MODELLING PREDICTORS OF VARIATIONS IN PUBLIC DAY SECONDARY SCHOOLS STUDENTS' LEARNING OUTCOMES, THARAKA NITHI COUNTY, KENYA

GATWIRI WINNIEJOY NKONGE

E83/CTY/33817/2015

A THESIS SUBMITTED TO THE SCHOOL OF EDUCATION IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN EDUCATIONAL PLANNING AND ECONOMICS OF EDUCATION, KENYATTA UNIVERSITY

NOVEMBER, 2021

DECLARATION

I declare that this thesis is my original work and has not been presented in any other university/institution for consideration. The thesis has been complemented by referenced sources duly acknowledged. Where text, data or tables have been borrowed from other sources, including the internet, these are specifically accredited and references cited in accordance with anti-plagiarism regulations.

....

GATWIRI WINNIEJOY NKONGE **DATE**

E83/CTY/33817/2015

Supervisors: This thesis has been submitted with our approval as University Supervisors.

....

DR. MUKIRAE NJIHIA **DATE**

Department of Educational Management,

Policy and Curriculum studies

Kenyatta University

....

DR. JOHN NDIRITU **DATE**

Department of Educational Management,

Policy and Curriculum Studies

Kenyatta University

DEDICATION

To my dear loving and caring parents, Mr. Linus Nkonge Kobia and Mrs. Cecilia Kagendo Nkonge who laid my educational foundation and from whom the inspiration to do this work is drawn. To my siblings: Royford Mwenda, Nelly Muthoni, Sharon Kathambi and Winnie Karimi. Without their love, support and unfailing encouragement, completion of this work would not have been possible.

ACKNOWLEDGEMENT

My deepest gratitude goes to God Almighty for giving me all that I needed for this work to come to a completion. I thank God for making Dr. Mukirae Njihia and Dr. John Nderitu my supervisors. To them I am heavily indebted. I thank them most sincerely for their invaluable time and prudent guidance in the development and production of this work.

My gratitude goes to Dr. Charity Limboro, Dr. Florence Itegi and Dr. Kariuki who read my scripts and provided valuable suggestions.

To my fellow classmates and friends in particular Ms. Violet W. Wainaina, Mr. Prince Addai-Tuffour and Ms. Jane Wegutu I say thank you for the discussions we had and encouragement you offered me. May God bless you mightily.

I would like to extend my appreciation to the principals of the public day secondary schools in Tharaka Nithi County for allowing me conduct this study in their institutions. Very special thanks to Tharaka Nithi County Education Officer, Mr. George Nderitu for the research permit at the County level and his cooperation in providing the list of all the targeted public day secondary schools to allow study sampling.

Finally, my love and appreciation are extended to the members of my nuclear family and extended family for their prayers, encouragement and emotional support in successful conclusion of this research.

TABLE OF CONTENTS

TITLE ..... **i**
DECLARATION ..... **ii**
DEDICATION ..... **iii**
ACKNOWLEDGEMENT ..... **iv**
TABLE OF CONTENTS ..... **v**
LIST OF TABLES ..... **xi**
LIST OF FIGURES ..... **xiii**
ABBREVIATIONS AND ACRONYMS ..... **xiv**
ABSTRACT ..... **xvi**

CHAPTER ONE: INTRODUCTION AND BACKGROUND TO THE STUDY **1**
1.1 Introduction 1
1.2 Background to the Study 1
1.3 Statement of the Problem 12
1.4 Purpose of the Study 14
1.5 Objectives of the Study 14
1.6 Research Hypotheses 14
1.7 Significance of the Study 15
1.8 Assumptions of the Study 16
1.9 Limitations of the Study 16
1.10 Delimitation of the Study 17
1.11 Theoretical Framework 17
1.12 Conceptual Framework 22
1.13 Operational Definition of Terms 24

CHAPTER TWO: REVIEW OF RELATED LITERATURE **25**
2.1 Introduction 25
2.2 Relationship between student's household characteristics and variations in learning outcomes 25

2.3 Relationship between student's parental/guardian characteristics and variations in learning outcomes 29
2.4 Relationship between student's conduct characteristics and variations in learning outcomes 33
2.5 Relationship between school resources and variations in learning outcomes 37
2.6 Summary of the literature review and gap identification 45

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY 48
3.1 Introduction 48
3.2 Research Design 48
3.3 Variables 50
3.4 Location of the Study 51
3.5 Target Population 51
3.6 Sampling Techniques and Sample Size 52
3.6.1 Sampling Techniques 52
3.6.2 Sample Size 53
3.7 Research Instruments 55
3.7.1 Students' Questionnaire on Predictors of Variations in Academic Achievement 56
3.7.2 Parents' Questionnaire on Predictors of Variations in Students' Academic Achievement 56
3.7.3 PDSS Student Group Interview Schedule 56
3.7.4 PDSS Principal Interview Schedule 57
3.8 Validity 57
3.8.1 Validity of Students' and Parents' Questionnaire 57
3.8.2 Validity of PDSS Principal and Student Group Interview Schedule 57
3.9 Reliability 58
3.10 Pilot Study 60

3.11 Data Collection Techniques 61
3.11.1 Qualitative Data Collection Techniques 62
3.11.2 Quantitative Data Collection Techniques 62
3.11.3 Document Analysis Data Collection Techniques 63
3.12 Data Analysis 63
3.12.1 Quantitative Data Analysis 64
3.12.2 Qualitative Data Analysis 67
3.12.3 Convergence and Discussion of Quantitative and Qualitative Analysis Findings 67
3.13 Logistical and Ethical Considerations 68

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS, AND DISCUSSION 69
4.1 Introduction 69
4.2 General and Demographic Information 70
4.2.1 Questionnaires Administered Return Rate 70
4.2.2 Interview Informants 74
4.2.3 Demographic Characteristics of Study Participants 74
4.2.4 Variations in PDSS and PDSS students' examination scores 82
4.2.5 Tested assumptions in Hierarchical multiple regression 86
4.3 Relationship between student's household characteristics and variations in examination scores 88
4.3.1 Student's household characteristics Indicators 88
4.3.2 Inter-relationship between indicators of Student's household characteristics 91
4.3.3 Model on student's household characteristics and variations in examination scores 92
4.3.4 Hypothesis Testing on relationship between student's household characteristics and variations in student's examination scores ... 100

