in learning**

Teachers who reported to integrate ICTs in their teaching were further asked to indicate the benefits they were able to experience or realize in their integration of ICTs and how it facilitated teaching and learning

"ICTs enhance students understanding in some abstract topics this enables teacher to cover content quickly due to easier comprehension of content being covered"

(Teacher, School KE-15)

"The multisensory approach of teaching and learning stimulates the learners and makes lesson enjoyable. This also increase students' concentration and eventually are able to recall what is covered due to enhanced visual memory "

(Teacher, School KP- 08)

"Learners are also able to use ICTs and research on their own and this saves a lot of time and improve knowledge acquisition and retention "

(Teacher, School ME-O2)

### **Reasons behind low ICT utilization in teaching and learning in the schools within the study locale**

Principals and teachers were asked in an open-ended question to provide the reasons that were hindering optimal (High/often utilization and very High/Almost Always) in their school. The answers provided were varied but seemed to converge to three themes

Lack or inadequate ICT infrastructure like computers, computer labs. Projectors, teacher's laptop and digital content for use in classroom teaching. In the study area



computers in school were found to be scarce, on average 1 computer is serving about 33 students -Computer student Ratio is (1:33). The projectors and teachers' laptops for use in teaching were also scarce with a mean of 1.1 and Standard deviation of 0.9 for projectors and mean of 2 and Standard deviation of 2.1 for teachers' laptops. This can be viewed as scarce since at ideal situation with 100 percent ICT integration in all classes, the projectors and laptops should be equal to the number of classes in a school.

The other challenge cited was power interruptions or outages that required schools in the area to invest in generators and other supplementary power sources and challenge of Internet in availability or its poor internet connectivity.

The other challenge was limited computer skills by teachers to operate projectors, computers and related peripherals as well as limited skills by teachers to take advantage of internet and related digital resources. This calls for an intensive teacher capacity building and upskilling on ICT integration in their specific subjects.

Most schools also indicated that their schools lacked a clear and unified internal policy guiding ICT utilization as an institutional strategy and consequently traditional chalk-talk conventional methodologies of teaching were common place.

#### **4.3.24 Average level of physical resources utilization (All ten resources combined) and academic achievement**

While the level of utilization for most of the specific resources considered was distributed between five groups from Almost Never (1) to Almost Always (5) the overall level of physical resources utilization that considered the average

utilization for all the ten resources combined ranged only between three groups from Rare/Low level of Utilization (2) to Often /High level of resource utilization (4).

**Table 4.34: Kruskal-Wallis  $H$  -test summary table comparing average level of physical resources utilization for all resources combined and academic performance**

Groups	n	Mean Rank	df	H	P-value	$r^2$
Low Utilization(rarely)	51	73.47				
Moderate Utilization (Occasionally)	99	82.92				
High Utilization (Often)	22	132.82				
Total	172		2	23.04	<.001 **	.135

Note: \*Significance attained at  $p < .05$  level, \* \* Significance attained at  $p < .001$  Level,

[NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

### **Overall level of physical resources utilization and academic performance**

A K-W H-test was performed to explore whether there was an effect of overall level of resource utilization on academic performance. The null hypothesis for K-W test was that there was no statistically significant influence between physical resources utilization and academic performance and therefore the mean ranks on academic performance was the same across the three groups.

Table 4.32 shows a significant difference between the groups ( $X^2$  (2, N=172) =23.04,  $p < .001$ ). The effect size ( $r^2 = .135$ ) was moderate. We therefore reject the null hypothesis ( $p < .001$ ) and conclude that the groups are statistically different.

### **Summary of the association between school physical resources utilization and academic achievement**

**Table 4.35: Summary table of the finding relating to association between Level of physical resource Utilization and academic achievement**

School Physical Resource	Negative Insignificant	Negative Significant	Zero relation	Positive Insignificant	Positive Significant	Effect Size (R <sup>2</sup> )
<i>General Curricular</i>						
1 Science laboratories					√	.087 (Moderate)
2 Libraries					√	.079(Moderate)
3 Halls/Auditoriums					√	.076(Moderate)
4 Classrooms					√	.079(Moderate)
5 Course books					√	.065(Moderate)
6 Teaching Aids					√	.072(Moderate)
<i>Co-curricular</i>						
7 Playing field					√	.093(Moderate)
8 Participation in inter school co-curricular activities					√	.060(Moderate)
<i>ICTs</i>						
9 Computer Labs					√	.072(Moderate)
10 Computers & Auxiliaries					√	.068(Moderate)
11 Overage level of utilization					√	.135(Moderate)
(All resources combined)						

√ -Outcome of statistical test relating academic achievement and level of physical resource utilization, R<sup>2</sup> is the strength of association between dependent and independent variable. (Multiplied by 100 it gives the percentage of variation in academic performance explained by the level of utilization of the given school physical resources)

Generally, the main hypothesis for the study was that;

*H<sub>02</sub>: School physical resources utilization does not have statistically significant influence on academic performance*

The findings as shown on table 4.33 indicated that there was a positive and significant influence between level of physical resource utilization and academic performance, for all the ten (100%) resources considered. The strength of association was moderate for most of the resource utilization level. The overall level of resource utilization was also positive and significant and the effective size was slightly higher but moderate ( $r^2=.135$ ) Implying that 13.5% of the variation in academic performance could be explained by overall physical resource utilization level.

### **Educational opportunity Equality (EOE) and distribution of level of physical resources utilization in the study locale**

The principle of educational opportunity equality (EOE) dictates that in the ideal scenario, variation in students' academic performance should mainly be a function of student's efforts and innate ability and thus should not be significantly related with distribution of school related variables like physical resources utilization since being very essential for learning, physical resources utilization should be optimal in all schools and fairly distributed (Nkonge et al.2021; UNESCO,2016a; Lazenby,2016; Sign, 2014; UNESCO, 1960).The distribution of physical resources utilization in the study locale indicates that it did not meet equality principle since utilization of physical resources was positively and significantly related with academic performance for all the physical resources considered indicating that

higher levels of physical resource utilization were skewed in favor of better performing schools in the study locale .This therefore raises equality concerns that should be addressed.

**Mechanism to ensure adequate and equitable resources distribution in schools and optimal resource utilization**

The researcher through personal oral interview with county quality assurance and standards (CQASOs)officers in charge of the Nyeri and Nyandarua county, sought to find out mechanisms in place to ensure adequate and equitable distribution of resources in all schools and optimal utilization of available resources. The CQASOs indicated that they routinely visit schools and make assessment of physical resources of a school relative to its population. From the assessment if they realize population has increased beyond the threshold of current streams its registered, they make recommendation that the school be registered in the next stream so that it can qualify to be considered for more teachers and for expansion of existing facilities based on its elevated status. The next stage becomes that of mobilization of requisite funds for infrastructural projects and for other resources. Repairs maintenance and improvement vote head can be used, infrastructure development fund from government or direct levy on parents can be used to source development funds. Such priorities are sponsored by school infrastructure committee (SIC)which is a subcommittee of the schools` Board of Management (BOM). The SIC has to closely liaise with county education committees and permanent secretary in charge of education through the director of secondary education for approval of such budgets and expenditures. Currently due to limited

funding some schools have scarcity or inadequacy of many resources. Increased enrolments have also aggravated the inadequacy of resources. In terms of resource utilization, this according to the CQASOs can only be ensured by proper instructional supervision, proper school routines and programs and ensuring resources are available in school and are in good usable conditions. In case of science laboratory, a policy exists that guides lesson allocation whereby every science subject is supposed to be given double lessons every week which are supposed to be used for science practical in the labs hence promoting lab utilization.

#### **4.4. Influence of student's Cognitive entry behavior (KCPE marks) on eventual KCSE performance**

The second objective of the study was;

Objective 2: To determine the influence of cognitive entry behavior in terms of average KCPE entry mark on learning outcome at the end of secondary school in terms of KCSE mean score.

One hypothesis was generated from this objective and it underpinned the association between cognitive entry behavior (in terms of average KCPE marks) and academic performance in KCSE at end of secondary school;

*H<sub>03</sub>: Students cognitive entry behavior does not have statistically significant influence on academic performance.*

To test this hypothesis, schools were asked to indicate the average KCPE marks of students that they usually admit. The school principals were to select the average

entry mark of students in their school from a group of five categories ranging from 100 marks and below to 400 marks and above.

**Table 4.36: Kruskal-Wallis  $H$  -test summary table comparing schools' average KCPE entry marks and final KCSE mean score.**

Groups	n	Mean Rank	df	H	P-value	$r^2$
100 marks and below	15	55.43				
Between 101 and 199	108	77.90				
Between 200 and 299	28	84.64				
Between 300 and 399	18	152.86				
400 and above	3	170.67				
<b>Total</b>	<b>172</b>		<b>4</b>	<b>49.64</b>	<b>&lt; .001* *</b>	<b>.29</b>

Source: Data from questionnaires (2021), SPSS analysis.

A K-W H-test was performed to explore whether there was an influence of average KCPE entry mark on eventual performance at the end of secondary school in terms of KCSE mean score.

The null hypothesis for K-W test was that the student's cognitive entry behavior did not have statistically significant influence on academic performance and therefore the mean ranks on academic performance were the same across the four groups.

Table 4.32 shows a significant difference between the groups ( $X^2$  (4, N=172) =49.64,  $P < .001$ ). The effect size ( $r^2 = .29$ ) was large. We therefore reject the null hypothesis ( $P < .001$ ) and conclude that the groups are statistically different.



The finding corroborates those obtained in a related study by Chebet (2018) on influence of cognitive entry behavior to performance of students at end of form one. The study incorporated 90 students from 5 boarding schools and five teachers from Bukwo district in Uganda. The study compared the student performance in exam at end of form one to those of their classmate peers at Uganda Certificate of Education (UCE). The study found that students performed better at end of form one if their peers had a high score at UCE concluding that quality of peer group members in terms of their prior performance had a positive spill over influence on individual student performance. Similar conclusions were arrived in an ex post facto and correlational study by Gitonga (2017) on *“Predictive validity of KCPE performance on KCSE performance among Alliance high school students in Kiambu county Kenya”*. The study found that national school post sterling results in part due to the fact that they usually admit the best students in KCPE. The individual students in a national school have good performance in KCPE but also benefit from positive spillover effect of learning with high quality classmates and school mate peers in terms of their average cognitive entry behavior. A study by OECD (2020) indicates that while sorting students into different schools based on their prior performance can help to achieve homogenous pedagogical practices by teachers in schools, the horizontal stratification created by the practice may lead to negative spillover effect if low ability peers are in the same school. Usually, low ability peers may disproportionately come from low socio-economic background and if these schools they are assigned are also neglected in terms of resources it becomes an issue of equity concern.

In a People daily newspaper article in Kenya titled, '*Our education System need Urgent Reboot* ' by Kaara (2022, Tuesday 3<sup>rd</sup> May :10), the article which was reacting to the fact that majority of secondary school students in 2021 KCSE scored grade D+ and below, described one of the reforms that Kenya's education system needed was the democratization of form one selection so that we don't have the students with highest cognitive entry behavior attend only few selected schools as is the case currently. The article further opined that all schools should have their general quality improved and facilities equated to those of national and some extra county schools. This will enable reasonable performance to emerge from all parts of the country and in all types of secondary schools and consequently performance will adopt a normal curve.

### **Teacher perceptions on distribution of students based on cognitive entry behavior**

To get in-depth information on perceptions of teachers regarding distribution of student's cognitive entry behavior and its influence on learning, Teachers were asked in an open-ended question to express their views on whether ability grouping of students at the time of posting them into different schools was beneficial for learning based on their experience and views. The teachers' views were divided

Some teachers were against ability grouping during student admission saying it was detrimental to learning.

"Sorting students by ability only helps learners with learning ability to access good schools but slow learners do not benefit. The slow learners end up being admitted in same schools (sub county schools and some county school) where they give teachers a hard time in content delivery since no much assistance in terms of resources and

capacity building is provided yet teachers are not spared in terms of being expected to produce good performance. "

(Teacher, School KL-15)

"Since all students rationally admire to go to high performing schools with high ability peers' students admitted in low performing schools feel inferior in terms of academics and this creates negative attitude towards learning. Furthermore, it leaves the weak learners on their own without high ability peers to help them in their weak areas yet if students were of mixed ability, it would help a lot in improving student participation. "

(Teacher, School KI-03)

Others teachers on the contrary, supported ability grouping during student admission indicating that it was beneficial to learning;

"Students compete at equal wavelength and compete favorably without intimidation from high ability peers. Teacher is able to handle the students well since they are of the same academic ability".

(Teacher, School NC-16)

"As a teacher, one is able to move with all learners at the same pace without leaving others behind. Also, each learner is able to be handled at his or her ability. "

(Teacher, school ND-26)

### **Educational opportunity equality (EOE) and distribution of student's cognitive entry behavior in the study locale**

The fact that distribution of students cognitive entry behavior positively and significantly explains academic performance in the study locale indicated that the positive spillover effects associated with students learning with high cognitive ability peers was skewed in favor of students in better performing schools ( most national and extra-county schools) and this raises equality concerns due to the

disadvantage suffered by students assigned low ability peers and the attendant negative spillover effects in the not very well performing schools (Most county and sub-county schools).

### **Addressing the challenge of low and differentiated academic performance**

From the interviews with county quality assurance and standards officers and teacher service commission county directors from the two counties on causes and how to fix the very many schools with low and differentiated academic performance, it emerged that public secondary schools are varied in many aspects and hence the approach the education officers take was to assess a school from many aspects in a case-by-case basis to diagnose and address performance challenges. While cognitive entry behavior constitutes the main contributory factor, there were many other factors like students' commitment and motivation to learn, home based factors, school leadership and communication factors, resources, staffing and newness of some schools. Some schools like subcounty schools may have confounding of these challenges whereby a school may be new, have very few and less experienced teachers, have students of low cognitive entry behavior and has scarcity of learning resources.

Some schools receive students with very low cognitive entry behavior and with multiple learning needs and the situation is aggravated in part by the 100% transition from primary to secondary policy whereby in the past some students used to move directly to Polytechnique to pursue hands on courses like artisan. From the discussions it became apparent that some affirmative action in learning process may need to be taken to support schools that admit such students especially

the slow learners who may naturally need more contact hours or learning time, teachers in such schools may need capacity building to enable them better handle the learners` needs in terms of language of instruction and delivery of content, the schools should have adequate and diversified teaching aids and visualization tools especially ICTs. If not well addressed posting students in schools with history of perpetual underperformance may be a demotivation and dis incentive to learners and sometimes even to teachers.

The third task of the study was to establish the influence of *teacher qualifications* on academic performance. The indicators or proxies of teacher competencies in a given school was looked at in three folds, Highest academic certificate held by teachers, number of years they have been teaching and their level of participation in professional development or capacity building activities.

#### **4.5 Influence of Teacher Qualifications on Academic Performance**

The third objective of the study was;

Objective 3: To establish the influence of teacher qualifications on academic performance in the study locale.

Teacher qualifications was viewed in relation to distribution of highest academic certificate attained by teachers in schools and distribution of teacher`s experience based on the number of years in the teaching experience.

The hypothesis that underpinned the association between teacher qualifications and academic performance was;

*H<sub>04</sub>: Teacher qualifications does not have statistically significant influence on academic performance.*

To test this hypothesis, two approaches were employed, one where the average teacher qualification certificate was associated with academic performance with no consideration to student population in a school and the alternative approach that took into consideration the student population in a school.

To test this hypothesis based on average teachers' qualification certificate (ATQ) independent of student population in a school, the principals in all the sampled schools were asked to give the total number of all teachers employed in their school and their highest academic certificate from diploma to doctorate. This data was used to work out the Average Teacher Qualification (ATQ) in a school.

$$\begin{aligned} \text{Average Teacher Qualification(ATQ)} \\ = \frac{(D \times 1) + (B \times 2) + (M \times 3) + (P \times 4)}{\text{Total number of teachers}(N)} \end{aligned}$$

Where;

N is the total number of teachers in a school, D is number of teachers in a given school with Diploma certificate, B is number of teachers in a given school with Bachelor's certificate, M is number of teachers in a given school with Masters certificate and P is number of teachers in a given school with Doctorate (PhD) certificate.

Average Teacher Qualification (ATQ) ranges from 1-the lowest value if all teachers in a school were diploma holders to 4- the largest value if all teachers were doctorate holders.

In the study locale, the ATQ had a mean of 1.873 (SD=0.28). This implied that in the study locale the average highest academic certificate held by secondary school teachers was a bachelor's degree and that the number of diploma holders in the schools was higher than both masters and doctorate holders combined. The minimum ATQ was 1.00 while the highest was 2.98.

#### 4.5.1 Average teacher qualification certificate and academic performance

Average teacher Qualification was used to sort schools into three ordinal groups from low to high. A K-W H-test was performed to explore whether there was an effect of teacher average qualification on academic performance. The null hypothesis for K-W test was that teacher qualifications (in terms of average teacher qualification certificate in a school) did not significantly influence academic performance and therefore the mean ranks on academic performance would be the same across the three groups.

**Table 4.37: Kruskal-Wallis *H* -test summary table comparing average teacher qualification certificate (ATQ) and academic performance**

Groups	n	Mean Rank	df	H	P-value	r <sup>2</sup>
Low	68	76.86				
Moderate	65	99.28				
High	39	82.01				
Total	172		2	7.145	.028 *	.042

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

Table 4.34 shows a significant difference between the groups ( $X^2$  (2, N=172) =7.145, P =.028). The effect size ( $r^2$  =.042) was however small but significant. We therefore reject the null hypothesis ( $p < .005$ ) and conclude that the groups are statistically different and therefore average teacher qualification certificate (ATQ) positively and significantly influenced academic achievement in the study locale

The study further sought to determine how distribution of highest academic certificate influenced academic performance when the student population in schools was put into consideration. This computation involved two stages. The first stage involved assuming all teachers were equally qualified and determine how quantity of teachers independent of qualification influenced learning through the Teacher Adequacy Index (TAI). The next stage was to factor in the qualifications certificate of each teacher and compute a weighted TAI termed as Teacher Qualification Index (TQI). The influence of highest academic certificate held by teachers in a given school on performance was taken as the difference in the effect sizes of TAI and TQI.

$$\text{Teacher Adequacy Index(TAI)} = \frac{(D \times 1) + (B \times 1) + (M \times 1) + (P \times 1)}{\text{Total student Population}(N)} \times 100\%$$

(All teachers assigned equal weight-only effect of teacher quantity will be measured)

$$\text{Teacher Qualification Index(TQI)} = \frac{(D \times 1) + (B \times 2) + (M \times 3) + (P \times 4)}{\text{Total Student Population}(N)} \times 100\%$$

(Higher weights assigned to teachers holding higher academic certificate - Confounded effect of both quantity and academic certificate will be measured)



Where;

N is the population of students in a school, D is number of teachers in a given school with Diploma certificate, B is number of teachers in a given school with Bachelor's certificate, M is number of teachers in a given school with Masters certificate and P is number of teachers in a given school with Doctorate (PhD) certificate.

### Teacher adequacy and academic performance

Teacher adequacy index was used to sort schools in four ordinal groups from very low index to High index

**Table 4.38: Kruskal-Wallis *H* -test summary table comparing teacher adequacy and academic performance**

Groups	n	Mean Rank	df	H	P-value	r <sup>2</sup>
Very low	14	98.86				
Low	100	101.71				
Moderate	50	61.81				
High	8	29.13				
Total	172		3	33.1	p < .001* *	.19

Note: \*Significance attained at p < .05 level, \* \* Significance attained at p < .001 Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

A K-W H-test was performed to explore whether there was an effect of teaching aids Utilization on academic performance.

The null hypothesis for K-W test states that the Mean ranks on academic performance are the same across the three groups.

Table 4.33 shows a significant difference between the groups ( $X^2$  (3, N=172) =33.1,  $p < .001$ ). The effect size ( $r^2 =.19$ ) was high. We therefore reject the null hypothesis ( $p < .001$ ) and conclude that the groups are statistically different. What is observable is that well performing school (mean ranks 98.86 and 101.7) had higher teacher deficit than low performing schools (mean ranks 61.81 and 29.13) inadvertently due to their comparative higher student populations.

This imply that teacher adequacy was a moderating variable (A variable in favor of low performing schools)

#### 4.5.2 Teacher highest qualification certificate and academic performance

Teacher qualification index (TQI) was used to sort schools in four ordinal groups from very low index to High index

**Table 4.39: Kruskal-Wallis  $H$  -test summary table comparing teacher highest qualification and academic performance**

Groups	n	Mean Rank	df	H	P-value	$r^2$
Very low	7	93.93				
Low	87	101.48				
Moderate	52	82.09				
High	27	44.65				
Total	172		3	27.5	$p < .001^{* *}$	.16

Note: \*Significance attained at  $p < .05$  level, \* \* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

A K-W H-test was performed to explore whether there was an effect of teacher highest qualification on academic performance.

The null hypothesis for K-W test states that the Mean ranks on academic performance are the same across the three groups.