4.4 Relationship between student's parental/guardian characteristics and variations in examination scores 101
4.4.1 Student's parental/guardian characteristics Indicators 102
4.4.2 Inter-relationship between indicators of Student's parental/ guardian characteristics 103
4.4.3 Model on parental/guardian characteristics and variations in examination scores 105
4.4.4 Hypothesis Testing on relationship between student's parental/ guardian characteristics and variations in student's examination scores 113
4.5 Relationship between student's conduct characteristics and variations in examination scores 115
4.5.1 Student's conduct characteristics Indicators 115
4.5.2 Inter-relationship between indicators of Student's conduct characteristics 117
4.5.3 Model on student's conduct characteristics and variations in examination scores 118
4.5.4 Hypothesis Testing on relationship between student's conduct characteristics and variations in student's examination scores 124
4.6 Relationship between School Resource Characteristics and variations in examination scores 126
4.6.1 School resource characteristics Indicators 127
4.6.2 Inter-relationship between indicators of School resource characteristics 129
4.6.3 Model on school resource characteristics and variations in examination scores 131
4.6.4 Hypothesis Testing on relationship between school resource characteristics and variations in student's examination scores 140

4.7 Prediction equations of variations in examination scores 142
4.7.1 Cross-tabulation of students' household, parental/guardian, conduct and school resource characteristics, and variations in examination scores 143
4.7.2 Inter – Correlations among the Predictor Variables 147
4.7.3 Hierarchical regression analysis summary for variables predicting variations in examination scores 148

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 166
5.1 Introduction 166
5.2 Summary of the Findings 166
5.2.1 Model of the relationship between student's household characteristics and variations in examination scores 167
5.2.2 Model of the relationship between student's parental/guardian characteristics and variations in examination scores in Tharaka Nithi County PDSS 168
5.2.3 Model of the relationship between student's conduct characteristics and variations in examination scores in Tharaka Nithi County PDSS 168
5.2.4 Model of the relationship between the PDSS resources and variations in examination scores in Tharaka Nithi County 169
5.2.5 Prediction equations of variations in examination scores 170
5.3 Conclusions 174
5.3.1 Model of the relationship between student's household characteristics and variations in examination scores in Tharaka Nithi County PDSS 175
5.3.2 Model of the relationship between student's parental/guardian characteristics and variations in examination scores in Tharaka Nithi County PDSS 175

5.3.3 Model of the relationship between student's conduct characteristics and variations in examination scores in Tharaka Nithi County PDSS 176
5.3.4 Model of the relationship between the PDSS resources and variations in examination scores in Tharaka Nithi County 176
5.3.5 Prediction equations of variations in examination scores 177
5.4 Recommendations 178
5.4.1 Policy Recommendations 178
5.4.2 Recommendations for Further Research 183

REFERENCES 184

APPENDICES 193
Appendix I: Student Questionnaire on Predictors of Variations in Learning Outcomes 193
Appendix II: Students Group Interview on Predictors of Variations in Learning Outcomes 199
Appendix III: Parent/Guardian Questionnaire on Predictors of Variations in Students' Learning Outcomes 202
Appendix IV: Principal Interview Schedule on Predictors of Variations in Students' Learning Outcomes 206
Appendix V: Document Analysis Guide on Predictors of Variations in Students' Academic Achievement 211
Appendix VI : Tested Assumptions of Hierarchical multiple regression Analysis 213
Appendix VII: Approval of Research Proposal from Graduate School 217
Appendix VIII: Research Authorization from Graduate School 218
Appendix IX: Research Permit from National Commission for Science, Technology and Innovation (NACOSTI) 219
Appendix X: Research Permit from Tharaka Nithi County 220

LIST OF TABLES

Table 3.1: Summary of the Study population and Sample size 55

Table 3.2: Reliability Test results for Students' and Parents' Questionnaire . 60

Table 4.1: Students' Questionnaires Return Rate 71

Table 4.2: Parents'/Guardians' Questionnaires Return Rate 72

Table 4.3: Summary of the Study Interview Informants 74

Table 4.4: Students' Primary School Category 75

Table 4.5: Year Students Did KCPE 76

Table 4.6: Students' KCPE Scores 77

Table 4.7: Students' KCPE Mean Scores Test of Variances Homogeneity ... 78

Table 4.8: Student's Caregiver Relationship 79

Table 4.9: PDSS Principals' Characteristics 81

Table 4.10: PDSS Variations in examination scores 82

Table 4.11: PDSS Students' Variations in examination scores 83

Table 4.12: Description of variations in students' examination scores 85

Table 4.13: Student's household characteristics Indicators 89

Table 4.14: Inter-relationship between indicators of Student's household characteristics 91

Table 4.15: Model on student's household characteristics and variations in examination scores 93

Table 4.16: Relationship between student's household characteristics and Variations in examination scores 100

Table 4.17: Student's parental/guardian characteristics Indicators 102

Table 4.18: Inter-relationship between indicators of Student's parental/guardian characteristics 104

Table 4.19: Model on parental/guardian characteristics and variations in examination scores 106

Table 4.20: Relationship between student's parental/guardian characteristics and variations in examination scores 114
Table 4.21: Student's conduct characteristics Indicators 116
Table 4.22: Inter-relationship between indicators of Student's conduct characteristics 117
Table 4.23: Model on student conduct characteristics and variations in examination scores 119
Table 4.24: Relationship between student's conduct characteristics and variations in examination scores 125
Table 4.25: School resource characteristics Indicators 127
Table 4.26: Inter-relationship between indicators of School resource characteristics 129
Table 4.27: Model on school resource characteristics and variations in examination scores 131
Table 4.28: Relationship between school resource characteristics and variations in examination scores 141
Table 4.29: Cross-tabulation of students' household, parental/guardian, conduct and school resource characteristics, and variations in examination scores 146
Table 4.30: Inter – Correlations among the Predictor Variables 147
Table 4.31: Hierarchical regression analysis summary for variables predicting variations in examination scores 149

LIST OF FIGURES

Figure 1.1: Variations in PDSS Students KCSE Mean Score 2014-2018 11

Figure 1.2: Conceptual Framework 22

Figure 3.1: Study research process using the Convergent mixed-parallel design..... 49

ABBREVIATIONS AND ACRONYMS

ASALs	Arid and Semi-Arid Lands
BOM	Board of Management
CSI	Coping Strategy Index
EFA	Education for All
EPF	Education Production Function
FDSE	Free Day Secondary Education
FPE	Free Primary Education
GOK	Government of Kenya
KCPE	Kenya Certificate of Primary Education
KCSE	Kenya Certificate of Secondary Education
KNBS	Kenya National Bureau of Statistics
NACONEK	National Council for Nomadic Education in Kenya
NACOSTI	National Commission for Science, Technology and Innovation
OECD	Organization for Economic Cooperation and Development
PISA	Program for International Student Assessment
PDSS	Public Day Secondary Schools
SDGs	Sustainable Development Goals
SES	Socio-Economic Status
SFP	School Feeding Programme
SPSS	Statistical Package for the Social Sciences
TSC	Teacher Service Commission
UIS	UNESCO Institute for Statistics

UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UPE	Universal Primary Education
WFP	World Food Programme

ABSTRACT

In an effort to facilitate realization of sustainable development goal 4 and therefore enhance equity and access to basic education in Kenya, the government has adopted various strategies. They include full support of public day secondary education tuition and non-tuition cost aspects such as school feeding programme in Arid and Semi-Arid Lands to aid equity in attainment of secondary education. Equity in attainment of quality secondary education is evidenced by non-relation of the differences in students' household, parental and school characteristics on variations in learning outcomes. Thus, equitable secondary education variations in learning outcomes are only related to students' differences in conduct characteristics. Public Day Secondary School students' learning outcomes in Tharaka Nithi County, have the highest Kenya Certificate of Secondary Education examination performance variation compared to other Kenyan Counties. Thus, study objectives: To model the relationship between student's household characteristics and variations in examination scores; To model the relationship between student's parental/guardian characteristics and variations in examination scores; To model the relationship between student's conduct characteristics and variations in examination scores and To model the relationship between the availability and adequacy of Public Day Secondary School resources and variations in examination scores in Tharaka Nithi County Kenya. Framed upon Education Production Function model and Rawls' theory of justice, the study adopted Convergent parallel mixed method research design. The study targeted all the year 2020 form 3 students in Public Day Secondary Schools Tharaka Nithi County. The study used stratified random sampling technique to select 738 form 3 students (368 male and 370 female) and purposive sampling to select 15 (12 male and 3 female) principals. Quantitative data was collected using student and parent's questionnaires, and document analysis tool, and analysed using descriptive and inferential statistics. In addition, qualitative data was collected using principal and students' interview schedule and analysed thematically. Descriptive statistics comprised of frequency distribution, percentages, measures of central tendency and variability. Inferential statistics including Pearson's correlation coefficient and multiple regression analysis were used in hypothesis testing. Results indicated a statistically significant positive relationship, $r = 0.662$ at $p < .01$ between student's household characteristics and variations in student's examination scores. Student's family resources resulted to students' household characteristics contribution to students' variations in examination scores. There is a statistically significant positive relationship of $r = 0.635$ at $p < .01$ between student's parental/guardian characteristics and variations in student's examination scores. Differences in student's parental/guardian support resulted to students' variations in examination scores. On the other hand, there were statistically significant negative relationship, $r = -0.214$ at $p < .01$ between student's conduct characteristics and variations in student's examination scores. The results also indicated a moderately strong statistically significant positive relationship, $r = 0.674$ at $p < .01$, between school resource characteristics and variations in student's examination scores. The equation for predicting variations in examination scores after controlling for all the predictor variables was found to have following parameters (β_0=-6.173, β_1=-0.006, β_2=0.035, β_3=-0.438, β_4=0.341, β_5=0.063 and β_6=0.328. The study recommended that Public Day Secondary Schools financing policy to focus on equity rather than per capita.

CHAPTER ONE

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 Introduction

This chapter comprises of the background to the study, statement of the problem, purpose, objectives, hypothesis, significance, limitations and delimitations, assumptions, theoretical and conceptual framework; and operational definition of terms used in the study.

1.2 Background to the Study

Education is a prerequisite for realization of the global 2030 Agenda for sustainable development and individual's well-being. There are many international frameworks put in place to enhance access and equity in provision of education. Sustainable Development Goal four (SDG4), for example, aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (UNESCO, 2016). The SDG4 outcome target 4.1 aims to ensure that all girls and boys complete free, equitable, quality primary and secondary education leading to relevant learning outcomes by 2030 (UNESCO, 2016). Further, SDG Target 4.5 focus on education equity and the need to ensure equal access to all levels of education for vulnerable persons (UIS, 2018). According to UIS (2018), SDG Target 4.5 further commits all the UN member states to address all forms of inequalities in academic achievements and guarantee equality of opportunity in attainment of quality education outcome. Education is anchored in article 26 of the Universal Declaration of Human Rights which states that everyone has the right to free education.

Benefits associated with education prompt governments in the world to commit to implementing their international, regional and national commitments to education. For instance, the Kenyan government is committed to implementing SDG4 goal on education, post 2015 education targets. Before the development of SDGs, the government developed the Sessional paper No. 14 of 2012 on Reforming Education and Training and the Basic Education Act (2013) which emphasize the need of free basic education as well as give a framework of providing quality and equitable basic education (Republic of Kenya, 2015b). Moreover, the Kenya Constitution (2010) articles 43 (1f), 53 (1b) and 55 (a) in chapter 4 provides for free and compulsory basic education to all children. It obligates the state to facilitate attainment of quality and equitable education outcomes.