Table 4.34 shows a significant difference between the groups ( $X^2(3, N=172) = 3$ ,  $p < .001$ ). The effect size ( $r^2 = .16$ ) was high. We therefore reject the null hypothesis ( $p < .001$ ) and conclude that the groups are statistically different. What is observable though. Is that while most well performing school (mean rank 101.48 and 93.93) had lower teacher qualification index than low performing schools (mean ranks 44.65 and 82.09) due to low teacher quantity, the effective size caused by TQI is smaller ( $r^2 = .16$ ) than that of TAI ( $r^2 = .19$ ). Implying that though performing schools had low teacher quantity than less performing schools, the teacher in high performing schools had relative superior academic qualifications as evidenced by the effect size drops by 0.03. This means that high academic qualification influences academic performance positively and significantly as it reduces the moderating power of teacher quantity (advantage low performing schools enjoy of high teacher quantity) from 0.19 to 0.16.

The analysis relating distribution of highest academic certificate in schools and academic certificate in both approaches used shows that teacher academic qualifications (based on highest academic certificate) positively and significantly influence academic performance though due to greater deficit of teachers in

performing schools compared to less performing schools it acts to reduce the negative effect arising from teacher deficit in performing schools.

The findings of positive and significant influence of teacher qualification on academic performance are in agreement with a study by Bolarinwa & Kolawole (2020) on *Teachers' qualification and teaching experience as correlates of students' academic performance in Ekiti state Nigeria*'. The study found that teacher's academic certificate significantly influenced students' academic performance. Similar findings were arrived at by Nyamomgo (2016) who related teachers' academic qualification to students' performance in Nyamira county in Kenya. However, meta-analysis by Glewwe et al. (2013) got results that were inconclusive when teachers' academic qualification was related to students' academic qualification in 43 high rigor studies.

Head teachers being the immediate instructional supervisors were asked to express their views and opinions on whether higher academic certificate held by a teacher beyond the minimum requirement for teaching at secondary school level (Diploma) had any bearing on student achievement. Their views were almost divided.

For those principals who affirmed or agreed that higher academic certificates were beneficial and linked to learning outcomes they provided supportive claims like;

"The teacher capacity building is enhanced; they tend to be more knowledgeable and versed in diverse educational and content related issues. This broad perspective tends to enable them handle varied learners needs better. "

(Principal, School ND-17)

"The students feel they are getting the best of knowledge from the highly qualified teachers. The teacher acts as a perfect role models or mentors to the students and this helps to give morale to the students and make them ambitious. "

(Principal, School KW-02)

For those who disagreed or refuted that higher academic certificate were beneficial and linked to learning outcomes they provided supportive claims like;

"In most cases teachers' dedication or commitment and passion in teaching count more than higher academic certificates. There are also other factors like teachers' creativity and pedagogical skill used or even learners' motivation to learn. In sum teaching is more of a calling and not a qualification".

(Principal, School KL-10)

"A diploma which is the minimum qualification needed is enough to make students to pass. In most cases, the scope and areas of specialization in those degrees has no direct relation with content taught at secondary school level or in improving learning outcomes. Diploma teachers who are more hands on with content often outperform the more qualified teachers who at the beginning have to start with content familiarization from scratch. "

(Principal, School KW-17)

Though the principals' views appeared divided in opinions, higher teacher qualifications appear to be acknowledged strategy of raising teacher quality and consequently learning quality. The interaction between a teacher and a student is *'where the rubber meets the road'* in terms of quality of educational experiences to the learner and this need to be enhanced and promoted. A daily nation article by Nyamai &Atieno (2022 Friday, April 22:1) titled *'Why TSC does not promote teachers with masters, PhDs'*. Citing TSC human resource director Mr. Julius Olayo indicated that TSC only recognized teachers in administration as the only ones in higher grades or job cadres and not those teachers with higher academic

certificates. This according to the director was guided by salaries and remuneration commission advice from job evaluations however, the failure to recognize teachers with high academic certificates may act to discourage teachers from acquiring higher certificates beyond basic entry requirements and this may eventually hurt education quality.

#### **4.5.3 Teacher experience and academic performance**

Distribution of teachers experience in schools based on the number of years the teachers had taught was the other aspect of teacher qualifications that the study considered to test the hypothesis that;

*H<sub>04</sub>: Teacher qualifications does not have statistically significant influence on academic performance.*

School principals were asked to indicate the number of years the teachers in their schools had taught which enabled computation of the proportion of experienced teachers in every school.

The proportion of experienced teachers, those who had taught for five and above years out of the total teachers teaching in a given school was used to sort schools into three groups depending on the percentage score. Low (Below 50%), Moderate (Between 51% and 69%) High (70% and above)

**Table 4.40: Kruskal-Wallis  $H$  -test summary table comparing proportion of experienced teachers and academic performance**

Groups	n	Mean Rank	df	H	P-value	$r^2$
Low Proportion	23	66.87				
Moderate Proportion	88	80.19				
High Proportion	61	103.01				
Total	172		2	11.693	.003*	.070

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

A K-W H-test was performed to explore whether there was an effect of teacher highest qualification on academic performance.

The null hypothesis for K-W test states that teacher qualification does not significantly influence academic performance and therefore the mean ranks on academic performance are the same across the three groups.

Table 4.35 shows a significant difference between the groups ( $X^2$  (2, N=172) =11.693,  $p =.003$ ). The effect size ( $r^2 =.070$ ) was moderate. We therefore reject the null hypothesis ( $p =.003$ ) and conclude that the groups are statistically different.

The findings concur with most of the reviewed studies including Bolarinwa & Kolawole (2020), Glewwe et al. (2013) and Nyamomgo (2016) which are in concurrence that teachers teaching experience both in terms of years of service and participation in capacity building programs significantly enhance student academic achievement. Nyamomgo (2016) also finds that experienced teachers compared to

novice teachers have better classroom management skills, guidance counselling skills, syllabus and subject content mastery. They are also advantaged in being able to apply the washback effect of previous examinations in tailoring their pedagogical practices and teaching content.

### **Educational opportunity equality (EOE) and distribution of teacher qualifications in the study locale**

The principle of educational opportunity equality (EOE) dictates that in the ideal scenario, variation in students' academic performance should mainly be a function of student's efforts and innate ability and thus should not be significantly related with school inputs distribution like teacher qualifications since this should be evenly distributed in all schools as per the number of enrolled students (Nkonge et al.2021; UNESCO, 2016a; Lazenby,2016; Sign, 2014; UNESCO, 1960). Overall from the findings, it can be said that there was a higher representation of teachers with higher experience and higher academic qualification in the performing schools than in less performing schools .This advantage was however minimal compared to the disadvantage found in performing schools of a low teacher adequacy (per capita distribution of teacher quantity based on population of students in a school) .This was because there was a high population of students in performing schools compared to less performing schools. To meet equality principle, the Teacher Service Commission (TSC) may need to rationalize teachers by ensuring a fair distribution of teachers based on qualifications as well as hiring of more teachers to fix the deficit and deployment of some teachers to schools with highest shortages.



### **Teacher balancing in public secondary schools**

In an oral interview with teacher's service commission (TSC) county directors representing Nyeri and Nyandarua counties on mechanisms in place to ensure fair and equitable distribution of teaching staff in all public schools in relation to quantity and qualification, it was confirmed that there were clear policy guidelines in place. In relation to highest academic certificate attained, teachers needed only to have a minimum of a diploma certificate and must have scored a minimum of C+ in the two teaching subjects they intend to teach. Higher qualification beyond diploma certificate only serves to enhance once chances of recruitment or promotion as a teacher. In terms of teacher quantity, the commission makes use of a mechanism called Curriculum-Based Establishment (CBE) whereby the smallest school I streamed (four classrooms and maximum enrolment of 180 students) is assigned 9 teachers, 4 streamed (sixteen classrooms and maximum enrolment of 720 students) is assigned 38 teachers, 12 streamed (forty-eight classrooms and maximum enrolment of 2160 students) is assigned 101 teachers. All schools are also assigned only one principal but in terms of deputies, schools of between 1-5 streams have 1 deputy principal while schools of between 6-12 streams have 2 deputies. Due to high teacher demands there are always shortfalls of teachers posted to schools and schools are expected to supplement TSC teachers with temporary teachers employed by the respective schools' Boards of management (BOM teachers) .Though TSC is active on frequent data collection on status of teacher in schools for purpose of teacher rationalization, the quarterly and annual recruitment of teachers by the commission is not always commensurate to the

demand of teachers and thus shortages and imbalances are common in different schools. Teacher balancing based on experience of teachers is not addressed directly but teachers that are given a chance to transfer from one school to another must have served for five years in their initial posting schools and also teachers that are promoted by TSC (following competitive interviews) are often transferred to other schools on deployment grounds and this may help redistribute teacher experience in schools though not directly.

In relation to teacher utilization, the officers agreed that average teacher workload varied widely between teachers within a school and between schools but the expected average was 27 lessons per week for a teacher. Another form of teacher utilization related to schools that engaged their teachers for remedial teaching outside the official teaching hours and during weekends. The current study had established that classroom and teacher utilization for remedial teaching was more prevalent in performing schools than in less performing schools. This indicated that more needed to be done to bridge the performance gap since according to John Carol (1989:26) weaker or slow learners need to be afforded more contact time to master the same content with students at higher aptitude. Moreover, a myriad of studies has confirmed the almost academic truism that increasing contact hours directly increases academic achievement (Cattaneo, Oggenfus & Wotter, 2016; Asio & Jimenez, 2020; Onchiri, 2010)

#### **4.6 Principals` demographic characteristics**

The fourth and last task of the study was to explore the effect of principals` instructional leadership practices (as a process variable) on academic performance. To begin with the *principals` characteristics* in terms of *Gender, Educational qualification, Age* and *Principalship experience* were determined as input variables and the study sought to find if there existed any association between these variables and academic performance. There was no statistically significant association between gender of principal and students` academic performance ( $U = 2412.5$ ,  $N=172$ ,  $p = .157$ ) Educational qualification of principal and students` academic performance ( $X^2 (3, N=172) = 4.150$ ,  $p = .0246$ ). Age of Principal and students` academic performance ( $X^2 (3, N=172) = 6.279$ ,  $p = .099$ ). Only association between Principalship experience and students` academic performance was significant ( $X^2 (4, N=172) = 9.805$ ,  $p = .044$ ). This suggests that based on the findings, academic performance in public secondary schools is not defined so much by characteristics of principals in terms of (gender, educational qualification or age) the only exception being principalship experience.

##### **4.6.1 Principals` Instructional leadership and academic performance**

The fourth objective of the study was;

Objective 4: To determine the influence of instructional leadership on academic performance

One hypothesis was generated from this objective and it underpinned the association between principal instructional leadership practices and academic performance.

*H<sub>04</sub>: Instructional leadership does not have statistically significant influence on academic performance.*

To test this hypothesis, the concept of ***Instructional leadership*** was viewed through the lenses of five dimensions that is; how effectively principals engaged in Defining and communicating their school mission, Proper managing of instructional programs, strategic resource provision to aid teaching and learning, Developing and supporting teacher quality and motivation, and leadership beyond school borders. On each dimension teachers and Heads of Departments (HoDs) in every school were given five-point Likert scale questions to rate the extent to which they perceived their principal practices fulfilled the five dimensions. The Likert scale ranged from Almost Never/Strongly Disagree (1) to 5 (Almost Always/Strongly Agree).

Descriptive analysis of the five dimensions was as outlined in table 4.41.

**Table 4.41: Summary of descriptive statistics of principals` instructional leadership dimensions**

<b>Dimensions</b>	<b>Practices/Attributes</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>SD</b>
<b>Define the School Mission</b>	Develops learning goals &mission, Communicates the goals& mission	1	5	3.0523	.96285
<b>Manages Instructional Program</b>	Supervise and evaluate teaching and assessment. Prevent learning interruption, Monitors student progress, maintains high visibility.	1	5	3.1105	.86822
<b>Strategic Resource Provision</b>	Prompt provision of Instructional materials asked for, Hold meetings/consults on material needs	1	5	3.1453	.86979
<b>Developing teacher quality and motivation</b>	Promotes/sponsors teacher capacity building, assists teacher in classroom management issues, provides incentives/reward to teachers.	1	5	3.0756	.85162
<b>Leadership Beyond school borders</b>	Collaborates with other stakeholders, Collaborates with parents	1	5	2.9419	.80720
<b>Overall instructional Leadership</b>	Define school Mission, Manages Instructional Program, Strategic resource provision, Develop teacher quality, Leadership beyond school borders	2	4	2.9767	.55095

Source: Data from questionnaires (2021), SPSS analysis.

Table 4.41 indicates that all the five dimensions were practiced by principals though with varying intensity. Based on the overall means, the dimension that was most widely practiced was Strategic resource provision with a mean of 3.145 (SD=0.869) while the least practiced was Leadership beyond school borders with a mean of 2.942 (SD=0.551). The overall instructional leadership considering all dimensions had a mean of 2.977 (SD=0.551) and was more tempered as it lacked the extreme extent ranges of Almost Never and Almost Always.

**Define the school mission, Managing Instructional Programs, Strategic resource Provision and academic performance**

A K-W H-test was performed to explore whether there was an effect of the extent to which the principals were effective in defining school mission and vision of their school and communicating it to stakeholders, Managing of Instructional time and Strategic resource provision on academic performance. This was based on the views and perceptions of the teachers and HoDs.

The null hypothesis for K-W test states that the Mean ranks on academic performance are the same across the groups in each of the dimensions.

**Table 4.42: Kruskal-Wallis  $H$  -test summary table comparing Defining School Mission, Managing Instructional Programs, Strategic Resource Provision and academic performance**

	<b>Define School Mission</b>		<b>Manage Instructional Programs</b>		<b>Strategic Resource Provision</b>	
<b>Group</b>	<b>n</b>	<b>Mean rank</b>	<b>n</b>	<b>Mean rank</b>	<b>n</b>	<b>Mean rank</b>
Almost Never	10	69.7	5	54.8	7	30.36
Rarely	36	82.44	34	65.15	25	64.32
Occasionally	70	83.19	77	89.73	84	93.36
Often	47	88.19	49	95.62	24	92.58
Almost Always	9	138.28	7	113.43	6	96.38
Total	172		172		172	
<b>Test statistics</b>		H=11.47, df=4 $r^2=0.067$		H=12.3, df=4 $r^2=0.072$		H=16.485 df=4 $r^2=0.096$
<b>P -Value</b>		0.022*		0.015*		0.02*

Note: \*Significance attained at  $p < .05$  level, \*\* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

#### **4.6.2 Defining School Mission and Communicating to stakeholders versus academic performance**

Table 4a shows a significant difference between the groups ( $X^2(4, N=172) = 11.47$ ,  $p = .022$ ). The effect size ( $r^2 = .067$ ) was moderate. Schools with principals that more effectively define their mission and vision and communicate the same clearly to all relevant stakeholders had higher mean ranks (88.19 and 138.28) compared to schools with less effective principals (82.44 and 69.7) We therefore reject the null hypothesis ( $p = .0022$ ) and conclude that the groups are statistically different.

### 4.6.3 Managing Instructional Programs and academic performance

Table 4.42 shows that Schools with principals that have put up mechanisms that better protect and optimally utilize instructional time without interruptions or wastage, Monitor student progress, are present in school most of the time and motivates students to perform have a better mean rank (95.62 and 113.43) than those who are not very effective (65.15 and 54.8). The difference between groups is statistically significant ( $X^2(4, N=172) = 12.3, p = .015$ ) with a moderate effect size ( $r^2 = .072$ ). We therefore reject the null hypothesis ( $p = .0015$ ) and conclude that the groups are statistically different.

To get some in-depth information regarding managing instructional programs, Principals were asked in an open-ended question whether they had a strategy in place in their school to cater for students who were low achievers/performers in academics. Many principals answered to the affirmative although the extent and implementation methods they used differed. Some of the strategies that were outlined included;

"Close monitoring of weak learners (those falling below a set cut-off mark or stream position) and embracing Value Added Progress (VAP) at all the time"

(Principal, School TE-11)

"Increasing contact time for weak learners through extra remedial lessons so that weak learners can catch up with the rest of the student. "

(Principal, School KP-24)

"Regularly calling the parents of students whose performance is falling below a certain set grade/position or is falling below the expected capability/potential of the students for academic clinics and at any other time based on need to discuss learner's progress. "

(Principal, School ME-19)



#### **4.6.4 Strategic Resource Provision and academic performance**

Table 4.43 shows that Schools with principals that are more highly strategic in providing required resources to facilitate smooth teaching and learning have better mean rank (95.62 and 113.43) than those who are less highly strategic (65.15 and 54.8). The difference between groups is statistically significant ( $X^2(4, N=172) = 16.485, p = .0015$ ) with a moderate effect size ( $r^2 = .096$ ).

We therefore reject the null hypothesis ( $p = .0015$ ) and conclude that the groups are statistically different.

**Table 4.43: Kruskal-Wallis  $H$  -test summary table comparing Developing Teacher quality and motivation, Leadership beyond School Borders, Overall Instructional leadership Practice and academic performance**

	<b>Developing Teacher Quality &amp; Motivation</b>		<b>Leadership Beyond School Borders</b>		<b>Overall Instructional Leadership Practice</b>	
<b>Group</b>	<b>n</b>	<b>Mean rank</b>	<b>n</b>	<b>Mean rank</b>	<b>n</b>	<b>Mean rank</b>
Almost Never	7	44.64	5	37.40	0	-
Rarely	30	75.80	40	79.13	28	42.77
Occasionally	83	81.41	93	87.62	120	91.92
Often	47	105.81	28	93.79	24	110.42
Almost Always	5	112.20	6	125.17	0	-
Total	172		172		172	
<b>Test statistics</b>	H=15.595, df=4 $r^2=0.091$		H=10.003, df=4 $r^2=0.058$		H=28.555 df=2 $r^2=0.167$	
<b>P -Value</b>	0.004*		0.04*		< .001* *	

Note: \*Significance attained at  $p < .05$  level, \* \* Significance attained at  $p < .001$  Level, [NS] Not Significant.

Source: Data from questionnaires (2021), SPSS analysis.

A K-W  $H$ -test was performed to explore whether there was an effect of Principals' effectiveness in developing teacher quality and motivation, Leadership beyond school borders and overall instructional leadership on academic performance.

The null hypothesis for K-W test states that the Mean ranks on academic performance are the same across the groups in each of the dimensions.

#### **4.6.5 Developing teacher quality and motivation versus academic performance**

Table 4.39 shows that Schools with principals that highly develop their teacher quality and motivation through means like supporting their capacity building, induction programs, peer learning, bonding excursions and other incentives have better mean rank (105.81 and 112.20) than those who are less highly effective (75.8 and 44.64). The difference between groups is statistically significant ( $X^2(4, N=172) = 15.595, p = .004$ ) with a moderate effect size ( $r^2 = .091$ ).

We therefore reject the null hypothesis ( $p = .004$ ) and conclude that the groups are statistically different

For in depth information relating to developing teacher quality through professional capacity building, teachers were asked whether they had been sponsored or facilitated by their principal to attend any in-service training or capacity building in the last two years. The answers were varied. A sizeable number of teachers reported that they had not been sponsored for any in-service training while others had been sponsored for at least one or two workshops. Areas covered by some of the workshop/capacity building programs that teachers attended included the following ; Training as Kenya National Examination Council (KNEC) examiners, Remote learning methodology a program offered by Ministry of Education (MoE), ICT integration in teaching and learning, improving creativity and innovation in teaching of sciences and mathematics a program offered by SMASSE, team building, TPAD training, set books sensitization, setting and

marking of internal exams and syllabus changes and emerging issues in national examination trends.

### **Teacher motivation and incentives**

In regard to teacher motivation and incentives, teachers were asked whether their schools had a policy of rewarding or appreciating teacher excellence in work performance. Most teachers indicated that such arrangements of rewarding teachers existed though they were inadequate and differed from one school to another. Some teachers indicated that when their school perform well, they are given an annual motivational trip fully paid by their school, others indicated that there are monetary rewards to teachers when their students score quality grades that is grades B, B+, A- and A plain or if they advance in co-curricular activities to regional level and beyond and perform exemplary. Some schools cited that their principal always recognizes their efforts by writing appreciation or commendation letters and certificates.

Some teachers also seemed to view principals professional support given in the course of their work or provision of teaching learning material as a form of motivation for them to work better

"The principal is polite, courteous and friendly when I joined this school I was inducted well and given a lot of professional support".

(Teacher, School KL-12)

"Our principal recognizes our efforts as teachers, and is keen to appreciate every positive thing you do to improve learning, this makes us feel good. She also supports our work by ensuring all

materials required for learning that we ask for are purchased and delivered on time ".