Psacharopoulos and Patrinos (2018) explain that education significantly impacts on a country's gross domestic product (GDP) per capita. They further note that education drives the national economic growth and has intergenerational effects. On secondary education, Polcyn and Gawrysiak (2017) and World Bank (2005) maintain that secondary education academic achievement is positively correlated with lifetime earnings. They explain that secondary education aids accumulation of human capital and consequent economic growth and development. Secondary education is sandwiched between primary and tertiary education. Thus, its quality affects education levels above and below it (Baumann and Winzar, 2016). UNESCO's analysis on education's impact on poverty showed that if all adults in the world attained quality secondary education, 420 million people would be lifted out of poverty (UNESCO, 2017).

Quality secondary education is demonstrated by attainment of quality learning outcomes (Scheerens, Luyten, and Ravens, 2011). Quality learning outcomes demonstrate attainment of knowledge, skills, attitudes and creativity needed to solve problems locally and globally summarized as student's academic achievement (Kyriakides, Devine and Papastylianou, 2017). Student's academic achievement is the main indicator of learning outcomes (Dooley and Schreckhise, 2016). Student's academic achievements are measured by tests ranging from international which cover the common core concepts to national which cover the national curricular. According to Spruit (2015) grade A reflects outstanding level of academic achievement, grade B reflects high level of academic achievement and grade C reflects satisfactory level of academic achievement.

In most countries, quality education outcome in secondary education is characterized by grades A, B and C in the examination mean scores (Spruit, 2015). Learning outcomes are the academic achievements considered as student's mean score in an examination (Berkowit and Benbenishty, 2017). Both formative and summative examination mean scores can be used as indicators of the quality education learning outcomes (Dooley and Schreckhise, 2016). Formative examination mean scores are ongoing, flexible, informal and monitor learning process while summative examination mean scores are more formal, evaluative of student's learning at the end of the instructional unit and allow comparison. Education filters its recipients to enable employers identify those with superior abilities using summative examination mean scores. However, Cerdeira, Nunes, Reis, and Seabra (2018) demonstrate that formative examination scores make valid

estimates for the summative examination scores. Consequently, since learning outcomes influence future economic opportunities, there is need for equity in education financing to guarantee equality of opportunity for all students in attainment of quality examination scores in both their formative and summative assessments. International and national education goals aim to achieve equality of opportunity in attainment of quality education outcomes (UNESCO, 2017).

Equity in education financing is the fairness and justice extended to all in distribution of resources (Rakabe, 2016). Equality of opportunity in attainment of quality education learning outcomes is mainly facilitated by equity in education financing (Baker and Levin, 2014). Consistent with Malusa (2017), equity demands distribution of resources according to individual unique needs. UIS (2018) notes that equity in education financing guarantee equality of opportunity in attainment of quality education learning outcomes evidenced by non-relation of the differences in students' socio-economic and school resource characteristics to variations in learning outcomes. However, UIS (2018) stipulate that differences in students' conduct characteristics related to variations in learning outcomes evidence equality of opportunity in attainment of quality education learning outcomes. Student's conduct characteristics, socio-economic characteristics and school resources are generally identified as the main predictors of variations in student's academic achievements (Levitan, 2016).

Polcyn and Gawrysiak (2017) describe student's conduct characteristics as student's level of intelligence determined by student's entry behaviour and effort

employed by individual learners. Student's level of intelligence is the student's cognitive level. In addition to the student's cognitive level, student's determination to academically succeed illustrated by student's effort, time spent learning, determines student's academic achievement (Anna and Arthur, 2017). Consistent with UIS (2018), students' conduct characteristics are circumstances within the control of the individual students. Since students' conduct characteristics are within the control of individual student, relationship between student's conduct characteristics and variations in examination scores evidence equality of opportunity in attainment of quality education learning outcome.

UIS (2018) explains key dimensions of students' socio-economic characteristics as household, gender, ethnicity, residence, poverty, physical fitness and immigration status. In addition, Isaac (2016) point out that socio-economic characteristics are broadly categorized as household and parental features and are associated with academic achievements. Consistent with Mwangi, Kiteme and Wiesmann (2016), household features include residence, size and income level while parental features include occupation, income and education level. Berkowitz and Benbenishty (2017) demonstrate that households with low incomes have low food security as measured using Coping Strategy Index (CSI) Maxwell and Caldwell, 2008). Further, students from such households tend to have low academic achievement in school. According to UIS (2018) students' socio-economic characteristics predicting variations in examination scores indicate inequality of opportunity in attainment of quality education outcome.

According to Kapur (2018) school resources are tools that help teachers teach and students learn. They encompass teaching and learning materials, laboratory and technology facilities while teacher characteristics are skills and abilities of teachers showed by their qualifications, experience and approachability. Kapur (2018) point that teacher's gender, motivation and employment terms characterise teachers. School resources have been found to influence students' academic achievements (Hyman, 2016). Consistent with UIS (2018), school resources predicting students' variations in examination scores indicate inequality of opportunity in attainment of quality education outcome. However, Malusa (2017) observed that application of equity in financing school resources neutralizes the influence of student's socio-economic characteristics on academic achievement thereby guaranteeing equality of opportunity in education outcome where only students' conduct characteristics make prediction of students' variations in examination scores and not socio-economic or school resource characteristics.

Globally, most individuals have limited access to private credit for financing secondary education (Cerdeira et al., 2018). However, in both developing and developed countries, governments actively provide public education subsidies in an attempt to ensure provision of equitable quality secondary education (Polcyn and Gawrysiak, 2017). Consistent with Kyriakides et al. (2017) countries do not have to sacrifice quality education outcome to achieve equality of opportunity in attainment of quality education outcome.