(Teacher, School KP-37)

#### **4.6.6 Leadership beyond school borders and academic performance**

Table 4b shows that Schools with principals that demonstrate higher degree of Leadership beyond their school borders especially in tapping the support of parents and other helpful stakeholders have better mean rank (93.79 and 125.17) than those who are less highly effective (79.13 and 37.40). The difference between groups is statistically significant ( $X^2(4, N=172) = 10.003, p = .04$ ) with a moderate effect size ( $r^2 = .058$ ). We therefore reject the null hypothesis ( $p = .04$ ) and conclude that the groups are statistically different

#### **4.6.7 Overall Instructional Leadership and academic performance**

Overall Instructional leadership was considered as the average score of all the five dimensions of instructional leadership for a school. It was the most representative indicator of the overall performance of a principal instructional leadership practice. From table 4.39, the mean rating was moderate without extreme scores on either end. Schools with principals with a higher/better instructional leaderships practice had a higher mean rank than schools with Principals with a lower rating on instructional leadership practices. The difference between groups was statistically significant ( $X^2(2, N=172) = 28.555, p < .001$ ) with a high effect size ( $r^2 = .167$ ). We therefore reject the null hypothesis ( $p < .001$ ) and conclude that the groups are statistically different

This finding concurs with a related study by Hou, Cui & Zhang (2019) on *Impact of instructional leadership on high school students' academic performance in Shenyang China*. The study focused on four dimensions of instructional leadership that is, defining school mission, promotion of teacher development, managing instructional programs and leadership beyond school borders (public relations). All the Principals' instructional leadership practices were found to positively and significantly influence academic performance with the exception of public relations. In general, the study found that instructional leadership as a variable significantly influenced students' academic performance and acted as significant moderating variable between students' entry grade in high school and the grade they achieved at the end of high school in the 26 high schools studied. Similar findings were arrived at by Ndambuki (2020) in a mixed method study in Makueni county in Kenya which explored the influence of instructional leadership on secondary school students' academic achievement. The study found that instructional leadership was positively and significantly correlated with academic performance in all the dimensions addressed.

### **Educational opportunity equality (EOE) and distribution of instructional leadership in the study locale**

The principle of educational opportunity equality (EOE) dictates that in the ideal scenario, variation in students' academic performance should mainly be a function of student's efforts and innate ability and thus should not be significantly related with school related variables including instructional leadership since being a critical process variable that can facilitate learning instructional leadership should be optimally practiced in all schools and fairly distributed in all schools (Nkonge et

al.2021; UNESCO,2016a; Lazenby,2016; Sign, 2014; UNESCO, 1960).The distribution of instructional leadership was positively and significantly related with academic performance in all the dimensions considered indicating that instructional leadership was skewed in favor of performing schools .This therefore raises an equality concern that need to be addressed so that instructional leadership is fairly represented and practiced in all schools.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter gives a succinct summary of the key findings, conclusions and recommendations for policy, practice and for further studies

#### 5.2 Summary

This section provides a summary of the key findings based on the major objectives and hypothesis of the study.

##### 5.2.1 Influence of physical resources adequacy and utilization on academic performance

The objective constituted two parts firstly to establish the adequacy status of physical resources in the study area and its influence on academic performance and secondly, to determine the status of resource utilization in the study area and its influence on academic performance. The status of resource adequacy and utilization were obtained from univariate descriptive analysis while the associations were obtained from bivariate non-parametric inferential statistics.

##### a) Adequacy of physical resources

In relation to general *curricular* resources adequacy, Coursebooks were most adequate resources where 158(92%) schools had fairly adequate students` and teachers` course books. The next adequate physical resources were classrooms with 142(83%) schools having relatively adequate classrooms. The main challenge being the poor distributions of classrooms where most high performing schools had



large population of students compared to available classrooms and consequently had large class sizes than the recommended 45 maximum students per class. The next resources that were fairly adequate were science laboratories where 106 (62%) schools had fairly adequate science lab facility with only a paltry 5(3%) of schools lacking completely the science laboratory facility. Teaching aids were adequate in 80(47%) schools while school halls or auditoriums were adequate in only 31(18%) schools whereby 42(24%) schools completely lacked the facility. Libraries were the scarcest of the general curricular resources with only 24 (14%) schools having adequate library facilities, furthermore, almost half of the schools 78 (45%) lacked a library facility.

In relation to *co-curricular* resources adequacy, playing fields were adequate in nearly a half of the schools 98(57%) and similarly 94(55%) schools had adequate facilities to support sports, music and drama activities.

In relation to *Information Communication Technologies (ICTs)* resources adequacy, there was gross under investment. No school had adequate number of computers or computer labs but worse still, 68 (40%) schools and 75(44%) schools respectively completely lacked computers and computer labs. Most schools had only one projector with mean of 1.122(SD=0.938) which was grossly inadequate as ideally projectors should be equal to classroom numbers. 20 (12%) schools completely lacked projectors. In relation to teacher laptops for use in technology aided instruction 46(28%) schools completely lacked laptops while the rest of the schools had either 1 or 2 laptops with a mean of 1.65 (SD=2.14). Teacher laptops

and projectors were thus grossly inadequate in all schools as they are functionally used together during a lesson.

In relation to ICT integration support or auxiliary facilities examined, only 5(3%) had all the facilities considered (electricity and lighting in all rooms, sockets in classrooms, dustless whiteboards or smart boards, internet connection and digital content)

When all the resources considered in the study were aggregated together, only 49 (28.48%) schools had all the eleven physical resources considered available, the remaining 128 (71.52%) had between one to four physical resources completely lacking. The four physical resources that lacked the most in schools included; libraries 78 (45%), computer labs 75 (44%), computers 68 (40%), and School halls/auditoriums 42 (24. %).

#### **b) Relationship between physical resource adequacy and academic achievement**

The relationship between physical resource adequacy and academic performance was underpinned by the first hypothesis linked with the first objective;

*H<sub>01</sub>: School physical resources adequacy does not have a statistically significant influence on academic performance*

The findings were that in relation to association between general *curricular* resources and academic achievement, apart from science lab adequacy and course book adequacy that were not significant, all other resources had positive and

significant influence on academic achievement (library (H (2, N=172) =10.63, P=.005), school halls (H (2, N=172) =7.88, P=.019), and teaching aids (U=4435.5, N=172, P=.02) Library facility had the highest effective size ( $r^2 = .062$ ) meaning that variation in library adequacy explained 6.2% of variation in academic performance. Hall facility adequacy, and teaching aids adequacy explained 5% and 3% respectively of the variation in academic performance. Classroom adequacy was; however, inversely related to academic performance since most performing schools had large class sizes due to high student population relative to number of classrooms.

There was a positive and significant association between *co-curricular* related resources and academic achievement. Playing field adequacy (H (2, N=172) =7.5, P=.024). and co-curricular facilities adequacy (U=4345, N=172, P=.037) explained 4% and 3% of the variation in academic performance

There was a strong positive and significant association between *ICTs* resources adequacy and academic achievement. Computer adequacy (U=5038, N=172, P < .001), Computer labs adequacy (U=4774, N=172, P < .001) and ICT support/auxiliary facilities adequacy (H (3, N=172) =8.765, P=.033) explained 13%, 7.2% and 5.1% respectively of the variation in academic performance.

When all eleven physical resources were aggregated together, there was a positive and significant association between schools with overall adequate physical resources and academic performance (U=1682, N=172, P < .001). Overall physical

resources adequacy of a school thus explained 11.3% of variation in academic performance.

**c) Extent of resource utilization**

In relation to the status of resource utilization in the study area and its influence on academic performance, the study focused on establishing which resources were less frequently (Not at all and rarely) utilized. The findings indicate that computer labs were most less frequently utilized facilities 110 (64%) schools, then library facilities 100 (58%) schools, games resources 87 (51%) classrooms 87(51%)schools, ICTs utilization for computer aided instruction 83(48%) schools, Hall/auditorium facility 69(40%) schools, Teaching aid 50(29%) schools, playing field 49(29%) schools, science lab utilization 34(17%) schools, course book 34(17%). In general, apart from libraries, computer labs and teaching aids that were on average rarely utilized, most of the other resources were on average occasionally or moderately utilized. The overall level of physical resources utilization considering all physical resources combined was 2.83 (SD=0.631) meaning that on average resources were occasionally or moderately utilized.

**d) Relationship between physical resource utilization and academic achievement**

The relationship between physical resource utilization and academic performance was underpinned by the second hypothesis that was linked with the first objective;

*H<sub>02</sub>: School physical resource utilization does not have statistically significant influence on academic performance*

The findings were that there was a positive and significant influence between academic achievement and level of utilization of all the physical resources considered. In particular, for the general *curricular* resources utilization and academic achievement, all the considered resources had positive and significant influence on academic achievement (Classrooms (H (4, N=172) =13.586, P=.009), Science labs (H (2, N=172) =12.735, P=.013), and Library (H (4, N=172) =13.51, P=.009) Hall/Auditorium (H (4, N=172) =13.079, P=.011) , Teaching aids (H (3, N=172) =12.343, P=.006) Course book (H (3, N=172) =11.154, P=.011) .Classroom facility utilization had the highest effective size ( $r^2 =.079$ ) meaning that variation in classroom facility utilization explained 7.9 % of variation in academic performance. While Science labs, library, Hall/auditorium, teaching aid and course book utilization explained 8.7%, 7.9%,7.6%, 7.2% and 6.5% respectively

As an emergent finding, it was also observed that science lab condition (H (3, N=172) =8.335, P=.04), and library condition (H (3, N=172) =12.937, P=.0095), were important determinants of library utilization and they were consequently significantly related to academic performance though with smaller effect sizes than facility utilization.

There was a positive and significant association between utilization of *co-curricular* related resources and academic achievement. Playing field utilization (H (4, N=172) =15.964, P=.003). and participation in inter-school co-curricular

activities ( $H(3, N=172) = 9.581, P = .0022$ ), explained 9.3% and 6% of the variation in academic performance

There was a positive and significant association between Computer lab utilization ( $H(4, N=172) = 15.27, P = .09$ ), and general *ICTs* resources utilization ( $H(3, N=172) = 11.675, P = .009$ ) and academic achievement. Computer lab utilization had a moderate effect size ( $r^2 = .079$ ) meaning that variation in computer lab utilization explained 7.9 % of variation in academic performance while general *ICTs* resources utilization explained 7% of variation in academic performance.

Overall level of physical resources utilization for all resources combined had a positive and significant association with academic performance ( $H(2, N=172) = 23.04, p < .001$ ). The overall level of physical resource utilization had a moderate effect size ( $r^2 = .0135$ ) meaning that variation in overall level of physical resource utilization explained 13.5% of variation in academic performance. This being comparatively stronger than any other level of physical resource utilization considered for a specific physical resource.

### **5.2.2 Influence of students` cognitive entry behavior and academic performance**

The second objective was to determine the influence of cognitive entry behavior in terms of average KCPE entry marks on learning outcome at end of secondary school in terms of KCSE mean score. This objective was related with the third hypothesis of the study and it underpinned the association between cognitive entry

behavior (in terms of average KCPE marks) and academic performance in KCSE at end of secondary school;

*H<sub>03</sub>: Students cognitive entry behavior does not have statistically significant influence on academic performance.*

The findings indicate a strong and positive influence between average KCPE marks and eventual KCSE mean score ( $H(4, N=172) = 49.64, p < .001$ ). The effect size was large ( $r^2 = .29$ ) indicating that 29% of variation in KCSE mean score was explained by variation in students' composition based on their KCPE cognitive entry behavior.

### **5.2.3 Influence of teacher qualifications on academic performance**

The third objective was to determine the influence of teacher qualifications on academic performance. The objective had one related hypothesis that underpinned the association between academic qualifications and academic performance

*H<sub>04</sub>: Teacher qualifications does not have statistically significant influence on academic performance.*

Teacher qualification was viewed in terms of Highest academic certificate and experience in terms of teachers' teaching duration. The finding was that average teacher qualification certificate (ATQ) in schools positively and significantly influenced learning outcomes ( $X^2(2, N=172) = 7.145, P = .028$ ). The effect size ( $r^2 = .042$ ) was however small but significant. This implied that distribution of teachers' highest academic certificate explained 4.2% of the variation in academic performance within the study locale. When student population in schools was

considered in relation to the distribution of teacher quantity and qualification certificate, the findings were that in terms of teacher distribution, there were more teachers per students in the low performing schools since the teacher adequacy was inversely related to academic performance ( $F(3, N=172) = 33.1, p < .001$ ). This implied that teacher adequacy was a moderating variable (an advantage variable in favor of low performing school). When the teacher highest academic qualification was however factored in, the effective size of teacher quantity dropped by 0.03 implying that the high performing schools had teachers of slightly higher academic qualification. Teachers highest academic certificate, therefore, positively influence learning achievement though teacher imbalance was even more critical challenge as an emergent finding.

In relation to teacher experience in terms of teaching duration, the findings were that schools with a high proportion of experienced teacher (those that had taught for minimum five years and above) significantly outperformed those that had more proportion of novice teachers that had taught for less than five years ( $F(2, N=172) = 11.693, p = .003$ ). Teaching experience explained 7% of the variation in learning achievement.

#### **5.2.4 Influence of principal's instructional leadership practices on academic performance**

The fourth and last objective of the study was to determine the influence of instructional leadership on academic performance.



To begin with the status of instructional leadership was assessed and analyzed by use of descriptive statistics. The concept of instructional leadership was assessed through the lenses of five dimensions. The findings of the study were that all the five dimensions were practiced by principals in all schools in the study area though at varying extent. According to the overall means, the order in which the dimensions were practiced by principals ranged from the most widely practiced dimension, strategic resource provision (3.1453 mean, SD=0.869), Managing instructional programs (3.1105 mean, SD=0.8682), Developing teacher quality and motivation(3.0756 mean, SD=0.8516), Defining school mission (3.052mean, SD=0.9629), to least practiced dimension Leadership beyond school borders (2.9419 mean, SD=0.807).In sum overall principal instructional leadership considering all five dimensions was practiced at overall mean of 2.977 and standard deviation (SD) of 0.551

**a) Association between instructional leadership and students' academic achievement**

One hypothesis was generated from the fourth objective and it underpinned the association between principal instructional leadership practices and academic performance.

*H<sub>05</sub>: Instructional leadership does not have statistically significant influence on academic performance.*

In relation to association between principals` instructional leadership practices and academic achievement all the five dimensions assessed positively and significantly influenced academic achievement. Strategic resource provision(H (4, N=172)

=9.805,  $p = .044$ ), Developing teacher quality and motivation ( $H(4, N=172) = 9.805$ ,  $p = .044$ ), Managing instructional programs ( $H(4, N=172) = 9.805$ ,  $p = .044$ ), Defining school mission ( $H(4, N=172) = 9.805$ ,  $p = .044$ ), to least practiced dimension Leadership beyond school borders ( $H(4, N=172) = 9.805$ ,  $p = .044$ ). The dimensions explained the variation in learning achievement from the highest 9.6% for strategic resource provision, 9.1% for developing teacher quality and motivation, 7.2% for managing instructional programs, 6.7% for defining school mission and the least influence of 5.8% for leadership beyond school borders.

The overall instructional leadership that incorporated all the five dimensions was strongly associated with academic achievement ( $H(2, N=172) = 28.555$ ,  $p < .001$ ) with a high effect size ( $r^2 = .167$ ). This implied that variation in principals' instructional leadership practices explained 16.7% of the variation in academic performance within the study area.

To clearly isolate instructional leadership variable, academic achievement was further found not to be associated with principal's demographic characteristics like gender, highest academic certificate, or age as all these were insignificantly related with academic achievement with exception of principalship experience ( $H(4, N=172) = 9.805$ ,  $p = .044$ ) which explained academic achievement by a moderate effect size ( $r^2 = .057$ ).

### **5.3 Conclusions**

Based on the findings, this study has resulted into several conclusions

- i. In relation to *physical resources adequacy*, it was astonishing that there were many resources that were completely not available or lacked in the schools, for instance, Libraries were lacking in 45% of the schools, computers 40%, computer labs 44%, school halls/auditorium 24% and science labs and playing field 3% each. Furthermore, there was a stark disparity in the distribution of physical resources adequacy which was established based on per capita distribution of resources to the total population of students in a school. Highly populated schools which had not upscaled their physical resources had such resources thinly distributed to all the students enrolled. The overall *physical resources utilization level* was sub-optimal as on average it had ( $M = 2.83$ ,  $SD = 0.631$ ). This implied that on average most resources were occasionally or moderately utilized. When adequacy and level of resource utilization were related with academic performance, resource adequacy explained 11.3% while level of resource utilization explained 13.5% of the observed variation in academic performance. This clearly depicted the level of physical resource utilization as a more definitive variable than mere resource adequacy. Furthermore, as an emergent finding, the state of physical resource condition was found to be instrumental in promoting utilization. These findings were in consonance with the views of a majority of HoDs who observed that poor condition of the facilities was one of the major factors that limited the utilization of physical resources.

- ii. Student cognitive entry behavior was the single variable with the highest effect size and it explained 29% of the variation in learning achievement in public secondary schools within the study area. This implied that the positive spillover effects associated with a student learning with high ability peers were skewed in favor of the well performing schools.
- iii. Though distribution of teachers highest academic certificate affected academic achievement positively and significantly, the small effect size ( $r^2 = .042$ ) indicated that, the major challenge in the study area was not disparity in teacher highest academic certificate but the imbalance in distribution of teacher quantity or adequacy where the scarcity of teachers was highest in high performing schools due to their high student population relative to low performing schools most of whom being subcounty schools.
- iv. Principal`s Instructional leadership practices constituted the second strongest variable that explained variations in academic performance after cognitive entry behavior-Effect size ( $r^2 = .167$ ) meaning that variation in overall principal`s instructional leadership practices explained 16.7% of the observed variation in academic performance. When taken separately, All the five dimensions of instructional leadership considered (Defining school mission, managing instructional programs, Strategic resource provision, developing teacher quality and motivation and leadership beyond school borders) were all positively and significantly associated with academic performance. The effect size (magnitude of variation in academic performance caused) by the overall principal`s instructional leadership

incorporating all the five dimensions was stronger than any single instructional leadership dimension considered separately. This implied that for principals to be effective in influencing academic performance in their schools they must prioritize all the dimensions of instructional leadership together as it is the overall instructional leadership that is strongest in influencing performance than any single dimension taken separately.

#### **5.4 Recommendations**

Consequent to the study findings and conclusions, the following recommendations can be suggested

##### **5.4.1 Educational Policy Recommendations**

- i. There is need for ministry of education to formulate clear policy that stipulates not just the minimum standards of both quality and adequacy of curricular, co-curricular and ICT physical resources expected in all public secondary schools, but also addresses the harmonization of these resources in public schools as per their current population of students enrolled (per capita distribution of physical resources as per current student population). This will ensure that all schools are similar and comparable in resource adequacy as expected based on equality principle and are enabled to provide high quality teaching and learning that would consequent promote high academic achievement .
- ii. Owing to the fact that cognitive entry behavior of students was found to be a key variable that influenced learning and learning outcomes in a very strong way, especially in relation to positive externalities or spillover effects of

student learning with high ability students like those in current national schools, government may need to review its secondary school admission criteria to ensure more random or even distribution of all students in public schools or ensure equity measures are adequately put in place to cater for the affirmative action of schools that admit students of very low ability like subcounty schools to enable them access equivalent educational opportunity.

- iii. There is need to review current framework of training and preparation of school managers or principals so as to incorporate and intensify instructional leadership training as a critical capacity building area beyond the traditional management roles (planning, organizing, staffing, directing and controlling) with proven association in improving learning outcomes in schools.
- iv. There is need for TSC and ministry of education to review teacher quality policies so that ministry does not only recognize but also facilitates teachers to acquire higher academic qualification and professional development. There is also need to improve modalities to ensure balanced distribution of teachers in all schools in terms of quantity and qualifications

#### **5.4.2 Recommendation Relating to Educational Practice**

- i. Public secondary schools should beef up their physical resource's adequacy relating to co-curricular activities to give students a greater array of co-curricular choices as there is a positive and significant association between these resources and academic performance. Despite some minimal dissenting perceptions from respondents on the role of co-curricular activities and

academic performance this study finds that co-curricular activities augment rather than hinder learning and academic achievement.

- ii. While inadequacy of computer and other ICT related resources in the schools was an evident barrier to technology integration, the low level of utilization of the already available ICT resources in most schools was even more critical and hidden barrier to ICT integration. Schools thus need to not only invest in ICT resources but also develop modalities and internal policies to stimulate and incentivize technology integration in teaching and learning including capacity building initiatives.
- iii. School principals as instructional leaders should not only strategically plan and mobilize funds to ensure essential physical resources are adequate as per their current student enrollment, but must be keen to supervise optimal utilization of the available resources so as to get value for their investments since resource utilization matter more for enhanced learning and academic achievement as opposed to mere adequacy or availability of resources. Within the study area, most physical resources were on average rarely or moderately utilized.
- iv. Since poor condition of resources available was found to be a major impediment to optimal resource utilization in the study area, there is justification for schools in the study locale to invest in improving the condition of the available physical facilities a case in point being that Libraries in the study locale should be well-furnished and stocked with relevant reading materials including internet accessibility and ensure there is a designated librarian .Similarly , science laboratories should be well maintained and have

sufficient reagents and chemicals, apparatus , fume chambers and gas pipping to improve the current state of library and laboratory utilization

- v. Quality Assurance and Standards officers (QUASO), and ministry officials should in addition to monitoring human and physical resource adequacy in schools, keenly monitor optimal resource utilization and exercise of instructional leadership practices by school principals as key school processes that matter for learning achievement. There is also need to enhance principals' instructional leadership skills and competencies and ensure that principals prioritize this role among there many other competing roles in general school management.

#### **5.4.3 Recommendation for Further Research**

- i. A replication study involving private secondary schools to compare the level of schools` inputs and processes and their relative influence on learning achievement.
- ii. A similar study incorporating other learning inputs and processes like teacher commitment and motivation to teach, students' commitment and motivation to learn, classroom management practices and pedagogical approaches
- iii. A study focusing on how other types of leadership other than instructional leadership influence learning and learning achievement.
- iv. There is need to mainstream action research seeking to analyze national examinations and other learning assessments so as to establish whether learning objectives are effectively met, factors promoting or impeding learning and how to address them. The findings should be used to improve all



secondary schools in Kenya so that differential performance is only attributable to students' individual effort or aptitude but not due to variation in schools' inputs and processes.

#### REFERENCES

- Achimugu, L. (2017). *Availability and utilization of instructional materials for teaching chemistry in senior secondary schools*. International journal of novel research in education and learning, Vol 4, issue 3, pp.33-43
- Adalikwu, S., & Isaac, T. (2013). *The influence of instructional materials on academic performance of senior secondary school students in chemistry in cross river state in Nigeria*. Global Journal of educational research, vol. 12,2013: 39-45. Doi <http://dx.doi.org/10.4314/giedr.v12i1.6>
- Adede, K. (2012). *Impact of school infrastructure on provision of quality education in public secondary of Nyakach District, Kenya*. Masters of Art thesis of University of Nairobi
- Agingu, E. (2018). *Validity of primary school examination as predictor of secondary school examination score among public secondary school students in Kisii Central sub-County, Kenya*. International Journal of research-Granthaalayah. Vol. 6 (issue 4) April 2018. Doi:10.5281/zenodo.1241461; pp 80-94
- Alexander, K.& Morgan, S.,(2016) *The Coleman report at fifty: Its legacy and implications for future research on equality of opportunities*. The Russel Sage foundation. Journal of the social sciences. vol 2 No.5 pp1-16. Retrieved <https://www.jstor.org/stable/10.7758/rsf.2016.2.5.01>

- Ali, N., Khan, A., & Ahmed, T. (2020). *Effect of school buildings on academic achievement of secondary school student in Southern Pakistan*. Global education studies review V(II), pp:28-34. Retrieved: <https://doi.org/10.31703/gesr.2020> (V-II). 04
- Armstrong, P. (2015). *Teacher characteristics and students' performance: An analysis using hierarchical linear modeling using results from SACMEQ III study*. South African Journal of Childhood Education (SAJCE) ;vol5 n2.online version. Retrieved.[www.http://.science.org.29](http://www.http://.science.org.29)
- Asiago, D. (2018). *Administrative factors influencing quality of education in public secondary school in Kitui, Kisii and Nairobi counties, Kenya*. A doctor of educational administration thesis of University of Nairobi.
- Asio, J. & Jimenez E. (2020). *Effects of remediation activities on grade 5 pupils' academic performance in Technology and livelihood education (TLE)*. Pedagogical research 5(4), em0075.<http://doi.org/10.29333/pr/8464>
- Atieno, A. (2014) *Influence of teaching and learning resources on students' performance in Kenya Certificate of secondary Education in Free Day Secondary Education in Embakasi district, Kenya*.an MED project report in educational planning, UoN.
- Ayaz, M.,Nasir, A., Abdul, B., Rooh, U., & Mati, (2017).*Impact of school library on student academic achievement at secondary school level in Southern district of Khyber Pakhtunkhwa, Pakistan*. International journal of academic research in business and social sciences, vol 7 No5
- Barret, P. Treves, A. Tigran, S. Diego, A. & Ustinova, M. (2019). *The impact of school infrastructure on learning: A synthesis of evidence*. International development in focus. Washington D.C World Bank. doi:10.1596/978-1-4648-1378-8
- Baidoo-Anu, D., Gyamerah, K. & Chanimbe, T.(2023). *Secondary school categorization in Ghana: Silent plight of students and implications for equitable learning*. Journal of Human Behavior in Social Environment;33(3); pp348-365; doi:10.1080/10911359.2022.20616
- Bashir, S ,Lockheed, M, Ninah, E, & Tan, J, (2018). *Facing forward: Schooling for learning in Africa*. Washington DC: World Bank. Retrieved from <Http> Open knowledge.[Worldbank.org/handle/10986/29377](http://Worldbank.org/handle/10986/29377) license: CCBY 3.0.
- Befiie-Nwile, C. & Amie-Ogan, T. (2021). *Classroom provision and Libraries utilization as determinants of student academic performance in public junior secondary school in river state*. International Journal of Innovation development and policy studies 9(1):86-93

- Bernhardt, V., (2017). *Data analysis for continuous school improvement (4<sup>th</sup> ed.)*. New York: Routledge. Doi <https://doi.org/10.4324/97813151/01026>.
- Bolarinwa, D. & Kolawole, A. (2020). *Teachers teaching experience and educational qualification as correlate of academic performance of students in public secondary school in Ekiti State, Nigeria*. Journal of Education and practice. Doi 10.7176/JEP/11-2-12, pp.108-110
- Caliskan, M. (2014) *Effect of cognitive entry behavior and affective entry characteristics on learning levels*. Doi.10.12738/estp.2014.5.1834. Retrieved <http://www.edam.com.tv/estp>
- Cattaneo, M., Oggenfuss, C. & Wolter, S. (2016). *The more the better? The impact of instructional time on student performance*. Discussion paper No 9797 IZA DP No 9797
- Chokera, K. (2014). *Influence of teacher characteristics on pupils' academic performance in public primary schools in Kenya: A case of Akithi division Meru County, Kenya*. Masters of Arts project report in Project Planning and Management (PPM); UoN.
- Chitegesye, N. (2018) *Determinants of quality education in community secondary schools in Temeke municipality*. Master of education in administration, planning and policy studies of the Open university of Tanzania.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2<sup>nd</sup> Edition)*. New York; Academic press.
- Coleman, J., Campbell, E., Hobson, C., Partson, J., Weinfel, F. & York, R. (1966) *Equality of Education opportunity*. Washington DC.: USA government printing office.
- Consolata, L. Hermes, J. (2015). *Managing school internal mechanism for performance improvement in secondary education: A case of six secondary schools in Eastern zone Tanzania*. Sage open. Doi : 10.1177/2158244015610172. Retrieved from <http://us.sagepub.com/en-us/nam/open-access-at-sage>.
- Corder, G. & Foreman, D. (2009). *Non-parametric statistics for non-statisticians: A step by step approach*. Hoboken, New Jersey, John Wiley and sons.
- Craft, S. (2012). *The impact of extracurricular activities on student achievement at the high school level*. Doctor of philosophy dissertation. University of Southern Mississippi. Retrieved from <https://aquila.usm.edu/dissertations/543>
- Creswell, J. (2014). *Research design: Qualitative, quantitative and mixed method approaches (4th Ed.)* New Delhi, India: Sage.

- Creswell, J., Plano, K. (2011) *Designing and conducting mixed method research* (2<sup>nd</sup> ed.). Thousand Oaks, CA: Sage.
- Crouch, L., Rolleston, C., & Gustafsson, M. (2021). *Eliminating global learning poverty: The importance of equalities and equity*. *International Journal of Educational Development*; 82(2021)102250.
- Dixon, H., & Ward, G. (2015) *The value of masters study to teachers professional practice: Contradictory discourse within workplace*. *Australian Journal of teacher education*. 40(2). Retrieved <http://dx.doi.org/10.14221/ajte.2015v40n2.4>
- Ellerhost, A. (2014) *A study of relationship between teacher characteristics and students' performance in high school geometry*. Master's thesis report. State University New York
- Garson, J. (2012). *Selected effects functions and causal role function in the brain: the case for an etiological approach to neuroscience*, *Biology & Philosophy*, 26, 547
- Gibbon, S., Telhaj, S. (2012) *Peer effects: Evidence from secondary school transition in England*. Discussion paper No.6455. Institute for the study of labor (IZA). Bonn, Germany ; IZA publication
- Glewwe, P. Hanushek, E., Humpage, S and Raviana, R. (2011) *School resources and educational outcomes in developing countries: review of literature from 1990 to 2010*. Cambridge Massachusetts; National bureau of economic research. <http://www.nber.org/papers/w17554>.
- Glewwe, P. Hanushek, E., Humpage, S and Raviana, R. (2013) *School resources and educational outcomes in developing countries: review of literature from 1990 to 2010*. Edited review for presentation to Minnesota economic association, Chicago ; University of Chicago press
- Gore, J., Rosser, B., Jeremus, F., Miller, A. & Harris, J. (2023). *Fresh evidence in the relationship between years of experience and teaching quality*. *The Australian Educational Researcher*. <https://doi.org/10.1007/s13384-023-00612-0>.
- Government of Kenya (GoK, 2015). *Basic Education Regulations*. Nairobi, Kenya; Government printers.
- Government of Kenya (Gok, 2019) *Sessional paper No 1 of 2019 on a policy framework for reforming education and training for sustainable development in Kenya*. Nairobi, Kenya; Government printers.
- Gwambombo, I. (2013). *The effect of teachers workload on students' academic performance in community secondary schools: A study of Mbeya city*

,Tanzania. MED dissertation report in Administration Planning and Policy Studies (APPS),Open University of Tanzania.

- Haim,S. (2018) *Why principals sidestep instructional leadership: The disregarded question of schools` primary objective*. Journal of educational leadership, vol28,pp517-538.Doi 10.11771105268461800404
- Hallinger, P. & Wen-Chung, W. (2015) *Assessing instructional leadership with the principal instructional management rating scale*.AG Switzerland.Springer.Doi-101007/978-3-319-15533-3
- Hanushek, A., Woessman, I. (2015). *Handbook of international development and education*. Northampton, MA USA: Edward Elgar publishing
- Hanushek, E.(2020) *Education production functions*.CA, USA; Elsevier ltd. Retrieved <https://doi.org/10.1016/B978-0-12-815391-8.00013-6>
- Hanushek, E., Piopiunik, M.,& Wielderhold, S.,(2014) *The value of smarter teachers: International evidence on teacher cognitive skills and student performance*. NBER working paper 20727 Massachusetts. Retrieved <http://www.nber.org/papers/w20727>
- Hou,Y., Cui, Y. & Zhang, D. (2019).*Impact of instructional leadership on high school student academic achievement*. Asia Pacific academic review (2019), pp.543-558.<https://doi.org/10.1007/s12564-019-09574-4>
- Jagero, N. (2014) *Input-Output relationship and the quality of education in day secondary schools in Kenya*. International journal of community and corporative studies. Vol. 1 No 2, pp.42-50
- Jo Blanden & Sandra, M. (2015) *Reducing inequality in education and skills: Implications for economic growth*. European Expert Network on economics of education (EENEE).Luxembourg: European Union
- Jonah,S. (2014). *The importance of auditorium acoustics*. Spaces for learning impacting K-12 education. Spaces for learning .com. Retrieved: [www.acentech.com/bio/Jonah](http://www.acentech.com/bio/Jonah)
- Judith, K. (2018). *Influence of computer aided instruction (CAI) on students` achievement, self-efficiency and collaborative skills in chemistry in secondary school of Tharaka-Nithi county, Kenya*. Doctor of Philosophy thesis of Kenyatta university
- Kamau, A., (2021). *Influence of competitive co-curricular activities on self-concept deviant behavior and academic performance among schools in Central region, Kenya*. A PhD thesis in physical education exercise and sports science of Kenyatta University.

- Kapelinyang, P. (2018). *Influence of learners participation in co-curricular activities on academic performance in public secondary schools in Kapenguria division of West Pokot county*. Master of Education thesis in curriculum studies and psychology of University of Eldoret
- Kenya Institute of Curriculum Development (KICD, 2016). *Needs Assessment on curriculum reform for tertiary level in Kenya*. Nairobi, Kenya; KICD.
- Kenya Institute of Curriculum Development (KICD, 2017). *Basic Education Curriculum Framework*. Nairobi, Kenya; KICD.
- Kenya National Examination Council (2018) *KCSE examination performance report*. Nairobi Kenya; KNEC
- Kimengi, N., Kaptala, W., & Okero, R.(2014). *Students co-curricular participation perception and academic performance in Kenya secondary schools*. Journal of educational policy and entrepreneurial research (JEPER)vol1 No 2014, PP 31-39. Retrieved from <http://www.iiste.org/journals/index.php/JEPER>
- Kivunja, C. (2018) *Distinguishing between theory, theoretical framework and conceptual framework: A systematic review of lessons from the field*. International Journal of higher education, Vol 17, No .6 ,2018. Retrieved from <https://doi.org/10.5430/ijhe.v7n6p44>.
- Kosgei, A., Mise, J. ,Odhiambo, O. and Ayugi, M. (2013). *Influence of teacher characteristics on student academic achievement among secondary schools in Nandi district, Kenya*. Journal of Education and Practice; vol4; No 3;2013; pp 2222-2884
- Kothari,C. (2013) *Research methodology: Methods and techniques(2<sup>nd</sup> ed.)*.Mumbai, India; New age international.
- Krasnoff, B. (2015). *Leadership qualities of effective principals*. AK: North West Comprehensive Centre (NWCC)
- Kyriakides, L., Creemers, B., Charalambous, E. (2018) *Equity and quality dimensions in educational effectiveness* (volume 8). Cham, Switzerland; Springer. Retrieved from <https://doi.org/10.1007/978-3-319-72066-1>
- Lazenby, H. (2016). *What is equality of opportunity in education?* Theory and Research in Education (TRE); Vol 14 (1);65-76: doi:10.1177/1477878515619788; Sage publications
- Li, J., Chan, P., & Hu, Y. (2023). *The effect of principals` instructional leadership on primary school students academic achievement in China: Evidence from multiple Mediating Analysis*. Sustainability 2023;15;2844; <https://doi.org/10.3390/su115032844>.

- Ligaya, L.Figueroa, L. and Jihyun, L. (2016) *Investing the relationship between school facilities and academic achievement through geographical weighted regression*.Doi:1080/19475683.2016.12 31717.Retrieved <http://anals.gis22:4dot.com>
- Liu,H.Jan.V.,Sarah, G.,Wim,V.(2014) *School processes mediate school compositional effects:Model specification and mediation*. British educational research journal. Vol 41 issue 3pp423-447 Retrieved: <https://doi.org/10.1002/berj.3147>
- Majgaard, K., Alain, T.(2012).*Education in sub-saharan Africa: A comparative analysis*. Washington D.C: World Bank.
- Makori, A. & Onder, I H. (2013). *Understanding realities, inequalities and implications associated with policy and practice in form one selection in Kenya*. British Journal of Arts and Social Sciences vol. 17 No1 (2014) pp.146-16
- Manyaka, C. (2019). *Effect of utilization of physical resources on performance of students in the Kenya Certificate of Secondary Education in Marani Sub County, Kenya*. A Master of education Thesis of Africa Nazarene University.
- Maria, K. & Marie-Anne, V. (2013). *When do textbooks matter for achievement? Evidence from African primary school*. Elsevier; 119(3); pp. 311-315; 10.1016/j.econlet.2013.03.0.2. halshs-00828418
- Mathya, P.& Akala, W. (2014) *Effects of teacher recruitment and utilization policy on quality of secondary schools in Kenya* .IOSR Journal of Research & Methods in Education (IOSR-JRME):2320-7388, vol4, issue1 ver. III, pp10-17.
- Ministry of Education (MoE, 2018) *National Education Sector Strategic Plan (NESSP) 2018-2022*.Nairobi, Kenya; Government printers
- Misanya, S. (2013) *Peer influence on academic performance of form one students in girls boarding schools in Kadunyi constituency, Bungoma county, Kenya*. Master of art project of University of Nairobi
- Mogaka, M. (2020) *Availability and utilization of school resources on students' academic achievement in public day secondary school in Kisii county, Kenya*. A PhD thesis in educational planning and economics of Kenyatta University
- Mogaka, M. (2019). *Availability and utilization of library resources on students' academic achievement in public secondary schools in Kisii county*. International journal of research and innovation in social sciences (IJRISS), vol 3 issue 8.

- Mokaya, Z. (2013). *Influence of school infrastructure on students' performance in public secondary in Kajiado county, Kenya*. Master of Education in corporate governance project of University of University.
- Monk, H. (2019) *Efficiency in education: The choice of outcomes, the choice of inputs, the transformation process and the implication on policy*. <http://education.state.university.edu>
- Mugenda, O.& Mugenda, A. (2012) *Research methods dictionary*. Nairobi, Kenya; Applied research and training services ART press.
- Mutuku, M. (2018) *Influence of instructional leadership on academic performance in Machakos county, Kenya*. A doctor of philosophy thesis report in educational management, Kenyatta university.
- Mutune, K. and Orodho, J. (2014) *Teachers turnover: What are the explanatory variables in public secondary schools in Mbeere South sub-county, Embu county, Kenya*. Journal of Humanities and Social Sciences; vol19 issue 12;pp11-24
- Muturi, P., (2015). *A review of Nyeri county Kenya strategic plan 2013-2017*. International journal of economics, commerce and management 3 issue 5, May 2015.pp 1364-1405.Retrieved from <http://ijecm.co.uk>
- Mwiluli, M. (2018). *Influence ICT integration on academic performance in public secondary school in Kenya: A case of Makueni county*. Masters of Arts Project in in Project planning and Management of University of Nairobi.
- Ndambuki, B. (2020). *Influence of principals' instructional leadership practices on student academic performance in public secondary schools in Makueni county, Kenya*. Doctor of philosophy thesis in education administration of South Eastern Kenya University (SEKU)
- Njuguna, K. (2018) *Access and utilization of Instructional materials in teaching and learning of biology in secondary schools in Dagoretti South Sub-County*, Nairobi. PGDE project report, UoN.
- Nkonge, G., Ndiritu, J., Njihia, M.(2021).*Equality of opportunity in learning outcomes attainment through financing public day secondary schools resources in Kenya*. Eastern African Journal of Interdisciplinary studies; Vol 3;issue 1;pp 78-88;doi:<https://doi.org/10.37284/eaj.3.1.303>.
- Ntawiha, P. (2011) *Educational inputs and their implications for output in public secondary schools in Nyarugenge and Nyamasheke Districts Rwanda*. A PhD thesis in Education, Kenyatta University.



- Nyagosia, P. (2011) *Determinants of differential Kenya Certificate of Secondary Education and school effectiveness in Kiambu and Nyeri Counties, Kenya*. MED project. Kenyatta University.
- Nyakuwa (2017). *The effect of laboratory exposure on students' academic achievement in practically based subjects in secondary schools in Wakio district of Uganda*. A bachelor of science dissertation, College of education open and long-distance learning, Kampala International University.
- Nyamongo, D. (2016). *Relationship between selected school-based factors and students' performance in Kenya Certificate of Secondary Examinations in Masaba North sub county, Nyamira county, Kenya*. Masters of Education project in management of Egerton University.
- Nyawira, L., Gikandi. B., Kamau, M., (2019,July 16).Schools groan under weight of hundreds of extra students. The Standard newspaper,p.6
- Nyimenjie, O. (2018). *Educational resource utilization for effective teaching and learning in public secondary schools in River State Nigeria*. International Journal of Innovative Development and Policy Studies. 6(2) pp50-58
- OECD (2008). *Improving school leadership volume1: Policy and practices*. Paris France OECD publishing.
- OECD (2011a). *Lessons from PISA for the United States: Strong performers and successful reformers in education*. Paris, France; OECD publishing. Retrieved from [Http://dx.doi.org/10.1787/9789264096660-en](http://dx.doi.org/10.1787/9789264096660-en).
- OECD (2011b). *Improving school leadership: Pointers for policy development*. Paris France; OECD publishing. <http://www.oecd.org/edu/school/leadership>
- OECD (2012). *Equity and quality in education: Supprting disadvantaged students and schools*. OECD publishing. Retrieved [Http://dx.doi.org/10.1787/9789264130852-en](http://dx.doi.org/10.1787/9789264130852-en)
- OECD (2013). *PISA 2012 Results: What makes schools successful? Resource, Policies and Practices (volume IV)*. Paris, France; OECD publishing.
- OECD (2018) *Effective teacher policies: Insights from PISA*. Paris France; OECD publishing. Retrieved <http://dx.doi.org/10.1787/9789264301603-en>
- OECD (2019a) *Organization of Economic Community and Development (OECD) future of education 2030: Making physical education dynamic and inclusive for 2030*.Paris, France; OECD publishing
- OECD (2019b) *PISA 2018: Insights and interpretations by Andreas schleicher*. Paris France. OECD publishing.

- Oguta, P. (2022). *Teacher experience factor impetus on student academic performance*. Journal of Research Innovation and Implications in Education.6(1,141-148)
- Oloyo, P.(2015).*The relationship between physical environment and academic achievement in public secondary schools in Nairobi city, Kenya*. A doctor of philosophy thesis of Kenyatta university in environmental planning and management.
- Onchiri, J. (2010). *Effect of remedial teaching on pupil's performance in Mochengo zone, Gucha South district, Kenya*. A bachelors degree of early childhood and primary education dissertation of Kampala international university.
- Onderi, H & Makori, A. *An evaluation of secondary school principals` perception of learning resources in free secondary education era in Kenya*. African Educational Research Journal, vol1(3), pp171-182, October 2013.
- Orcan, F. (2020). *Parametric or non-parametric: Skewness to test normality for mean comparison*. International journal of assessment tool in education, vol.7,No.2,pp 255-265.<https://doi.org/10.21449/jate.656077>
- Orodho, J. (2012). *Techniques of writing research proposal and reports in education and social sciences*. Nairobi, Kenya; Kanejza publishers.
- Oyaro, O.(2013) *An analysis of the factors influencing demand for master's in education degree: A case study of the University of Nairobi, Kenya*. Masters of education project in economics of education of Kenyatta University.
- Ozoglu, M. (2015) *Teacher allocation policies and the unbalanced distribution of novice and senior teachers across regions in Turkey*. Austrarian journal of teacher education ;40 (10). Retrieved <https://ro.ecu.edu.au/ajte/140/iss10/2>
- Paunonen, S.& Ashton, M. (2013) *Prediction of academic performance with personality traits: A replication study* .Journal of research and personality,47(6),778-781.Retrieved from <https://doi.org/10.1016/j.r.p.2013.08.003>
- Pervin, M., Ferdowsh, N.& Munni, I. (2021).*Teacher-student interactions and academic performance of students*. Dhaka university journal of biological sciences;30(1);87-93;doi:103329/dujbs.v30i/.51812
- Pritchett, L. (2015) *Creating educational systems coherent for learning outcomes: Making the transition from schooling to learning*. Research on improving systems of education (RISE). working paper 15/005.December 2015.Retrieved [www.rise.programme.org](http://www.rise.programme.org).