There are several ways through which governments ensure equality of opportunity. Many developed countries objectively finance their education system using a school funding formula. The school funding formula in some Organization for Economic Co-operation and Development (OECD) member countries comprise of four variables based on student number and level, needs, curriculum and school characteristics (Konow, Saijo and Akai, 2016). It thus, enhances achievement of equality of opportunity in attainment of quality education outcome as illustrated in the Program for International Student Assessment (PISA) scores (OECD, 2018). PISA assesses problem solving and cognitive skills on students aged 15 years in all the OECD member countries. According to OECD (2018), Finland and Estonia are ranked highest in PISA scores among the OECD countries, indicating achievement of quality education outcome. Further, OECD (2018) notes that Finland and Estonia demonstrate equality of opportunity in their attainment of quality education outcome. According to UIS (2018), students' variations in PISA and school examination scores in Finland and Estonia are only related to student's differences in conduct characteristics and not their differences in school resources and socio-economic characteristics.

In South Africa, secondary education is funded on an equitable basis (International Budget Partnership, 2017). Parents who cannot afford school fees are exempted from fees payment and schools are funded depending on their need. Most sub-Saharan African countries however, finance their secondary education system on the principle of equality (Roemer and Unveren, 2016). Education financing on principle of equality is based on the number of children in school. Thus, children

living in rich households receive same amount of government spending as children in poorest households. Kyriakides et al. (2017) explain that highest performing education systems in Southern and Eastern African countries according to Southern and Eastern Africa Consortium for Monitoring Educational Quality (SEACMEQ) findings demonstrate equality of opportunity in attainment of quality education outcomes. Thus, students' variations in examination scores are only related to student's differences in conduct characteristics. SEACMEQ conducts research and training in the South and East African countries, to generate research-based policy advice to plan quality education (Hungi, 2012).

UNESCO (2016) notes that government expenditure on education in Kenya is relatively high compared to Uganda and Tanzania, and other countries in sub-Saharan Africa. Approximately 6.5 percent of the Kenyan GDP is spent on education, while about 20 percent of the total budget is allocated to the education sector (Republic of Kenya, 2015). In Tanzania, the education sector accounts for 15% of the total budget and 3.9% of Gross Domestic Product (GDP) below the Global Partnership for Education (GDE) recommendation of atleast 20% of the national budget to education (UNICEF, 2018). Uganda government expenditure on education is 10.9% of the total budget and 2.1% of the GDP (World Data Atlas, 2018). The Kenyan government introduced Free Day Secondary Education (FDSE) policy in 2008 (Republic of Kenya, 2015b). FDSE policy aimed to ensure not only access to secondary education, but also equality of opportunity in attainment of quality secondary education outcomes among all students (Republic of Kenya, 2015b). The FDSE policy provided a maximum secondary education cost for all

Public Day Secondary Schools (PDSS) as Ksh. 22,244 in the year 2008/09 and government financing of each secondary school student Ksh. 10,265 (Republic of Kenya, 2008). Parents/guardians of students in PDSS paid Ksh. 11,979 for secondary education.

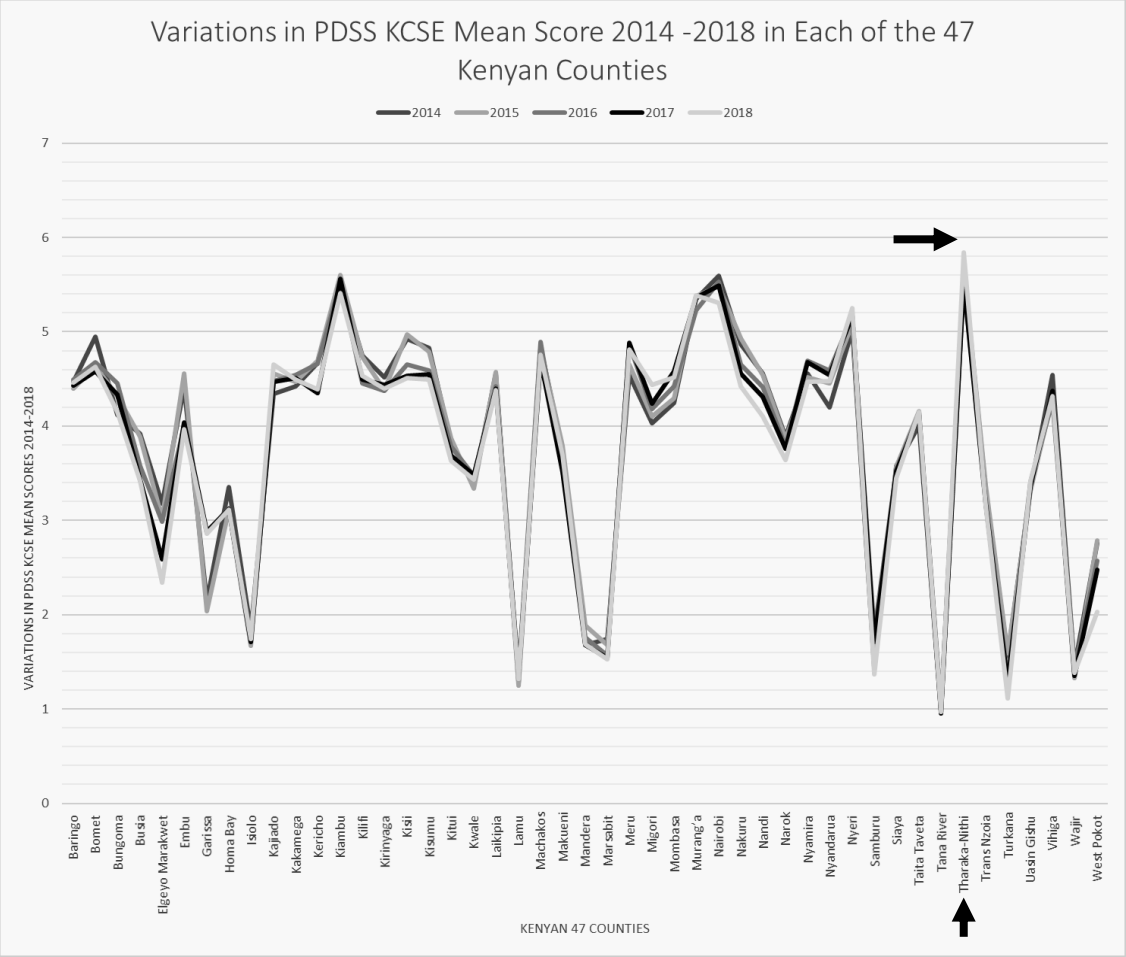
Further, in the year 2014/2015 the government increased secondary education financing to Ksh. 12,870 but parents/guardians of students in PDSS had to pay Ksh. 9,374 to fully meet PDSS cost (Republic of Kenya, 2015). This became a challenge to most students attending PDSS as they could not access or participate in secondary education learning thus compromising equality of opportunity in attainment of secondary education (Mutegi, Muriithi and Wanjala 2017). However, in 2017/18 the government fully financed tuition costs in PDSS by providing each student Ksh. 22,244 (Republic of Kenya, 2017). School resources financed in PDSS include teaching and learning materials, administration costs, personnel emoluments, repair costs, Electricity, Water and conservancy (EWC) and student's medical costs (Republic of Kenya, 2017). Further, in PDSS, the government exempted students from paying for any education costs except for lunch and uniform.

The government of Kenya has adopted various strategies to support lunch costs in PDSS. Firstly, the nationwide School Health Policy and National Education Sector Plan (NESP) 2013-2018 recommendation on provision of home grown balanced school meals by the parents in all Kenyan schools (Republic of Kenya, 2016). Secondly, in Arid and Semi-Arid Lands (ASALs), in Kenya where provision of

homegrown meals is not possible, the Ministry of Education Science and Technology (MOEST) implements School Feeding Programmes (SFPs) jointly with the World Food Programme (WFP). Lastly, the government of Kenya established the National Council for Nomadic Education in Kenya (NACONEK) under the nomadic policy and entrenched it to the Basic Education Act 2013 (Republic of Kenya, 2009). NACONEK mobilizes community support on school lunch and eradication of cultural practices inhibiting attainment of quality and equitable education outcome in ASALs.

Despite the strategies adopted by the government, the Kenya National Examination Council (KNEC) Data, in the period (2008 – 2018) illustrate differences in the summative examination mean scores, Kenya Certificate of Secondary Education (KCSE) in the PDSS. Sisungo, Kaberia, and Buhere (2014) noted a significant correlation between students' performance in KCSE and school level of funding. Schools funded below 30% performed poorly in KCSE (Sisungo et al., 2014). KCSE guides students' admission to tertiary education and labor market. According to Republic of Kenya (2012) quality education outcomes in KCSE is evidenced by academic achievement of grades A (12 points), A- (11 points), B+ (10 points), B (9 points), B- (8 points) and C+ (7 points) mean scores. Grades E (1 point) and D- (2 points) in KCSE mean scores signify poor performance (Kivilu, 2015). According to Kivilu (2015), grades C (6 points) and C- (5 points) are average grades and would lead a student to pursue diploma and certificate courses respectively which would give students a chance of securing a job in the Kenyan labor market.

Between 2014 and 2018, the best performed PDSS in Kenya had an average mean score of 7 points (C+) and the least performed PDSS a mean score of 2 points (D-), a variation of 5 points (KNEC Data, 2018). Among the 47 Kenyan Counties, Tharaka Nithi PDSS KCSE mean scores had the highest variations of an average of 5 points for the period (2014–2018).



Source: KNEC Data, 2014 – 2018

Figure 1.1: Variations in PDSS Students KCSE Mean Score 2014-2018

Figure 1.1: depicts that although Kiambu and Nairobi Counties have high variations of PDSS KCSE mean score, Tharaka Nithi County has the peak in all the five-year period, 2014-2018. Unlike Kiambu and Nairobi Counties, Tharaka Nithi County is one of the Kenyan semi-arid land Counties receiving extra government support in the PDSSs because of need, such as the support of school feeding programme besides each student grant of Kshs. 22,244. Nevertheless, unlike other semi-arid land counties such as Lamu, Garissa and Taita Taveta which have lower variations of PDSS KCSE mean scores; Tharaka Nithi variations are high. Consequently, PDSS students in Tharaka Nithi County have high variations in their KCSE mean scores since PDSS KCSE mean scores are computed from the individual student KCSE mean score. This prompts the questions, 'Do variations in students examination scores in PDSS demonstrate equality of opportunity?' and 'What models of predictors of variations in students' examination scores in PDSS in Tharaka Nithi County have the highest predictive values?'

1.3 Statement of the Problem

The Kenyan government applies the concept of equity in financing PDSS resources. In addition to fully funding tuition costs, it supports lunch costs through jointly working with WFP in facilitating SFPs in ASALs. The government mobilizes community to support education in ASALS through NACONEK operations.

Application of equity concept in financing of PDSS resources aims to neutralize the influence of student's socio-economic characteristics on learning outcomes and

therefore ascertain equality of opportunity in attainment of quality secondary education outcome among students in PDSS. Equality of opportunity in attainment of quality secondary education outcome among students in PDSS would then be demonstrated by only students' conduct characteristics predicting variations in students' examination mean scores and not students' socio-economic or school resource characteristics.

In a period of five years (2014 – 2018), performance in the best PDSS KCSE mean scores deviates from the least performed PDSS with an average of 5 points in all the PDSS in Kenya. This raises the question on whether variations in students' examination scores in PDSS demonstrate equality of opportunity. Further, Tharaka Nithi County, one of the 47 Counties in Kenyan, in the five-year period (2014 – 2018) has had the highest variation between PDSS KCSE mean scores within the County of 5 points similar to the national level variation in PDSS KCSE performance. Thus, despite government efforts of ensuring equity financing in PDSS by providing need-based interventions, variations in learning outcomes in PDSS in Tharaka Nithi County are highest for a five-year period consecutively. This also mean that students attending PDSS in Tharaka Nithi County have high variations in their KCSE performance since a PDSS KCSE mean score is computed from the individual student KCSE score. This prompts the question on whether the variations of PDSS student's examination scores in Tharaka Nithi County depict equality of opportunity intended by the government interventions in PDSS, and the model of predictors of variations in students' learning outcomes in PDSS, Tharaka Nithi County, Kenya.