- Pritchett, L. (2013). *The rebirth of education: Schooling and learning*. Center for global development. Washington D.C: Bookings institute press.
- Prosperity, M. (2019). *Status of educational resources in rural public secondary schools*. Munich, GRIN Verlag; <https://www.grin.com/document/1250186>.
- Psacharopoulos, G. (2015) *Benefits and costs of the education targets for the post-2015 development agenda*. Copenhagen, Denmark; Consensus Centre.
- Republic of Kenya (RoK, 2017). *Secondary Education Quality Improvement Project (SEQUIP), Vulnerable and Marginalized Groups Framework (VMGF)*. ministry of education, state department of basic education report. July 2017.Nairobi. Kenya; Government printers
- Reyn, E., Peter, S. (2010). *The effect of peer socio-economic status on students` achievement: A meta-analysis*. Armsterdam, Netherlands; Enschete publication
- Reynold, D., Teddlie, C., Chapman, C.& Stringfied, S. (2015) *Effective school process*. Routledge international handbook for educational effectiveness and improvement research, policy and practice Routledge. Retrieved from <https://www.routledgehandbook.com/doi/10.4324/9781315679488.ch3> on 30 April 2021.
- Rimbogi, C. (2010). *Factors influencing the level of learners participation in physical education, sports and games in Secondary Schools: A case of Nyeri central district*. A MA project in project planning and management. UoN.
- Royal, K. (2017) *Using the Spearman Brown prophecy formula to improve medical school exams quality*. Journal of contemporary medical education 51-53.Doi:10.5455/jcme.20170705091608
- Sangara, A., Mercedes, G. (2016) *The role of information and communication in improving teaching and learning processes in primary and secondary schools*. Research in learning technology. vol 18 2010.issue 3 pp207-220.Retrieved from <https://doi.org/10.1080/09687769.2010.529108>
- Sarah, D. (2019). *Teachers shape students` motivation where do they learn how to do it?* Education week blog.[www.education week blog](http://www.educationweekblog.com).
- Scheerene J. (1991). *Process indicators of school functioning: A selection based on the research literature on school effectiveness*. Studies in Education Evaluation. Vol.17, pp.371-403; Great Britain: Pergamon press.
- Scheerene J. (2013). *What is effective schooling? A review of current thought and practice*. International Baccalaureate Organization 2013.

- Schleicher, A. (2018) *World Class: How to build a 21st-century school system, Strong performers and successful reformers in education*. Paris, France: OECD publishing.
- Scrivatsava, A. & Scrivatsava, P. (2018). *Impact of library use on academic performance among first year medical students*. Journal of medical science and clinical research (JMSCR) ,vol 06 issue 05 pp.860-864
- Sigh, A. (2017). *Effect of co-curricular activities on academic achievement of students* .International journal of education and multidisciplinary studies,6(3),241-254,doi:http://dx.doi.org/10.21013/jems.v6.n3.p4
- Simoes, S., Oliveira, T. & Nunes, C. (2022). *Influence of computers in students' academic achievement*. Heliyon (8) journal. Elsevier ltd.
- Singh, K. (2014). *Right to education and equality of educational opportunities*. Journal of International Cooperation in Education; Vol 16;No. 2 pp5-19
- Snilstveit, B., Stevenson, J., Menon, R., Phillips, D., Gallagher, E., Geelen, M., Jobse, H., Schmidt, T. & Jimenez, E. (2016). *The impact of education programs on learning and school participation in low and middle income countries: A systematic review summary report*. 3ie systematic review summary 7. London: International institute for impact evaluation
- Steinmann, I. & Olsen, R. (2022). *Equal opportunity for all? Analyzing within-county in school effectiveness*. Large -scale assessment in education 10:2.https://doi.org/10.1186/s40536-022-001
- Solomon, I. & Ndindi, A. (2014). *Resource utilization as a correlate of students' academic performance in Ohafia educational zone of Abia state Nigeria*. Knowledge review. Vol.31 No.2 pp.1-10
- Suleman, Q., Termit, K. & Zeecham (2014). *Effects of overscheduled involvement in co-curricular activities on the academic achievement of secondary schools' students in Kohat division Pakistan*. International Journal of learning and development vol 4 No.3. Doi 10.5296/ijld. v4i3.5973
- Sun, L., Kelly, D. & Michael, D. (2013). *School computer use and students' academic performance in secondary school*. Computer in education journal, pp.84-94
- Susan, W. Akala, W. & Imonje, R. (2019). *Influence of teacher academic qualification on pupils performance at Kenya Certificate of Primary Examinations in English subject in Kenya*. Journal of research and methods in education. Vol. 9, issue 3 pp1-7.
- The County Government of Nyandarua (2018). *County integrated Development plan (CIDP) 2018-2022*. Olkalou, Nyandarua; author.

- The County Government of Nyeri (2018). *County integrated Development plan (CIDP)2018-2022*.Nyeri central, Nyeri; author.
- The Nordic Indicator Workgroup (DNI ,2010). *Inputs, process and learning in primary and lower secondary school*. Conhagen, Denmark:Danish clearance house for educational research. Retrieved Http.www.dpu.dk/clearing house.
- Tomczak, M &., Tomczak, E. (2014). *The need to report effect size estimates revisited: An overview of some recommended measures of effect size*. Trends in sport science 2014;1(21) pp.19-25.
- Tucker, M. (Ed.). (2014) *Chinese Lessons: Shangai`s Rise to the Top of PISA league Tables*. PA: NCEE publishing.
- Tulmur, H. & Chemwei, B. (2015). *Availability and use of instructional teaching of conflict and conflict resolution in primary school in Nandi North district, Kenya*. International journal of education and practice, 3(6), pp.224-234
- UNESCO (2005). *EFA Global Monitoring Report 2005: The quality imperative*. France, Paris; UNESCO publishing.
- UNESCO (2015). *Incheon declaration: Education 2030- towards inclusive and equitable quality education and lifelong learning opportunities for all*. World education forum. ED/WEF 2015/MD/3. Paris France; UNESCO publishing
- UNESCO (2016 a). *Education 2030 framework for action*. France ,Paris: UNESCO publishing
- UNESCO (2016 b). *leading better learning: School leadership and quality in education 2030 agenda. Section of education policy* .Pars France: Author
- UNESCO (2019) *Learning and teaching materials*. UNESCO brief. digital library. Retrieved [www.unesco.org](http://www.unesco.org) on24th October 2019
- UNESCO (2012) *A place to learn: Lessons from research on learning environments*. UNESCO institute for statistics. Paris, France; Unesco publishing. Retrieved from <http://www.uis.unesco.org>
- UNESCO (1960). *Convention against discrimination in education*.14<sup>th</sup> December 1960.Retrieved:<https://www.refworld.org/docid/3ae6b3880.htm>
- United Nations Children`s Fund (UNICEF,2010) *The children left behind: A league table of inequality in child well-being in the world rich countries*. Florence, Italy: Author

- Ustun,U.& Eryilmaz, A. (2018) *Analysis of Finnish education system to question the reasons behind Finnish success in PISA*. Studies in educational research and development.2(2).pp93-114
- Von Bertalanffy, L. (1968). *General Systems Theory: Foundations, development applications*. Newyork; George Braziller.
- Waihenya, K., Nyamai, F., (2019, March 21) Education quality suffers as teacher shortage hits schools. Sunday Nation Daily newspaper.p.28 &29.
- Wanzala, O. (2019, December 23). *Mass failure in KCSE raises quality queries*. Daily nation newspaper page 4.
- Waweru, P., Thunguri, R.,Chui, M. (2016) *Physical facilities for holistic education: Lessons from secondary schools in Kiambu and Samburu counties, Kenya*. Journal of education and practice :vol 7 No 33 2016 PP 190-198. Retrieved from <http://www.iiste.org>
- Wekesa,E. and Simatwa, E. (2016) *.Student factors influencing academic performance of students in secondary education in Kenya: Acase of Kakamega county*. International Research Journal (May 2016). Doi [Http://dx.doi.org/10.14303/er.2016.138](http://dx.doi.org/10.14303/er.2016.138).
- Wekesa,E., Simatwa, E. and Okwach, I. (2016) *.Influence of teacher factors on students` academic performance in secondary education in Kenya: Acase of Kakamega county*. Green Journal of Educational Research ;6(4); Doi [Http://doi.org/10.15580/GJER.206.4.06016102](http://doi.org/10.15580/GJER.206.4.06016102); pp151-169.
- Wodon, Q. (2016). *School Infrastructure in Paraguay: Needs, Investments and costs*. World Bank studies.doi:10.1596/978-1-4648-0448-9.
- Word Bank (2017) *What do teachers know and do? Does it matter? Evidence from primary schools in Africa*. Washington DC; World Bank publication.
- Word Bank (2018) *Word development report 2018: Learning to realize education`s promise*. Washington DC; World Bank publication.
- World Bank (2016) *Education, Skills and labor market outcomes: Results from large-scale adult skills survey in urban areas in 12 countries*. STEP skills measurement. Word Bank Group. Washington DC. Retrieved from <http://microdata.worldbank.org/index.php/catalog/step/about>.
- Zeng, G., Zhong, M. & Wu, W. (2022).*The fellow effect on college students academic performance*. Pub Med central; Frontiers in psychology;13:1055963.doi:10.3389/fpsyg.2022.1055963;PMID:36619032

## APPENDICES

### Appendix I: Questionnaire for the Principal

Instruction: Tick (√) or write statements/descriptions as applicable. *Please be honest* in your responses as they will be reliably used for a scientific empirical analysis

#### Institutional profile

1. a) Which category is your school?

Sub-County                County                           

Extra County            National                       

b) Please indicate the type of your school?

Boys Boarding                Girls Boarding                           

Mixed Boarding                Boys Day                                   

Girls Day                                Mixed Day                                   

Mixed Day & Boarding        Boys Day & Boarding                   

Girls Day & Boarding

Any other (Please specify) .....

- c) Which year was your school established.....
- d) What is the size/area of your school in Hectares.....
- e) Do you have a playing field Yes , No . If yes, what is the approximate size of the field space in Hectares..... Is the playing field space adequate? Yes , No .
- f) Please indicate the total number of students in your school Boys.... Girls.... Total.....
- g) Please indicate the streams/classrooms per form and total enrolment in the table below.

<b>Form</b>	<b>Form 1</b>	<b>Form 2</b>	<b>Form 3</b>	<b>Form 4</b>
Number of classrooms				
Student population (Total enrolment in entire form/stream)				
Average class size				

- i. How many lessons are there per day for a class.....
- ii. Does the school have; Electricity      Yes    [ ]    No    [ ]  
 Internet Connection                      Yes    [ ]    No    [ ]  
 School Web Site                              Yes    [ ]    No    [ ]  
 School E-mail                                 Yes    [ ]    No    [ ]  
 Lighting in all rooms used for learning    Yes    [ ]    No    [ ]
- iii. If the school has internet connection, what type of internet connectivity is available?  
 Wired (e.g. cable, fiber optic, DSL, Dial-up)    [ ]  
 Wireless (e.g. satellite, hotspot, WI-FI)        [ ]  
 Both wired and wireless                              [ ]  
 Any other (Please specify).....
- iv. If your school has internet connection how is the internet availability/accessibility in your school?  
 Not at all                      [ ]                      Rarely                      [ ]



Sometimes [ ] Always [ ]

v. Does the school offer the following subjects?

Computers studies Yes [ ] No [ ]

Music Yes [ ] No [ ]

**Teachers` related aspects**

2. a) Please indicate the number of teachers in your school

i. Permanent teachers employed by TSC

Males ..... Females ..... Total .....

ii. Intern/contract teachers from TSC

Males ..... Females ..... Total .....

iii. Teachers employed by BOM

Males ..... Females ..... Total .....

iv. Student teachers on Teaching Practice (TPs)

Males ..... Females ..... Total .....

v. Any other (specify).....

b) Indicate the number of teachers in your school with the following qualification as their highest Academic Certificate (*Please exempt/omit Student Teachers on Teaching Practice-TPs*)

Highest academic certificate	Diploma/SI	BED/PGDE	Masters	Doctorate	<b>Any other</b>	Total
Number of teachers						

Please specify the qualifications held by teachers included in **Any other** above if they are there .....

c) Are there teachers in your school currently enrolled or pursuing academic studies?

Yes  No

If yes please specify the number of teachers and the academic degrees/diplomas they are pursuing.....

d) In your view, does high academic qualification in terms of academic certificate held by a teacher have a bearing in improving students` learning and achievement? (Give your view and reason for your answer).....

.....  
 .....

e) Exempting the Teachers on TP, how many teachers are 35 years of age and below?.....

f) Please, indicate the teaching experience in terms of years of professional practice held by teachers in your school. *(Please exempt/omit Student Teachers on Teaching Practice-TPs)*

Years of teaching experience	Below 3years	Between 3-4 years	5 years and above	Total
Number of teachers				

**Principals` Socio-demographic data**

*(If the principal is not filling in person, please make reference to the principal).*

3. a) What age category do you fall in?

Below 35 yrs.  35-39yrs  40-44 yrs.   
 45-49 yrs.  50-54  55 and above yrs.

b) Please indicate your gender Male  Female

c) For how long have you been a school principal in your professional practice?

0-2 yrs.                              3-5yrs                6-10 yrs.          
11-15 yrs.                          16 and above

d) For how long have you been principal in the current school you are in?

0-2 yrs.                              3-5yrs                6-10 yrs.   
11-15 yrs.                          16 and above

e) i) Please indicate your highest academic certificate attained.

Diploma         Bachelors         Master's       
Doctorate       Any Other (specify).....

Are you enrolled or pursuing any academic study?

Yes              No       

If yes which studies are you pursuing and what are your main reasons for this studies .....

ii) Have you received any training on Educational/School administration/leadership Yes         No  

If yes please specify type and duration of the training.....

.....

iii) To what extent did the training on administration/leadership above Include **Instructional Leadership** Training?

Not at all         to a small extent           to a large extent  

iv) If Yes above which key elements of Instructional leadership that you learnt define your work in the school you are in .....

.....

v) What can you comment about adequacy of training opportunities to principals/deputies to keep them abreast on *Instructional leadership*?

Not available [ ] Available but inadequate [ ]  
 Available and adequate [ ]

vi) Do you teach in classroom Yes [ ] No [ ]

If yes please indicate your workload in terms of lessons you are assigned per week.....

vii) Have you taught a candidate class in the last three years?

Yes [ ] No [ ]

If yes, please indicate the subject you taught and the mean score your class (es) attained.

2018 ..... 2019 .....  
 2020 .....

**School physical facilities**

4. a) Please indicate the quantity, capacity (Total number of students the facilities can accommodate) and adequacy of the following physical facilities in your school.

Type of physical facility	Quantity (Number of rooms available)	Total number of students that <b>all the rooms Combined</b> can accommodate at a go	Are the facilities adequate?
Physics lab(s)			Yes [ ] No [ ]
Chemistry lab(s)			Yes [ ] No [ ]
Biology lab(s)			Yes [ ] No [ ]
General Science lab			Yes [ ] No [ ]
Library			Yes [ ] No [ ]

Computer lab(s)			Yes [ ] No [ ]
Dining Hall			Yes [ ] No [ ]
Multipurpose/ Social Hall			Yes [ ] No [ ]

b) Are there any new physical infrastructural facilities currently being constructed in your school? Yes [ ] No [ ]

If yes, which are these new facilities under construction?.....

c) Which is the key source /sources of funds for the construction project(s) .....

**ICT Resources**

5. a) Indicate whether the following ICT resources are available or not and if available indicate the quantity and adequacy

<b>Tool</b>	<b>Available</b>	<b>Quantity</b>	<b>Adequate</b>
Projector(s)	Yes [ ] No [ ]	.....	Yes [ ] No [ ]
Computer labs	Yes [ ] No [ ]	.....	Yes [ ] No [ ]
Printers	Yes [ ] No [ ]	.....	Yes [ ] No [ ]

b) If your school has Computer labs, how many computers are in the labs altogether?.....Is/are the Computer lab manned by qualified ICT technicians Yes [ ] No [ ] If yes, how many technicians.....

c) If your school has a library, are there computers in the library for use by students in learning/ research purpose Yes [ ] No [ ] If yes how many computers are in the library? .....

d) Are there Computers stationed/Installed in classrooms? Yes [ ] No [ ] If yes, how many computers? .....

e) In **Total**, how many computers **Altogether** (computer labs /classes/library) are accessible to students for learning purpose .....

f) How many *laptop computers* are available to teachers for use in their teaching.....

g) Do classrooms have the following facilities to aid ICT integration?

Dust less whiteboard	Yes	[ ]	No	[ ]
Electricity	Yes	[ ]	No	[ ]
Sockets	Yes	[ ]	No	[ ]

**ICT utilization Extent**

6. a) To what extent are the computer labs used in teaching and learning of the other subjects other than computer studies (ICT integration in teaching and learning)

Not at all [ ]    Less Frequent [ ]    Moderately Frequent [ ]  
Very frequent [ ]    All the time [ ]

b) How frequently are ICTs (Computers, multimedia and digital content) utilized in classes/computer labs by teachers in teaching and learning of other subjects other than computer studies?

Not at all [ ]    Less Frequent [ ]    Moderately Frequent [ ]  
Very frequent [ ]    All the time [ ]

c) How frequently are ICTs utilized by students in your school in the learning of subjects other than computer studies?

Not at all [ ]    Less Frequent [ ]    Moderately Frequent [ ]  
Very frequent [ ]    All the time [ ]

d) In your view, which are the key challenges that mainly hinder/limit ICT integration/utilization in teaching and learning in your school?.....

.....  
.....

**Creation of Extra Learning Time**

7. As per your official/ mandatory school programs, how long on average (in hours) does a student spend **in classrooms** (With or without a teacher in class) during the following times and days of the week.

	<b>WEEKDAYS</b> (Mon-Fri) <b>MORNING PREPS AND REMEDIALS</b> Average hours per day students are in class before 8:00am	<b>WEEKDAYS</b> (Mon-Fri) <b>EVENING PREPS AND REMEDIALS</b> Average hours students are in class past 4:00 pm	<b>SATURDAYS</b> Total hours students are mandated/expected to be in classrooms for preps or remedials	<b>SUNDAYS</b> Total hours students are mandated/expected to be in classrooms for preps or remedials
Form 1				
Form 2				
Form3				
Form 4				

**Academic output variable**

8. Please indicate the overall mean score of yours school in the last three years and the average KCPE marks of the respective cohorts

	Average KCPE marks at entry (Entire cohort/stream)		average KCSE marks at exit (Entire cohort/stream)	
	Marks	Grade	Mean score	Grade
2020				
2019				
2018				



**Administrative/Leadership practices**

9. a) How can you rate the frequency of teacher absenteeism in your school?

Not at all [ ] Less frequent [ ] moderately frequent [ ]  
more frequent [ ] Very frequent [ ]

b) How can you rate lesson attendance in your school

Very low [ ] Low [ ] Moderate [ ]  
High [ ] Very high [ ]

c) How can you rate teacher punctuality for lessons in your school

Not at all [ ] To a small extent [ ]  
moderate extent [ ] Great extent [ ] Very great extent [ ]

d) Have you drafted a strategic plan for your school

Yes [ ] No [ ] If yes, how critical is strategic planning to  
performance improvement in your school? .....

e) Are there strategies in your school to cater for low achievers

Yes [ ] No [ ]  
if yes, what does the strategy entail? .....

10. a) Generally, what is the average KCPE entry marks for students in your school?

Between (0-100) E [ ] (101-200) D [ ] (201-300) C [ ]  
(301-400) B [ ] (401-500) A [ ]

b) In your school, do you *usually* manage to complete the syllabus for *all*  
*subjects* up to form four before the students sit for KCSE exams.

Yes [ ] No [ ]

c) If yes, when exactly do you, usually, complete the syllabus?

In form IV term III, a month or less before KCSE exams

In form IV term III, a few months before KCSE exams

In form IV term II  In form IV term I

While in form III

Any other time, please specify .....

11. a) How often do Quality Assurance and Standards Officers (QUASOs) Ministry of Education officials visit your school for assessment/guidance/support on quality improvement?

Not at all  Rarely  Occasionally

Often  Always

b) When was the last time the (QUASOs)/ Ministry of Education Officials visited and what key issues did the officials address/ highlight .....

.....

c) Is the Support or facilitation given by (QUASOs) /Ministry of education officials in your school management or school improvement efforts adequate? Yes  No

**Thank you for your time and participation**

## Appendix II: Questionnaire for HoDs

Instruction: Tick (✓) or write statements/descriptions as applicable. **Please be honest** in your responses as they will be reliably used for a scientific empirical analysis.

### Socio-demographic data

- 1a) Please indicate your gender male , female ,
- b) Please indicate your highest academic certificate attained.
- |           |     |                          |     |          |     |
|-----------|-----|--------------------------|-----|----------|-----|
| Diploma   | [ ] | Degree                   | [ ] | Master's | [ ] |
| Doctorate | [ ] | Any Other (specify)..... |     |          |     |
- c) Are you enrolled or pursuing any academic study? Yes , No ,. If yes which studies, are you pursuing and what are your main reasons for this study .....
- .....
- d) What age category do you fall in?
- |               |     |          |     |                   |     |
|---------------|-----|----------|-----|-------------------|-----|
| Below 35 yrs. | [ ] | 35-39yrs | [ ] | 40-44 yrs.        | [ ] |
| 45-49 yrs.    | [ ] | 50-54    | [ ] | 55 and above yrs. | [ ] |
- e) e) For how long have you been teaching since you graduated?
- |            |     |              |     |           |     |
|------------|-----|--------------|-----|-----------|-----|
| 0-2 yrs.   | [ ] | 3-5yrs       | [ ] | 6-10 yrs. | [ ] |
| 11-15 yrs. | [ ] | 16 and above | [ ] |           |     |
- f) For how long have you been teaching in the current school you are in ?
- |            |     |              |     |           |     |
|------------|-----|--------------|-----|-----------|-----|
| 0-2 yrs.   | [ ] | 3-5yrs       | [ ] | 6-10 yrs. | [ ] |
| 11-15 yrs. | [ ] | 16 and above | [ ] |           |     |
- g) What was your overall KCSE grade .....? Or EACE/ O level Division/Grade .....

- h) Did you study the subjects you are currently teaching during your secondary school level Yes , No ,. If yes, which grades did you attain at KCSE/EACE in the subjects you are currently teaching?

	Subject	Grade
1		
2		
3		

2. a) State the department in which you are head .....
- b) Which subjects are under your department.....
- c) Have you taught a candidate class in the last three years?  
 Yes [  ] No [  ] If yes please indicate the subject you taught and the mean score your class (es) attained.  
 2018..... 2019.....  
 2020.....

**Administrative related tasks and roles**

3. a) To what extent do you receive support from the principal in terms of provision of any required teaching- learning materials e.g., apparatus, chemicals, stationary, teaching aids, books?  
 Not at all [  ] Small extent [  ] Moderate extent [  ]  
 Great extent [  ] Very great extent [  ]
- b) What is the majority average teaching load per week of teachers in your department?  
 Below 15 Lesson [  ] 15-20 [  ] 21-25 [  ]  
 26-30 [  ] 31-35 [  ] Above 35 [  ]
- c) How can you describe the average teaching load of teachers in in your department in terms of facilitating quality teaching? .....

4. a) What is the level of adequacy of:
- i. Course Books for various subjects in your department  
 Not at all  Inadequate  Adequate
  - ii. Digital Content/ multimedia/CDs with subject specific content for various subjects in your department  
 Not at all available   
 Available but inadequate  available and adequate
- b) How can you rate the level of text books utilization (for serious studies/reading culture) by students in your school?  
 Not at all  Small extent  Moderate extent   
 Great extent  Very great extent
- c) Are there other teaching and learning resources/aids in your department like models, charts, stationaries Yes  No  If yes are the teaching learning aids adequate? Yes  No
- d) In which ways does the availability /adequacy of teaching resources affect teaching and learning in your department? .....
- e) How can you describe the level of ICT utilization in the teaching of subjects in your department?  
 Not at all  Small extent  Moderate extent   
 Great extent  Very great extent
- f) Is there a clearly stipulated policy or strategy in your school that focus on promotion of ICT integration in teaching and learning? Yes   
 No  If yes, what does it entail in brief? .....
- .....

**SCIENCES (Q4g-5g)**

g) What was the KCSE mean score of the following science subjects in the last two years in your school? Chemistry 2019. ....2020..... Biology 2019 .....2020. .... Physics 2019 .... .2020....

**Science laboratories availability and usage**

5. a) How many laboratories are available? (Please specify number of available labs per science subject and give the total capacity that the combined labs per subject can accommodate)

Type of laboratory	Physics lab(s)	Chem lab(s)	Bio lab(s)	General lab (s)
Number of labs/rooms				
Total number of students (total capacity) that the combined rooms above can accommodate at a go				

Please specify if there is any other type of science lab and give its capacity .....

.....

b) How well furnished with equipment and chemicals for practical are these labs?

Not at all            [ ]    Small extent    [ ]    Moderate extent    [ ]

Great extent        [ ]    Very great extent    [ ]

c) Please specify the condition of the laboratories in terms of whether they have:

Proper lighting            Yes [ ]                    No [ ]

gas piping                Yes [ ]                    No [ ]

flowing water/taps        Yes [ ]                    No [ ]

fume chambers (chemistry labs) Yes [ ]    No [ ]

Are the labs adequate for learning need of your school Yes [ ] No [ ]

Please explain the reasons for your answer in c above .....

.....

- d) Are the laboratories manned/operated by lab technicians  
 Yes  No  If yes, how many lab technicians are available in your school ..... Are the lab technicians well qualified/effective in their roles? Yes  No
- e) Generally, how can you rate the *level of utilization* of science laboratories for science practical by teachers in teaching sciences in your school?  
 Very low  Low  Moderate  High   
 Very high
- f) Is there a clearly stipulated policy or strategy in your school that focus on promotion of laboratory utilization/ using practical in teaching sciences as opposed to theoretical approach? Yes  No  If yes, what does it entail in brief?.....
- g) Which are the key challenges that hinder/limit use of science laboratories for science practical in your school?

**Library and related resources**

6. a) Do you have a library in your school Yes  No
- b) If yes how resourced is the library in terms of ***Relevant and Current Subject Specific*** Books and other reading material for use by students?  
 Not at all  Small extent  Moderate extent   
 Great extent  Very great extent
- c) What is the approximate total sitting capacity of the library /libraries .....
- d) Is there a designated librarian? Yes  No

- e) To what extent (in your view) do teachers make use of (utilize) the library and library resources in their work in your school?  
 Not at all  Small extent  Moderate extent   
 Great extent  Very great extent
- f) To what extent (in your view) do student make use of (utilize) the library and library resources in their studies in your school?  
 Not at all  Small extent  Moderate extent   
 Great extent  Very great extent
- g) Is/are the library/libraries in your school adequate in terms of serving the demand for library services?  
 Yes  No
- h) Is there a clearly stipulated policy or strategy in your school that focus on promotion of library and library resources utilization? Yes , No. If yes, what does it entail in brief? .....
- i) Which are the key challenges that hinder/limit use of library and library resources in your school? .....



7. How can you rate the adequacy and condition of the following physical resources in your school in terms of painting and general maintenance so as to best serve their intended purpose? Please Tick (√) or (×) as appropriate.

Resource	Availability  Indicate with a Tick (√) if resource is <u>Available</u> or Cross (×) if resource is <u>Not available</u> in your school.	Adequacy (Only If resource is available)	Condition (Only If resource is available)		
		Are the available resources <u>adequate</u> ? Tick (√) as is appropriate below.	How is the <u>condition</u> of available resources? Tick (√) as is appropriate below		
			Poor	Fair	Good
Classrooms		Yes [ ] No [ ]			
Science laboratories		Yes [ ] No [ ]			
Computer laboratories		Yes [ ] No [ ]			
Library		Yes [ ] No [ ]			
Books		Yes [ ] No [ ]			
Teaching aids and related materials		Yes [ ] No [ ]			
Dining Hall		Yes [ ] No [ ]			
Multipurpose /Social Hall.		Yes [ ] No [ ]			
Chairs and desks		Yes [ ] No [ ]			
Computers and related ICT educational resources		Yes [ ] No [ ]			
Co-curricular resources for sports, music and drama activities)		Yes [ ] No [ ]			

**Extent of Resource utilization (general scope)**

8. Please indicate the extent to which the following resources are **generally utilized by teachers in all subjects offered in your school** to facilitate teaching and learning. Never- 1, Rarely-2, Occasionally-3, Often -4 Always -5

School physical resources	Frequency of use				
	1	2	3	4	5
i. Teaching/learning aids/model/charts					
ii. Reference/guide books by teachers					
iii. Library services and resources					
iv. Laboratory equipment/chemicals in teaching sciences					
v. Computer lab for teaching and learning in other subjects other than computer studies					
vi. Computers and projectors in teaching & learning of other subjects other than computer studies					
vii. Dinning/Social /Conference halls for teaching & learning related purposes other than for meals or general assemblies					

9. a) How frequent do you hold staff meetings/Departmental meetings in a typical academic year?

Once per year        Termly                twice per term           

Thrice per term        Any other frequency please specify.....

b) In your opinion to what extent do such meetings, yield tangible solutions towards improving teaching and learning activities in your school?

Not at all                Small extent        Moderate extent           

Great extent        Very great extent           

c) What strategies have you put in place to ensure high quality learning and performance in your department?.....

**Development of teacher quality**

10. a) Have teachers in your department been sponsored for any workshops or professional training (INSET) by your school since 2019?

Yes [ ] No [ ]

b) If yes how many such trainings or workshops and what was the focus of such workshop?.....

.....

c) How can you describe the adequacy of such workshop’s opportunities to teachers in your school in terms of meeting the need of facilitating teaching quality improvement? Inadequate [ ] Adequate [ ]

d) Indicate the extent to which teachers in your department have been facilitated for development in the following specific areas N-not at all, S-small extent, M-moderate extent, G-great extent, V-Very great extent

<b>Area of capacity building</b>	<b>N</b>	<b>S</b>	<b>M</b>	<b>G</b>	<b>V</b>
i. Training in subject specific content or pedagogy					
ii. ICT integration in teaching and learning					
iii. Training as KNEC examiners					
iv. Training in Co-curricular activities					

**GAMES/CO-CURRICULAR ACTIVITIES**

11. In your opinion, how is the adequacy of teachers’ competencies (skillset) in facilitating co-curricular activities in your school?

Not at all [ ] In adequate [ ] Adequate [ ]

12. a) How readily and interested are teachers in your school, in participating with commitment in promoting co-curricular activities? Not at all committed [ ]

less committed [ ] moderately committed [ ]

highly committed [ ] Very highly committed [ ]

- b) Is there a clearly stipulated policy or strategy in your school that focus on increasing or promoting participation in co-curricular activities or utilization of co-curricular resources? Yes  No  If yes, what does it entail in brief?.....  
 .....
- c) Please indicate the overall KCSE mean score for your school in the last 3 years.  
 2018 .....2019 ..... 2020 .....
- d) Do students in your school go for Physical Education (PE) lessons  
 Yes  No
- e) Apart from time used for PE lessons, what other time is allocated for co-curricular related activities (games, drama or music) per week in your school?  
 (Please specify the day of the week and time allocated per day).....  
 .....
- f) Does your department invite coaches, games/sports trainers/mentors /career guidance experts to train students on various sports/drama/music  
 Yes  No   
 If Yes, How frequent  
 Not at all  Less frequent  moderately frequent   
 more frequent  Very frequent
13. a) How adequate does the administration support **Sports, drama and music activities** in terms of resource and financial requirements?  
 Not at all  less adequately  adequately
- b) To what extent does the principal develop data driven and strategic co-curricular goals toward improving standards and performance in co-curricular activities?  
 Not at all  Small extent  Moderate extent   
 Great extent  Very great extent

c) Indicate the adequacy of the facilities available for the following co-curricular activities

- i. Drama facilities? Not at all available [ ]  
 Available but Inadequate [ ] Available & Adequate [ ]
- ii. Music facilities? Not at all available [ ]  
 Available but Inadequate [ ] Available & Adequate [ ]

14. a) Please indicate which co-curricular activities are offered in your school and the adequacy and condition of the available resources to facilitate them.

Sports and Games	Availability of the co-curricular activity		Adequacy of equipment and facilities to support the activity in the school (Only if activity is available)		Condition of equipment and facilities (Only if activity is available)		
	Yes	No	Inadequate	Adequate	Poor	Fair	Good
Athletics							
Badminton							
Basket Ball							
Chess							
Football/Soccer							
Handball							
Hockey							
Lawn Tennis							
Netball							
Rugby							
Swimming							
Table Tennis							
Volley ball							

15. a) Please tick (✓) the co-curricular resources available in your school

- Sports field [ ] Hockey pitch [ ] rugby field [ ]  
 swimming pool [ ] handball pitch [ ] athletic track [ ]  
 lone tennis court [ ] badminton court [ ] table tennis [ ]  
 football pitch [ ] Theatre room(lyceum)[ ] Basketball court [ ]  
 gymnasium [ ]

b) In your opinion does participation in co-curricular activities influence academic performance positively or negatively and why?.....  
 .....

c) What are the key challenges facing participation in co-curricular (sports, music & drama) activities in your school? .....

**Resource utilization Extent**

16. Please indicate the extent to which the following resources are utilized in your school. Never- 1, Rarely-2, occasionally-3, often -4 Always -5

physical resources for co-curricular activities	Frequency of use				
	1	2	3	4	5
Sports, drama music reference materials (Book and non-book)					
Sports field					
Sports facilities and equipment					
Music facilities and equipment					
Drama facilities and equipment					

17. Are ICTs used in promotion of co-curricular activities in your school?

Yes [ ] No [ ]

If yes, in which way.....

**Co-curricular activities participation**

18. a) What was your schools` highest level in participation (in the last interschool competitions held) for the following categories in Drama? (Tick as is appropriate)

	<b>Did Not Participate</b>	<b>Zonal</b>	<b>County</b>	<b>Regional</b>	<b>National</b>
Creative Dance					
Modern Dance					
Narrative					
Spoken Word					
Solo Verse					
Coral Verse					
Stand Up Comedy					

b) Did the school participate in **Music** festival in the last interschool competitions held? Yes [ ] No [ ]

c) If Yes, kindly indicate the highest level your school participated in music festivals; Sub-County [ ] County [ ] Regional [ ] National [ ]

d) What was your highest level of participation in the following games in the last interschool competitions held (Tick (√) as appropriate)

	<b>Did not participate</b>	<b>Sub-County</b>	<b>County</b>	<b>Regional</b>	<b>National</b>
Athletics					
Badminton					
Basket Ball					
Chess					
Football/Soccer					
Handball					
Hockey					
Lawn Tennis					
Netball					
Rugby					
Swimming					
Table Tennis					
Volley ball					

**Thank you for your time and participation.**

### Appendix III: Questionnaire for Teachers

Instruction: Tick (✓) or write statements/descriptions as applicable. **Please be honest** in your responses as they will be reliably used for a scientific empirical analysis

1. a) Which age category do you fall in?

- Below 35 yrs.        35-39yrs        40-44 yrs.      
45-49 yrs.        50-54        55 and above yrs.

b) Indicate the name of your school.....  
.....

c) Please indicate your gender male , female ,

2. a) Please indicate your highest academic certificate attained.

- Diploma        Degree        Master's      
Doctorate        Any Other (specify).....

b) Are you enrolled or pursuing any academic study? Yes , No ,. If yes which studies, are you pursuing and what are your main reasons for this study?.....  
.....

3. a) Which are your teaching subjects.....

b) Have you taught a candidate class in the last three years? Yes  No , If yes please indicate the subject you taught and the mean score your class (es) attained.

2018 ..... 2019 .....  
2020 .....

4. a) For how long have you been teaching since you graduated?

- 0-2 yrs.        3-5yrs        6-10 yrs.      
11-15 yrs.        16 and above



- b) for how long have you been teaching in the current school you are in ?  
 0-2 yrs. [ ] 3-5yrs [ ] 6-10 yrs. [ ] 11-15 yrs. [ ]  
 16 and above [ ]

5. a) What was your overall KCSE grade .....? Or EACE/ O level Division/Grade/Points.....

b) Did you study the subjects you are currently teaching during your secondary school level Yes , No, .If yes, which grades did you attain at KCSE/EACE in the subjects you are currently teaching?

	Subject	Grade/Points
1		
2		
3		

6. a) What is your teaching load per week?

- 20 and below [ ] 21-25 [ ] 26-30 [ ]  
 31-35 [ ] Above 35 [ ]

b) How can you describe your teaching load in terms of its effect in enabling you deliver quality teaching in your school .....

.....

c) In which specific ways do you adapt/cope with your teaching assignments to ensure delivery of quality teaching to all students in your classes .....

.....

### School processes and related practices

7. a) Please indicate the extent to which you agree or disagree with the following statements. Please use

SD-Strongly Disagree, D-Disagree, U-Undecided, A-Agree, SA-Strongly Agree, SD imply principal is *Almost Never Involved* in the practice while SA imply principal is *Almost Always involved* in the practice.

Statement	SD	D	U	A	SA
<b>Developing Teacher quality and motivation</b>					
Our principal adequately promotes/sponsors teacher for capacity building					
Principal adequately assists teachers in solving teaching and classroom management challenges					
Our principal addresses teacher welfare issues like meals, drinks, and other teaching related incentives adequately					
<b>Goal setting and communication</b>					
Principal develops realistic data driven and strategic academic goals that promotes high standards and expectation in our school					
The principal clearly communicates the developed goals					
<b>Managing instructional programs</b>					
Principal closely monitors student progress in our school					
Principal adequately supervises and evaluates teaching and assessment					
School programs are rarely interfered with and routines are highly maintained					
Principal is always available in school					
<b>Leadership beyond school boundaries</b>					
Our school collaborates frequently with other schools and helpful agencies in promotion of high-quality learning and performance					
Our school adequately collaborates with parents and create forums like academic clinics that enable teacher-student-parent linkages for better discipline and academic performance					

b) Does your principal check availability and use of the following tools by teachers

Schemes of work	Yes	[ ]	No	[ ]
Lesson plans	Yes	[ ]	No	[ ]
Updated lesson notes	Yes	[ ]	No	[ ]
Use of ICTs in teaching	Yes	[ ]	No	[ ]
TPAD tools	Yes	[ ]	No	[ ]

**Development of teacher quality**

8. a) Have you been sponsored for any workshops or professional training (INSET) by your school since 2019? Yes [ ] No [ ]

If yes how many such trainings or workshops have you attended and what was the focus of such workshop or training? .....

b) How can you describe the adequacy of workshops teachers are sponsored for in your school in terms of facilitating teaching quality improvement?

Inadequate [ ] Adequate [ ]

**Incentives for teaching**

9. a) Does your school reward/incentivize performance by teachers in

Academics results Yes [ ] No [ ]

Co-curricular activities results Yes [ ] No [ ]

b) Please describe the nature of rewards or policy of rewarding such exceptional performance e.g. mean score improvement, quality grades, participation of games in national.....

c) How can you describe adequacy of such rewards?

Inadequate [ ] Adequate [ ]

d) What teacher incentives/motivational arrangements are there to appreciate teachers other than rewarding performance? (Specify frequency of such arrangements) .....

- e) How can you describe adequacy of such motivational/incentives initiatives?  
Inadequate [ ] Adequate [ ]

**Professional support and Induction**

10. a) How can you rate the kind continuous professional support from the principal in your day-to-day duties as a teacher in this school?

Very Poor [ ] Poor [ ] Fair [ ] Good [ ]  
Very Good [ ]

- b) Please, briefly specify why you rate the support as above.....  
.....

- c) When you joined this school, was the current principal the one in office?  
Yes [ ] No [ ]

- d) If yes, how can you rate the kind of induction into the school system that you received from the principal as a new teacher?

Very Poor [ ] Poor [ ] Fair [ ] Good [ ]  
Very Good [ ]

- e) Please, briefly specify why you rate the induction as above.....  
.....

**Resource utilization Extent**

11. Please indicate the extent to which you utilize the following in your teaching.

Never- 1, Rarely-2, occasionally-3, often -4 Always -5

School physical resources	Frequency of use				
	1	2	3	4	5
1. Reference/guide books					
2. ICT /digital content/ Computers in teaching					
3. Teaching aids/Models/Charts in teaching					
4. Library services and resources					
5. Computer laboratory for teaching-learning related activities in your subject					
6. Science Laboratory (if you teach science subject)					
7. Laboratory equipment/chemicals for practical in teaching (if you teach science subject)					

**Time on task/Opportunity to learn**

12. a) How many Internal Main Exams (IME) are done in a term in your school

by: form 1.....form 2 .....form 3 .....form IV .....

b) Are all Internal Main exams set out of 100% Yes  , No [  ] If, Not set out of 100% , please specify the usual length for form 1 exams.....form 2 exams .....form 3 exams.....form IV exams .....

c) Are the Internal Main Exams indicated above usually: Promptly marked, analyzed and returned to students Yes [  ] No [  ], Not sure [  ] Promptly revised by teachers in class Yes [  ], No [  ] , Not sure [  ] Promptly discussed in departmental/staff meetings so as to inform teaching and learning Yes [  ], No [  ] Not sure [  ]

d) d)What significance do the Internal Main Exams have in terms of guiding teaching and learning strategies in your school? .....

e) Do you have other exams like Continuous Assessment Tests (CATS) in between internal main exams Yes [ ] No [ ] If Yes please specify the number of such exams done per form and how different they are from internal main exams .....

f) Do you have remedial teaching in your school Yes [ ] No [ ]  
If yes in 12f above:

g) Which classes are subjected to remedial teaching?  
Form 1 Yes [ ] No [ ] Form 2 Yes [ ] No [ ]  
Form 3 Yes [ ] No [ ] Form 4 Yes [ ] No [ ]

h) When is remedial teaching generally done in your school for the different subjects?