1.4 Purpose of the Study

The study aimed at establishing if the variations of PDSS student's examination scores in Tharaka Nithi County showed equality of opportunity in attainment of secondary education. This was done through modelling of the relationship that exists between student's household characteristics, student's parental/guardian characteristics, student's conduct characteristics, school resource characteristics and variations in examination scores in Tharaka Nithi County PDSS.

1.5 Objectives of the Study

This study sought to achieve the following objectives:

(i) To model the relationship between student's household characteristics and variations in examination scores in Tharaka Nithi County PDSS.

(ii) To model the relationship between student's parental/guardian characteristics and variations in examination scores in Tharaka Nithi PDSS.

(iii) To model the relationship between student's conduct characteristics and variations in examination scores in Tharaka Nithi County PDSS.

(iv) To model the relationship between both availability and adequacy of PDSS resources and variations in examination scores in Tharaka Nithi County.

1.6 Research Hypotheses

The study was guided by the following hypotheses:

H_{O1}: There is no statistically significant relationship between student's household characteristics and variations in student's examination scores in Tharaka Nithi County's PDSS.

H_{O2}: There is no statistically significant relationship between student's parental/guardian characteristics and variations in student's examination scores in Tharaka Nithi County's PDSS.

H_{O3}: There is no statistically significant relationship between student's conduct characteristics and variations in student's examination scores in Tharaka Nithi County's PDSS.

H_{O4}: There is no statistically significant relationship between PDSS resources and variations in student's examination scores in Tharaka Nithi County.

1.7 Significance of the Study

It is anticipated that this study findings may have the following significance:

i. Guide policy makers on the relationship between students' socio-economic characteristics and variations in students' examination scores in PDSS schools. This may help in developing policies that will make all students' socio-economic characteristics to have no relation on academic performance.

ii. Educational planners and managers may use the finding of the study as a guide on the relationship between PDSS resources and variations in students' examination scores while planning for PDSS in Kenya may use it.

iii. Civil societies may use knowledge generated from this study to develop interventions in PDSS and ensure equality of opportunity in attaining secondary education in PDSS.

iv. PDSS parents/guardians may use the findings as they structure conducive home environment to help students in PDSS study thus reduce variations in

examination scores associated with household and parental/guardian characteristics.

v. Future researchers may build on the findings of this research to generate more knowledge in this field.

1.8 Assumptions of the Study

The study was conducted based on the following assumptions:

i. Respondents would give accurate and credible information. This was ensured by maintaining anonymity and confidentiality of respondents.

ii. The respondents of the research questions would be cooperative. Respondents participated in the study on voluntary basis.

iii. It was also assumed that the participating schools provided homogeneous environments for the students' attainment of secondary education. This assumption was based on the fact that these schools were all PDSS and within the same County.

1.9 Limitations of the Study

The following were the limitations of the study:

i. Manipulation of independent variables in this study to ensure that different groups were exposed to different levels of the independent variable was not possible. Thus, the findings of the study only indicate the relation and do not imply a causal-effect relationship.

ii. The study only involved form three students in selected PDSS within Tharaka Nithi County. The findings may be generalizable to other students with similar characteristics but with caution.

1.10 Delimitation of the Study

The following were delimitations of the study:

i. The study investigated predictors of variations in students' learning outcomes in PDSS schools only because of their role in ensuring equality of opportunity in attainment of secondary education.

ii. The study was limited to Tharaka Nithi County. Therefore, generalization of the findings shall be taken with caution.

iii. The study focused on student's household, parental/guardian, conduct and school resource characteristics as predictors of variations in students' academic achievement, out of the many predictors that influence students' variations in academic achievement.

iv. The study focused only on the cognitive domain of learning. Therefore, other domains of learning such as psychomotor and affective domain were not incorporated in this study.

1.11 Theoretical Framework

The study was guided by the theory of justice propounded in 1971 by John Rawls, Rawls (1999) and Education Production Function (EPF) model by Bowles (Hansen, 1970). Rawls theory of justice was primarily influenced by Kant, Locke and Rousseau ideas on liberalism and justice (Thompson, 2013). It advocates for

justice as fairness to each and every individual in the society. On the liberty of opportunity principle, theory of justice states that all people have equal right to opportunities available in society (Rawls, 1999). The difference principle in the theory of justice directs interventions made in a society are to be arranged so that they are to be of the greatest benefit to the least advantaged.

In this study, the theory of justice helped in understanding the Kenyan government efforts in providing equality of opportunity in attainment of secondary education in PDSS. Most students enrolled in PDSS in rural areas have low socio-economic status (Wakwabubi, Achoka, Shiundu, and Ejakait, 2016). Enhancing access to and provision of secondary education to students with low socio-economic status, reflects Rawls theory of justice principle on liberty of opportunity which states that all people have equal right to opportunities available in society. The government of Kenya fully pays tuition costs for all the students in the PDSS. In ASALs, the Kenyan government supports SFP and NACONEK operations in PDSS. John Rawls theory of justice explains that equality of opportunity should benefit the most disadvantaged. Kenyan government efforts in PDSS of benefitting the most disadvantaged children in attainment of secondary education through PDSS remain hypothetical claim unless predictors of variations in learning outcomes are demonstrated. In demonstrating the predictors of variations in learning outcomes, EPF model was found essential in understanding the knowledge production process and learning outcomes as the production output.