On **weekdays** in the **Morning** before normal classes  
Yes [ ] No [ ] If Yes, how many hours per day.....

On **weekdays** in the **Evening** after normal classes  
Yes [ ] No [ ] If Yes how many hours per day.....

On **Saturdays**  
Yes [ ] No [ ] If Yes how many hours .....

On **Sundays** Yes [ ] No [ ]  
If Yes how many hours .....

f) How can you rate the level of teacher attendance for such remedial lessons?

Very Low [ ] Low [ ] Moderate [ ]  
High [ ] Very High [ ]

13. Does your school invite career guidance /mentors /Motivational speakers  
Yes [ ] No [ ]

If Yes, How frequent

Less Frequent [ ] Moderately Frequent [ ] More Frequent

Very Frequent [ ]

**ICTs integration in teaching and learning**

14. a) How frequently do you use ICTs (Computers, multimedia and digital content) in classes for teaching

Never/Not at all [ ] Rarely [ ] Occasionally [ ]

Often [ ] Always [ ]

b) Which are the key challenges that limit/hinder ICT integration/utilization in teaching and learning in your school? .....

c) If ICTs are used for teaching, what benefits, in your view, does it have in promoting learning?.....

**Student's related aspects**

15. a) What is the average KCPE entry marks for students in your school?

Between (0-100)-E [ ] Between (101-200) –D [ ]

Between (201-300)-C [ ] Between (301-400)-B [ ]

Between (401-500)-A [ ]

b) To what extent do you think the average aptitude/cognitive entry behavior composition of student (average KCPE marks) in your school influences the eventual KCSE mean score?

Not at all [ ] Small extent [ ] Moderate extent [ ]

Great extent [ ] Very great extent [ ]

c) How do you adapt/cope with the effect of the cognitive entry behavior of students in your school in ensuring quality learning for all students is achieved? .....

d) Is ability grouping or sorting of students (sub-county, county, extra county and national) during secondary school admissions based on their KCPE performance beneficial to learning? please give your reason (s)?.....  
 .....

e) How motivated are students to learn in your school in term of being actively engaged in class, punctuality, doing assignments given and their efforts to do consultations on academic matters

Not at all [ ] Small extent [ ]  
 Moderate extent [ ] Great extent [ ]  
 Very great extent [ ]

f) How can you generally rate the level of discipline of students in your school?

Very low [ ] Low [ ] moderate [ ]  
 High [ ] Very High [ ]

g) Have students in your school been involved in any of the following issues in the last three years?

KCSE exam irregularities/cancellation	Yes [ ] No [ ]
Student expulsion/suspension	Yes [ ] No [ ]
School fires (Arsonist attacks)	Yes [ ] No [ ]
Bullying/Assault incidences	Yes [ ] No [ ]
Gross defiance of authority/Incitement/strikes/rampage	Yes [ ] No [ ]

16. a) Did your teacher education course cover/incorporate general training in sports, music or drama activities Yes [ ] No [ ] If yes, was the training, in your opinion, adequate in relation to equipping you with skillset to facilitate these activities? Yes [ ] No [ ]



- b) Do you have any other specialized training in coaching, officiating any sport drama or music activity? (please specify the training.....  
.....)
- c) Please indicate your terms/status of employment as a teacher. TSC P&P , TSC contract/Intern , BOM employed , Teaching Practice (TP) . Any other, please specify.....

**Thank you for your time and participation.**

#### **Appendix IV: Semi structured Interview schedule for CQASO and TSC CDE**

Dear Sir/Madam,

Thank you for finding time and accepting to be interviewed for this study. This study seeks to establish the influence of educational inputs and processes on academic achievement within public secondary schools in Nyeri and Nyandarua counties in Kenya. A clear understanding of the relationship between schools 'learning inputs and processes and academic performance may be beneficial in coming up with strategies and policies to improve educational standards and in particular ensuring that all students are provided a good chance to succeed in whichever school they are enrolled in. The interview may last only for about few minutes and I will be writing your responses as we proceed.

- 1) a What mechanisms are in place to ensure school physical and material resources are adequate and equitably distributed in all schools?
  - b What can you comment about the challenge of resource utilization?
- 2) a In which Ways do you ensure equitable distribution of teachers in terms of Quantity, Qualification, Experience and Capacity building?
  - b What can you comment about the challenge of teacher utilization?
- 3) How do you supervise/support schools to ensure school administrators have *Capacity* required to offer instructional leadership, and they implement *policies* that benefic student learning e.g syllabus coverage (Time -on-task), ICT integration, Games, teacher motivation and development.
- 4) Are there mechanisms in place to address schools struggling with academic performance of students like the Sub-County Schools?

**Thank you for your time and participation.**

**Appendix V: Observation Checklist on physical resource availability**

<b>Observation Task</b>	<b>What to observe</b>	<b>Comments /Remarks</b>
1. Check Science laboratory availability	<ul style="list-style-type: none"> <li>• Existence of specific labs for physics, chemistry and biology and the number of labs</li> <li>• If labs have adequate equipment and chemicals for use</li> <li>• Check evidence of frequency of use of laboratories for learning purpose</li> </ul>	
2. Check computer laboratory availability	<ul style="list-style-type: none"> <li>• How many labs are there? Their capacity and number of installed computers</li> <li>• If all students have access to computer labs or its only computer students that utilize the lab(s)</li> </ul>	
3. Check Classrooms availability	<ul style="list-style-type: none"> <li>• Check number of streams/classes per form</li> <li>• Check condition of chairs and desks</li> <li>• Check type of board used in class whether whiteboard or black board</li> <li>• Check if sockets are installed</li> <li>• Does class have evidence of use of teaching models e.g. wall maps charts</li> </ul>	
4. Check Library availability	<ul style="list-style-type: none"> <li>• Check if library is well stocked with books</li> <li>• Evidence of students making use of library</li> <li>• Evidence of use of computer or internet by students in the library</li> </ul>	
5. Check books and other teaching and learning materials availability	<ul style="list-style-type: none"> <li>• Check if students have course books for all subjects</li> <li>• Check evidence of stationary and other pedagogical resources</li> <li>• Check evidence of use of books and related materials for teaching learning purposes</li> </ul>	
6. Check ICTs and related device availability	<ul style="list-style-type: none"> <li>• Check if LCD projectors exist and laptops and their number</li> <li>• Check evidence of teacher use of these devices in teaching and learning</li> </ul>	
7. Check playing field availability	<ul style="list-style-type: none"> <li>• Check Size and condition of the field</li> <li>• Check facilities available for various sports</li> <li>• Check evidence of use of the field by students</li> </ul>	

### Appendix VI: Document Analysis Checklist

Document/Information source	Information to be retrieved
1. Examination performance analysis (Both KCSE) and internal exams	<ul style="list-style-type: none"> <li>• School mean score</li> <li>• Subjects being offered</li> </ul>
2. Teachers` mark books	<ul style="list-style-type: none"> <li>• Number of exams being done</li> <li>• General performance of students in exams</li> </ul>
3. Records of work book	<ul style="list-style-type: none"> <li>• Pace of Syllabus coverage</li> <li>• Diversity of resources used in teaching including ICTs</li> </ul>
4. Schemes of work	<ul style="list-style-type: none"> <li>• Pace of Syllabus coverage</li> <li>• Diversity of resources used in teaching including ICTs</li> </ul>
5. Class registers	<ul style="list-style-type: none"> <li>• Class sizes</li> <li>• Level of absenteeism/attendance</li> </ul>
6. Books inventory	<ul style="list-style-type: none"> <li>• Diversity of books available as well as those issued to students</li> </ul>
7. TPAD records	<ul style="list-style-type: none"> <li>• Compliance by teachers to TPAD requirements</li> </ul>
8. Strategic plan for the school	<ul style="list-style-type: none"> <li>• Schools` profile and performance trends</li> <li>• Vision and goals of the school</li> <li>• Strategies to improve quality of learning</li> <li>• Schools Physical and human resources</li> </ul>
9. Discipline record book	<ul style="list-style-type: none"> <li>• Students discipline in terms of nature of offences committed and corrective actions taken</li> </ul>
10. School programs timetable	<ul style="list-style-type: none"> <li>• Opportunity to learn in terms of diversity of school programs and time allocated for each activity</li> </ul>
11. Students` file or admission records	<ul style="list-style-type: none"> <li>• Students KCPE marks</li> </ul>

## **Appendix VII: Letter of Introduction to Respondents**

Department of Education Management

Policy and Curriculum Studies,

Kenyatta University.

P.O Box 43844

Nairobi 00100

KENYA

Date: .....

Dear Respondent,

I am a postgraduate student of Kenyatta University undertaking a doctoral degree programme in the Department of Educational Management Policy & Curriculum Studies in School of Education.

I am currently conducting a research within Nyeri and Nyandarua counties focusing on Schools` inputs and processes and their influence on learning and academic achievement. The study may be integral in providing the empirical status of adequacy of school inputs and nature of school processes as proximate determinants of school performance. This may be helpful in efforts towards ensuring that as basic education uptake surges with initiatives like 100% transition from primary to secondary, students are not just assured of mere schooling but are assured of quality learning opportunities in all schools.

You/your institution has been identified and chosen to contribute in provision of responses to the questions generated in line with the objectives of this current study. There are three types of questionnaires provided; for the school principal, for Heads of Departments (HoDs) and for teachers. Please ensure that no question is skipped or left unanswered and that the answers provided are genuine, truthful and factual. You are assured that the information provided will be treated with utmost confidence and all protocols of data security adhered to. The data provided will only be used for the purpose disclosed. Participation in this study is purely voluntary however, the study holds the promise to contribute in the improvement of educational practice in the study area.

thank you for your time and participation

Yours faithfully,

Samwel. N. Gatama.

**Appendix VIII: Additional Consents for Observation Photos Due to Ethical Considerations**

No	Photo	Teachers and Others/Students	Administration
1	(a)	Teacher ..... Others ..... <i>(Handwritten signatures and names)</i>	<i>(Circular stamp: MARIKA GIRLS SECONDARY SCHOOL, 19 MAY 2023, P.O. Box 137, CHWALE)</i> <i>(Signature: Mrs. Ndlangwa)</i>
2	(b)	Teacher ..... Others .....	<i>(Circular stamp: MARIKA GIRLS SECONDARY SCHOOL, 22 MAY 2023, P.O. Box 137, CHWALE)</i> <i>(Signature: Karunika)</i>
3	(c)	Teacher ..... Others ..... <i>(Handwritten signatures and names)</i>	<i>(Circular stamp: KARIKO SEC. SCHOOL, PRINCIPAL, P.O. Box 100, CHWALE)</i> <i>(Signature: M. S. Othaya)</i>
4	(d)	Teacher ..... Others .....	<i>(Circular stamp: KARIKO SEC. SCHOOL, PRINCIPAL, 19 MAY 2023, P.O. Box 100, CHWALE)</i> <i>(Signature: M. S. Othaya)</i>
5	(e)	Teacher ..... <i>(Handwritten signature)</i>	<i>(Circular stamp: KARIKO SEC. SCHOOL, PRINCIPAL, P.O. Box 100, CHWALE)</i> <i>(Signature: M. S. Othaya)</i>
6	(f)	Teacher ..... Others ..... <i>(Handwritten: Science Dept)</i>	<i>(Rectangular stamp: DEPUTY PRINCIPAL, CHINGA BOYS HIGH SCHOOL, P.O. Box 100, CHWALE)</i> <i>(Signature: M. S. Othaya)</i>
7	(g)	Teacher ..... <i>(Handwritten signature)</i>	<i>(Rectangular stamp: PRINCIPAL, MUNYANGE SECONDARY SCHOOL, 16 MAY 2023, P.O. Box 1359 - 10100, NYERI)</i> <i>(Signature: M. S. Othaya)</i>

## Appendix IX: list of Public Secondary Schools in Nyeri and Nyandarua

### Counties

No.	Name of School	Type	Category	No.	Name of School	Type	Category
<b><u>NYERI COUNTY</u></b>							
<b><u>SCHOOLS</u></b>							
<b>1-KIENI EAST (KE)</b>							
1	NAROMORU GIRLS	B	EC	16	MARAGIMA MIXED	D	SC
2	MOI EQUATOR GIRLS	B	C	17	MERE MIXED	D	SC
3	NAROMORU BOYS	B	C	18	MLIMA KENYA MIXED	D	SC
4	BURGURET MIXED	D	SC	19	MUKANDAMIA MIXED	D	SC
5	CHRIS MORONNE	D	SC	20	MUNYU MIXED	D	SC
6	DEB SOLIO MIXED	D	SC	21	MURERU MIXED	D	SC
7	GAKAWA MIXED	D	SC	22	MWICWIRI MIXED	D	SC
8	GATUAMBA MIXED	D	SC	23	NAROMORU MIXED	D	SC
9	GATUANYAGA MIXED			24	NDATHI MIXED	D&B	SC
10	IRIGITHATHI MIXED	D	SC	25	NDIRITI AGUTHI MIXED	D	SC
11	KABURAINI MIXED	D	SC	26	NYANGE MIXED	D	SC
12	KARUNDAS MIXED	D	SC	27	ST. JOSEPH ALLAMANO MIXED	D	SC
13	KIAMATHANGA MIXED	D	SC				
14	KIMAHURI MIXED	D	SC	28	ST. MONICA MUNYAKA MIXED	D	SC
15	LUSOI HIGH MIXED	D	SC	29	WARAZO JET MIXED	D&B	SC
<b>2-KIENI WEST (KW)</b>							
1	GATARAGWA GIRLS	B	C	17	MWEIGA HIGH MIXED	D&B	SC
2	ENDARASHA BOYS HIGH	B	C	18	MWIRERI MIXED	D	SC
3	ENDARASHA DM MIXED	D	SC	19	MWIYOGO MIXED	D	SC
4	AMBONI MIXED	D&B	SC	20	NJENG'U MIXED	D	SC
5	CHARITY MIXED	D&B	SC	21	OBSERVATION AL HILL MIXED	D	SC
6	EMBARINGO MIXED	D	SC	22	ST GEORGE MIXED	D	SC
7	GAKANGA MIXED	D	SC	23	ST PAUL KINYAITI MIXED	D	SC
8	GITITO MIXED	D	SC	24	ST THOMAS AQUINAS MIXED	D	SC
9	KAIMENO MIXED	D&B	SC	25	ST ANTHONY	D	SC
10	KIARAGANA GIRLS	D	SC	26	PADUA PURA MIXED	D	SC
				27	ST JOSEPH SIMBARA MIXED	D	SC

No.	Name of School	Type	Category	No.	Name of School	Type	Category
11	KIAMUNYURU MIXED	D	SC	28	ST JUDE MUGUNDA MIXED	D	SC
12	KIMURI MIXED	D	SC	29	ST MONICA GITEGI MIXED	D	SC
13	LABURRA MIXED	D	SC	30	ST REJINA NAIRUTIA MIXED	D	SC
14	LAMURIA DAY MIXED	D	SC	31	ST THOMAS RUIRUI MIXED	D	SC
15	MAHIGA HOPE MIXED	D	SC	32	WATUKA MIXED	B	SC
16	MUGUNDA MIXED	B	SC	33	BELLEVUE MIXED	D	SC
<b>3-MATHIRA EAST(ME)</b>							
1	KANJURI BOYS	B	EC	13	KANGOCHO SEC	D	SC
2	KIRIMARA BOYS HIGH	B	EC	14	KARATINA GIRLS	B	SC
3	GAKUYU MIXED	D	SC	15	KIAMABARA MIXED	D	SC
4	GATHEHU MIXED	D	SC	16	KIAMWANGI SEC	D	SC
5	GATONDO GIRLS	D&B	SC	17	KIARITHAINI BOYS HIGH	B	SC
6	GATUNDU MIXED	D	SC	18	MAGUTU GIRLS	B	SC
7	GATURIRI MIXED	D	SC	19	MATHAITHI GIRLS	D&B	SC
8	GIKAIBII BOYS	D&B	SC	20	MIIRI MIXED	D	SC
9	GIKUMBO MIXED	D&B		21	MUTHEA MIXED	D	SC
10	GITUNDUTI MIXED	D	SC	22	DIMAINI MIXED	D	SC
11	IHWAGI MIXED	D	SC	23	RAGATI MIXED	D	SC
12	ITUNDU MIXED	D	SC	24	ST AUGUSTINE KIENI MIXED	D	SC
<b>4-MATHIRA WEST (MW)</b>							
1	BISHOP GATIMU NG ANDU GIRLS HIGH	B	N	9	HIRIGA GIRLS	D&B	SC
2	TUMUTUMU GIRLS HIGH	B	EC	10	IRURI MIXED	D	SC
3	RUTHAGATI BOYS HIGH	B	C	11	NGUNGURU MIXED	D	SC
4	GENERAL CHINA MIXED	D	SC	12	KIANGOMA MIXED	D	SC
5	KANYAMA MIXED	D&B	SC	13	KIANJOGU MIXED	D	SC
6	ICUGA GIRLS	D&B	SC	14	RITITI MIXED	D	SC
7	KABIRUINI GIRLS	D&B	SC	15	NGAINI MIXED	D	SC
8	KIAMARIGA BOYS	D&B	SC	16	NGORANO MIXED	D&B	SC
<b>5-MUKURWEINI (MU)</b>							
1	SOUTH TETU GIRLS	B	EC	17	KIHUTI MIXED	D	SC
2	ST BONAVENTURE KAHETI BOYS	B	EC	18	KIMONDO MIXED	D	SC
3	MUKURWEINI BOYS	B	C	19	MIHUTI MIXED	D	SC
4	ACK KIUU MIXED	D	SC	20	MWERU HIGH MIXED	D&B	SC
5	GAIKUNDO MIXED	D	SC	21	NDIAINI GIRLS	D&B	SC



No.	Name of School	Type	Category	No.	Name of School	Type	Category
6	GATHIRITI MIXED	D	SC	22	NGAMWA MIXED	D	SC
7	GATHUNGURURU GIRLS	B	SC	23	NGORU ORTHODOX MIXED	D	SC
8	GIATHUGU TECH MIXED	D	SC	24	NJIRUINI MIXED	D	SC
9	GIKONDI (ST AUGUSTINE) MIXED	D	SC	25	REV MUHOHO FOR DEAF	B	SC
10	KAHARO MIXED	D	SC	26	RUTUNE MIXED	D	SC
11	KAHETI GIRLS	D&B	SC	27	ST ANN GITHUNGURI GIRLS	D	SC
12	KARABA MIXED	D	SC	28	ST JOHN THUNGURI ORTH MIXED	D	SC
13	KARINDI MIXED	D	SC	29	ST THOMAS GATURA MIXED	D	SC
14	KARUNDU MIXED	D	SC	30	TAMBAYA MIXED	B	SC
15	KIBUTIO MIXED	D	SC	31	THANGATHI MIXED	D	SC
16	KIHATE ORPHANS MIXED	B	SC	32	WAMUTITU MIXED	D	SC
<b>6-NYERI CENTRAL (NC)</b>							
1	KAGUMO BOYS HIGH	B	N	11	RWARE HIGH MIXED	D	SC
2	GIAKANJA BOYS SEC	B	EC	12	KAHIGA MIXED	D	SC
3	NYERI BOYS	B	EC	13	KIHATHA MIXED	D&B	SC
4	MURUGURU GIRLS	B	C	14	GACHIKA MIXED	D&B	SC
5	IHWA GIRLS	D	SC	15	KIHUYO MIXED	D	SC
6	GITATHIINI MIXED	D	SC	16	NGANGARITHI MIXED	D	SC
7	MARUA MIXED	D	SC	17	KIANDERE MIXED	D	SC
8	NYARIBO MIXED	D	SC	18	RIAMUKURWE MIXED	D	SC
9	THUNGUMA	D	SC	19	ITHENGURI MIXED	D	SC
10	ST VINCENT KIAMUIRU MIXED	D	SC	20	MUTHUAINI GIRLS	D	SC
<b>7- NYERI SOUTH (NS)</b>							
1	CHINGA BOYS HIGH	B	EC	20	KAGUMO MIXED	D	SC
2	CHINGA GIRLS HIGH	B	EC	21	KAIRUTHI MIXED	D&B	SC
3	KARIMA BOYS HIGH	B	EC	22	KARIKO MIXED	D	SC
4	KENYATTA HIGH SCHOOL (MAHIGA)	B	EC	23	KIAGUTHU MIXED	D	SC
5	MAHIGA GIRLS	B	EC	24	KIAHAGU MIXED	D	SC
6	OTHAYA BOYS HIGH	B	EC	25	KIAMUYA MIXED	D	SC
7	OTHAYA GIRLS	B	EC	26	KIHOME MIXED	D	SC
8	ST AGNES BIRITHIA GIRLS HIGH	B	C	27	KIHURI MIXED	D	SC
9	GAKUYU MAHIGA (PCEA) MIXED	D	SC	28	MUCHARAGE MIXED	D&B	SC
10	GATHERA SEC.	D	SC	29	MUIRUNGI	D	SC

No.	Name of School	Type	Category	No.	Name of School	Type	Category
11	GATHUMBI MIXED	D	SC	30	MIXED MUMBUINI	D	SC
12	GATUGI GIRLS	B	C	31	MIXED MUNYANGE	D	SC
13	GATUGI MIXED	D	SC	32	MIXED MUTHUAINI	D&B	SC
14	GITUGI MIXED	D	SC	33	GIRLS OLOF CHINGA	D	SC
15	GITUNDU MIXED	D	SC	34	GIRLS ST MARIA	D&B	SC
16	IHURIRIO MIXED	D	SC	35	GORETTI RURUGUTI		
17	IRIAINI GIRLS HIGH	B	SC	36	MIXED ST MARY	D	SC
18	IRINDI MIXED	D	SC	37	KARUTHI MIXED		
19	KABEBERO MIXED	D	SC	38	THUNGURI GIRLS MIXED	B	SC
	<b>8-TETU(TE)</b>				WITIMA MIXED	D	SC
1	KANGUBIRI GIRLS HIGH	B	EC	17	KAGONYE	B	C
2	DEDAN KIMATHI MEMORIAL HIGH BOYS	B	C	18	KIRITI MIXED	D	SC
3	DR KAMUNDIA GATHUTHI GIRLS	B	C	19	HUHOINI GIRLS HIGH	D	SC
4	NJOGUINI MIXED	D	SC	20	KIAWATHANJI MIXED	D	SC
5	GATHATHI INI MIXED	D&B	SC	21	MATHAKWAINI MIXED	D	SC
6	GITITU MIXED	D	SC	22	GAAKI MIXED	D	SC
7	ITHEKAHUNO MIXED	D	SC	23	KIGWANDI MIXED	D	SC
8	GICHIRA MIXED	D	SC	24	WAMAGANA GIRLS	B	SC
9	ST PAUL GITHAKWA MIXED	D&B	SC	25	ST JOSEPH WAMAGANA	D	SC
10	KAIGURI MIXED	D	SC	26	MIXED MUHOYA HIGH	D	SC
11	KARANGIA MIXED	D	SC	27	MIXED ST MARY	D	SC
12	IHITHE TECH MIXED	D&B	SC	28	KARIGUINI MIXED	D&B	SC
13	GATHUTHI MIXED	D	SC	29	WANDUMBI MIXED	D&B	SC
14	KIANDU SEC.	D	SC	30	GACHATHA MIXED	D	SC
15	KAIGONDE MIXED	D&B	SC	31	AGUTHI MIXED	B	SC
16	MUTATHIINI MIXED	D	SC	32	FT NYAMMO	D	SC
				33	MIXED NGOORU	D&B	SC
				34	MIXED KANJORA	D	SC
				35	MIXED		
				36	MIXED		
				37	MIXED		
				38	MIXED		
				39	MIXED		
				40	MIXED		
				41	MIXED		
				42	MIXED		
				43	MIXED		
				44	MIXED		
				45	MIXED		
				46	MIXED		
				47	MIXED		
				48	MIXED		
				49	MIXED		
				50	MIXED		
				51	MIXED		
				52	MIXED		
				53	MIXED		
				54	MIXED		
				55	MIXED		
				56	MIXED		
				57	MIXED		
				58	MIXED		
				59	MIXED		
				60	MIXED		
				61	MIXED		
				62	MIXED		
				63	MIXED		
				64	MIXED		
				65	MIXED		
				66	MIXED		
				67	MIXED		
				68	MIXED		
				69	MIXED		
				70	MIXED		
				71	MIXED		
				72	MIXED		
				73	MIXED		
				74	MIXED		
				75	MIXED		
				76	MIXED		
				77	MIXED		
				78	MIXED		
				79	MIXED		
				80	MIXED		
				81	MIXED		
				82	MIXED		
				83	MIXED		
				84	MIXED		
				85	MIXED		
				86	MIXED		
				87	MIXED		
				88	MIXED		
				89	MIXED		
				90	MIXED		
				91	MIXED		
				92	MIXED		
				93	MIXED		
				94	MIXED		
				95	MIXED		
				96	MIXED		
				97	MIXED		
				98	MIXED		
				99	MIXED		
				100	MIXED		
				101	MIXED		
				102	MIXED		
				103	MIXED		
				104	MIXED		
				105	MIXED		
				106	MIXED		
				107	MIXED		
				108	MIXED		
				109	MIXED		
				110	MIXED		
				111	MIXED		
				112	MIXED		
				113	MIXED		
				114	MIXED		
				115	MIXED		
				116	MIXED		
				117	MIXED		
				118	MIXED		
				119	MIXED		
				120	MIXED		
				121	MIXED		
				122	MIXED		
				123	MIXED		
				124	MIXED		
				125	MIXED		
				126	MIXED		
				127	MIXED		
				128	MIXED		
				129	MIXED		
				130	MIXED		
				131	MIXED		
				132	MIXED		
				133	MIXED		
				134	MIXED		
				135	MIXED		
				136	MIXED		
				137	MIXED		
				138	MIXED		
				139	MIXED		
				140	MIXED		
				141	MIXED		
				142	MIXED		
				143	MIXED		
				144	MIXED		
				145	MIXED		
				146	MIXED		
				147	MIXED		
				148	MIXED		
				149	MIXED		
				150	MIXED		
				151	MIXED		
				152	MIXED		
				153	MIXED		
				154	MIXED		
				155	MIXED		
				156	MIXED		
				157	MIXED		
				158	MIXED		
				159	MIXED		
				160	MIXED		
				161	MIXED		
				162	MIXED		
				163	MIXED		
				164	MIXED		
				165	MIXED		
				166	MIXED		
				167	MIXED		
				168	MIXED		
				169	MIXED		
				170	MIXED		
				171	MIXED		
				172	MIXED		
				173	MIXED		
				174	MIXED		
				175	MIXED		
				176	MIXED		
				177	MIXED		
				178	MIXED		
				179	MIXED		
				180	MIXED		
				181	MIXED		
				182	MIXED		
				183	MIXED		
				184	MIXED		
				185	MIXED		
				186	MIXED		
				187	MIXED		
				188	MIXED		
				189	MIXED		
				190	MIXED		
				191	MIXED		
				192	MIXED		
				193	MIXED		
				194	MIXED		
				195	MIXED		
				196	MIXED		
				197	MIXED		
				198	MIXED		
				199	MIXED		
				200	MIXED		
				201	MIXED		
				202	MIXED		
				203	MIXED		
				204	MIXED		
				205	MIXED		
				206	MIXED		
				207	MIXED		
				208	MIXED		
				209	MIXED		
				210	MIXED		
				211	MIXED		
				212	MIXED		
				213	MIXED		
				214	MIXED		
				215	MIXED		
				216	MIXED		
				217	MIXED		
				218	MIXED		
				219	MIXED		
				220	MIXED		
				221	MIXED		
				222	MIXED		
				223	MIXED		
				224	MIXED		

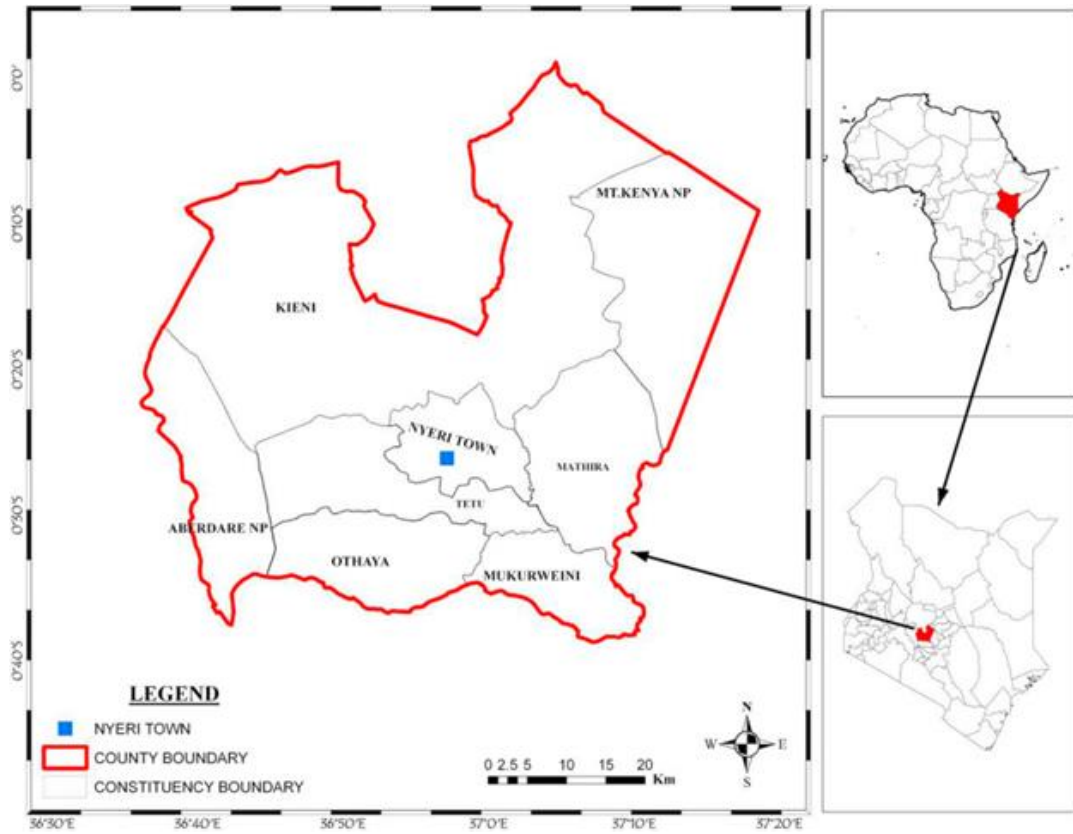
No.	Name of School	Type	Category	No.	Name of School	Type	Category
2	BONGO MIXED	D	SC	28	MUTHOMI SEC	D	SC
3	GITHINJI	D	SC	29	NDOTHUA	D	SC
4	HENI SECONDARY	B	C	30	NJABINI BOYS	B	EC
5	KAGERA-INI	D	SC	31	NJABINI MIXED	D	SC
6	KARATI SEC	D	C	32	NYAKIO	D	SC
7	KARIAHU	D	SC	33	RAGIA SECONDARY	D	SC
8	KINANGOP GATEWAY	D	SC	34	RWANYAMBO MIXED	D	SC
9	KIYO	D	SC	35	SASUMUA SEC	D	SC
10	KOINANGE	D	SC	36	ST. MARY'S	D	SC
11	MACIBAO SEC.	D	SC	37	TULAGA SECONDARY	D&B	SC
12	MT. KINANGOP GIRLS	B	EC	38	YAANG'A SEC	D	SC
13	MUGUMU HIGH	B	EC				
14	ABERDARE RANGES SEC	D	SC	39	MKUNGI	D	SC
15	GATHARA	D	SC	40	MURUAKI	D	SC
16	GITOGO	D	SC	41	MURURUGARU	D	SC
17	KAHURU	D	SC	42	MUTAMAIYU	D	SC
18	KAMBATA	D	SC	43	MUTI INI SEC	D	SC
19	KARIMA GIRLS	B	N	44	MWENDA ANDU	D	SC
20	KERARWA	D	SC	45	MWITEITHIA	D	SC
21	KIAMBARIKI	D	SC	46	NANDARASI	D	SC
22	KIMURI	D	SC	47	NDUNYU NJERU	D	SC
23	KINJA SEC	D	SC	48	RAITHA SEC	D	SC
24	MAGOMANO GIRLS SEC	B	EC	49	RUGONGO	D	SC
25	MAWINGO MIXED	D&B	SC	50	ST. MICHAELS	D	SC
26	MEKARO	D	SC	51	THINDI H.STAR	D	SC
				52	ST.CHRISTOPHER	D	SC
	<b>2-OLKOLOU-MIRANGINE-NYANDARUA CENTRAL (KL)</b>						
1	GITHIMA	D	SC	19	NYAITUGA	D	SC
2	GITUAMBA	D	SC	20	NYAKIAMBI	G	EC
3	KANJUIRI MIXED	D	SC	21	RUIRU	D	SC
4	KIHOTO	D	SC	22	RUTARA MIXED	D	SC
5	KURUNGU	D	SC	23	SABUGO	D	SC
6	MATINDIRI MIXED	D	SC	24	TUMAINI SEC	D	SC
7	MIRANGINE MIXED	D	SC	25	WANJURA	D	SC
8	NGORIKA SEC	D&B	SC				
9	GATARWA SEC	B	C	26	MANYATTA SEC	D	SC
10	GICHUNGO MIXED	D	SC	27	MIHUTI MIXED	D	SC
11	GITHUNGURI SEC	D	SC	28	MUNYEKI SEC	D	SC
12	HURUMA SEC	D	SC	29	MWIHOTI SEC	D	SC

No.	Name of School	Type	Category	No.	Name of School	Type	Category
13	KAHIA SEC	D	SC	30	NYANDARUA HIGH	B	N
14	KAIMBOKA SEC	D	SC	31	PASSENGA SEC	D	SC
15	KALOU SEC	D	SC	32	RURII SEC	D	SC
16	KAMADE SEC	D	SC	33	SALIENT MIXED	D&B	SC
17	KIENI SEC	D	SC	34	SILANGA SEC	D	SC
18	KIGANJO MIXED	D	SC				
<b>3-NDARAGUA- NYANDARUA NORTH (ND)</b>							
1	BAARI	D	SC	16	MUKOE	D	SC
2	GATHUNGUCHU	D	SC	17	MUNGETHO	D	SC
3	IRIGITHATHI	D	SC	18	MURICHU	B	SC
4	KAGONDO	D	SC	19	MWIHANGIA	D	SC
5	KAHEHO	D	SC	20	NDARAGWA BOYS	B	SC
6	KAHUHO	D	SC	21	NDARAGWA GIRLS	B	EC
7	KAMBAA	D	SC	22	NDIVAI	D	SC
8	KARAGOINI	D	SC	23	NGAI NDEITHIUA	D&B	SC
9	KIHARA	D	SC	24	PONDO	D	SC
10	KIRERA	D	SC	25	RAICHIRI	D	SC
11	KIRIOGO	D	SC	26	SHAMATA GIRLS	B	C
12	LAKE OLBOLLOSAT	D	SC	27	SIMBARA	B	SC
13	LESHAU BOYS SEC	B	EC	28	URUKU	D	SC
14	MATHINGIRA GIRLS	D&B	SC	29	WANGUI	D	SC
15	MBUYU	D	SC				
<b>4- OLJORO OROK-NYANDARUA WEST(JK)</b>							
1	GATHANJI SEC	D	SC	10	KARANDI SEC	D	SC
2	GATIMU GIRLS	D	SC	11	KIHEO	D	SC
3	GATIMU MIXED	D	SC	12	MATURA SEC	D	SC
4	GIKINGI SEC	D	SC	13	NGATHA SEC	D	SC
5	HOSPITAL HILL SEC	D	SC	14	NYAHURURU HIGH	B	EC
6	IGWA MITI SEC	D	SC	15	OL JORO OROK SEC	D	SC
7	KABATI SEC	D	SC	16	SILIBWET SEC	D	SC
8	KANGUI SEC	B	EC	17	UHURU SEC	D	SC
9	KANGUU SEC	D	SC	18	WERU	D	SC
<b>5-KIPIPIRI (KI)</b>							
1	GATHIORO SEC	D	SC	16	MANUNGA MIXED SEC.	D	SC
2	GATHUTHI	D	SC	17	MARIMU	D	SC
3	GATONDO	D	SC	18	MAWINGO	D&B	SC
4	GETA	D&B	SC	19	MICHORE	D	SC
5	JURA	D	SC	20	MIHARATI MIXED	D&B	SC
6	KABATI MIXED	D	SC	21	MIKEU MIXED	D	SC
7	KANGONGO	D	SC	22	MUHIRIO	D	SC
8	KIAMBOGO SEC	D	SC	23	MUMUI	D&B	SC
9	KIANJOGU	D	SC	24	NDEMI MIXED	D	SC
10	KIMURI	D	SC	25	SATIMA SEC.	D	SC

No.	Name of School	Type	Category	No.	Name of School	Type	Category
11	KIPIPIRI SCHOOL	D	C	26	ST. PETERS MAWINGO	D&B	SC
12	KIRIMA MIXED	D	SC	27	TARASHA	D	SC
13	LERESHWI MIXED	D	SC	28	WANJERI	D	SC
14	MAHINDU MIXED	D	SC	29	WANJOHI MIXED	D	SC
15	MALEWA SEC.	D	SC	30	WANJOHI GIRLS` SEC.	G	EC
				31	HUHIRIO SEC.	D	SC

Source: Nyeri & Nyandarua counties CQASOs` records, August 2018, August 2020

### Appendix X: Map of Nyeri County Kenya



Source: [http:// science direct .com](http://science direct .com), (January, 2019)



## Appendix XII: Approval of Research Proposal from Kenyatta University



KENYATTA UNIVERSITY  
GRADUATE SCHOOL

✶

E-mail: [kubps@yahoo.com](mailto:kubps@yahoo.com)  
[dean-graduate@ku.ac.ke](mailto:dean-graduate@ku.ac.ke)  
Website: [www.ku.ac.ke](http://www.ku.ac.ke)

P.O. Box 43844, 00100  
NAIROBI, KENYA  
Tel. 810901 Ext. 57530

### Internal Memo

FROM: Dean, Graduate School  
TO: Mr. Gatama S. Njenga  
C/o Department of Educ. Mngt. Policy & Curr. Studies  
KENYATTA UNIVERSITY

DATE: 7<sup>th</sup> July, 2021  
REF: ES3/CE/29122/13

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that the Graduate School Board at its meeting 25<sup>th</sup> June, 2021 approved your Ph.D. Research Proposal entitled "Influence of Schools' Learning Inputs and Processes on Kenya Certificate of Secondary Education Examination Performance in Nyeri and Nyandarua Counties".

You may now proceed with your Data collection, subject to clearance with the Director General, National Commission for Science, Technology & Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed supervision Tracking and Progress Report Forms. The Forms are available at the University's Website under Graduate School webpage downloads.

By copy of this letter, the Registrar (Academic) is hereby requested to grant you substantive registration for your Ph.D. studies.

Thank you  
  
RUBEN MURIUKI  
FOR: DEAN, GRADUATE SCHOOL

c.c. Chairman, Department of Educ. Mngt. Policy & Curr. Studies  
Registrar (Academic) Att; Mr. Richard Chweya

Supervisors:

1. Dr. Mary Otieno  
C/o Department of Educ. Mngt. Policy & Curr. Studies  
KENYATTA UNIVERSITY
2. Dr. Samuel Waweru  
C/o Department of Educ. Mngt. Policy & Curr. Studies  
KENYATTA UNIVERSITY

EM/cao



**Appendix XIII: Research Authorization Letter from Kenyatta University**



KENYATTA UNIVERSITY  
GRADUATE SCHOOL

E-mail: [kubps@yahoo.com](mailto:kubps@yahoo.com)  
[dean-graduate@ku.ac.ke](mailto:dean-graduate@ku.ac.ke)  
Website: [www.ku.ac.ke](http://www.ku.ac.ke)

P.O. Box 43844, 00100  
NAIROBI, KENYA  
Tel. 8710901 Ext. 57530

---

Our Ref: E83/CE/29122/13

Date: 7<sup>th</sup> July, 2021

The Director General,  
National Commission for Science, Technology & Innovation,  
P.O. Box 30623-00100,  
**NAIROBI**

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MR.GATAMA S. NJENGA- REG. NO. E83/CE/29122/13

I write to introduce Mr. Gatama who is a Postgraduate Student of this University. He is registered for a Ph.D. degree programme in the Department of Educational Management policy & Curriculum Studies in the School of Education.

Mr. Gatama intends to conduct research for Ph.D. thesis entitled, "Influence of Schools' Learning Inputs and Processes on Kenya Certificate of Secondary Education Examination Performance in Nyeri and Nyandarua Counties".

Any assistance given will be highly appreciated.

Yours faithfully,

A handwritten signature in blue ink, appearing to be 'Elshiba Kimani', written over a circular stamp.

**PROF. ELSHIBA KIMANI**  
**DEAN, GRADUATE SCHOOL**

RM/cao

Appendix XIV: Research License from NACOSTI

  
REPUBLIC OF KENYA

  
NATIONAL COMMISSION FOR  
SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **536896** Date of Issue: **09/August/2021**

**RESEARCH LICENSE**



**This is to Certify that Mr.. SAMWEL NJENGA GATAMA of Kenyatta University, has been licensed to conduct research in Nyandarua, Nyeri on the topic: INFLUENCE OF SCHOOLS' LEARNING INPUTS AND PROCESSES ON KENYA CERTIFICATE OF SECONDARY EDUCATION EXAMINATION PERFORMANCE IN NYERI AND NYANDARUA COUNTIES, for the period ending : 09/August/2022.**

License No: **NACOSTI/P/21/12140**

**536896**  
Applicant Identification Number

  
Director General  
NATIONAL COMMISSION FOR  
SCIENCE, TECHNOLOGY &  
INNOVATION

Verification QR Code



**NOTE: This is a computer generated License. To verify the authenticity of this document,  
Scan the QR Code using QR scanner application.**