EPF model by Bowles explains knowledge production process and learning outcome as the production output (Hansen, 1970). The EPF model aids in understanding the student's learning outcome which evidence knowledge production (Hanushek, 2008). Over decades, education researchers have used EPF model to establish how educational resources are distributed and their effect on students outcomes (Getange, 2013). The EPF model illustrates that in the knowledge production process, the amount of output is dependent on the amount of inputs (Hanushek, 1979). Besides, Bowles (1970) defines EPF model as

$A = f(X_{a, \ldots,} X_m, X_n, \ldots, X_v, X_w, \ldots, X_z)$ where,

A = Measure of education output (learning outcome) operationalized as examination scores

$X_{a, \ldots,} X_m$ = Constructs measuring the school resources include teaching and learning processes such as number of teachers and textbooks; laboratory and technology facilities; teachers characteristics, school leadership aspects, personnel emolument and education programmes enhancing education achievement in ASALs such as NACONEK and SFPs.

$X_n, \ldots, X_v$ = Constructs measuring student's socioeconomic characteristics include household characteristics such as residence, size and income level and parental characteristics such as occupation, income and education.

$X_w, \ldots, X_z$ = Constructs measuring student's conduct characteristics include student's level of intelligence determined by student's entry behaviour and effort employed by individual learners.

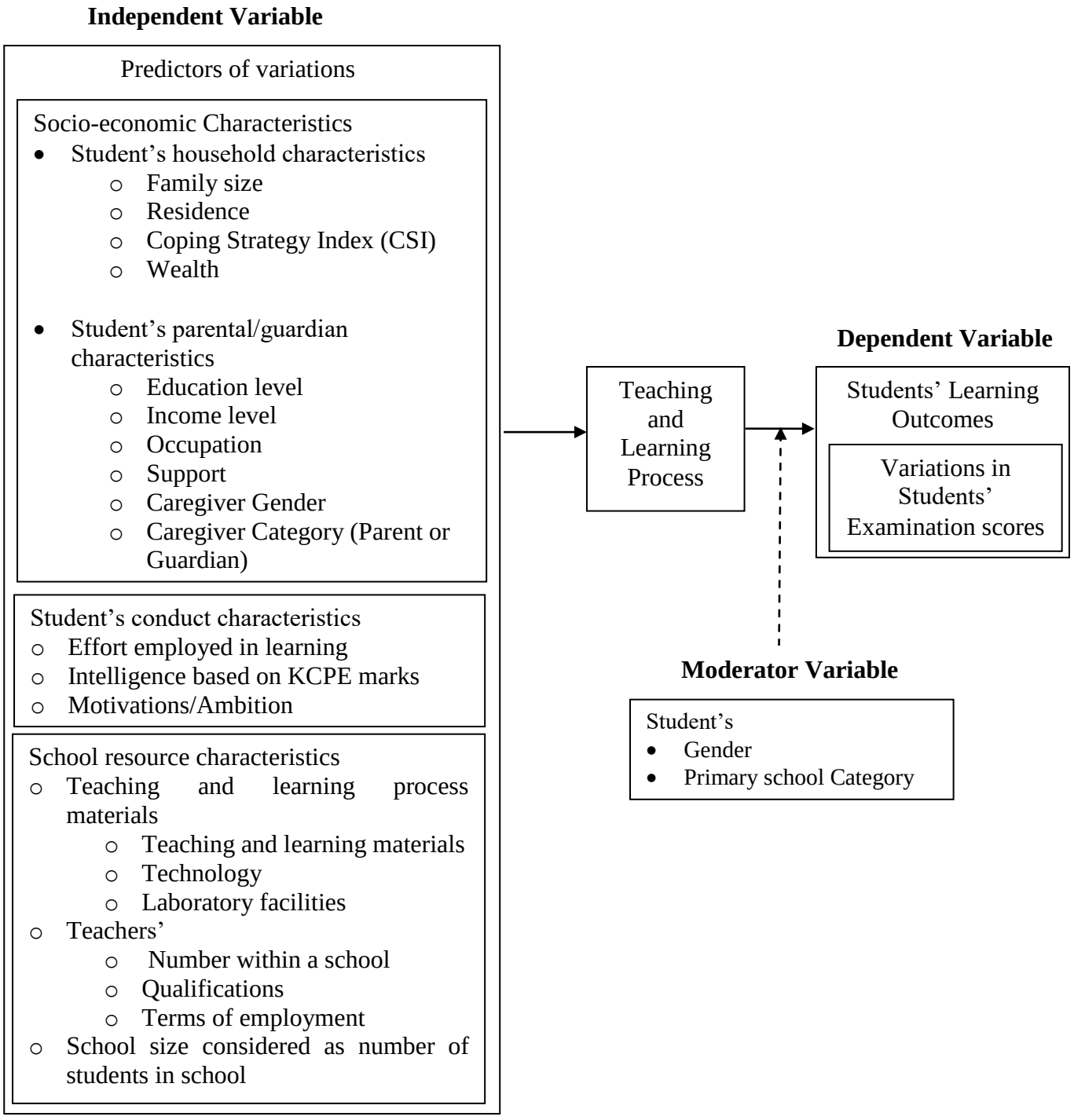
EPF model assumes a linear interaction between inputs and output. Education inputs are household, parental/guardian, conduct and school resources. Education inputs (Xa, …., Xm, Xn, …, Xv, Xw, …, Xz) are independent variables and do not depend on anything (Hanushek, 2008). In this study, EPF model explained the technical interaction of the education inputs through teaching and learning process in the PDSS to yield student's academic achievements summarized as student's examination scores. Students' learning outcomes attained through teaching and learning process were summarized as examination scores (Hanushek, 2008).

According to Rawls theory of justice, inequality is acceptable in education outcome if the education inputs are distributed in such a way that they improve the condition of the least advantaged members of the society. PDSS in Tharaka Nithi County have the largest variations in students KCSE scores compared to other PDSS in other Counties. The EPF model illustrated that the PDSS KCSE scores are dependent on the education inputs. The government of Kenya finances school resources in an effort to ensure equality of opportunity in attainment of secondary education. Equitably financed school resources counterbalance influence of both the household and parental/guardian characteristics on student's academic achievements and the differences in students' academic achievements are to everyone's advantage. This therefore explains Rawls theory of justice difference principle.

This study employed both the EPF model and Rawls theory of justice as the theoretical framework to further determine the order of the variable entry in

hierarchical multiple regression analysis. The present study conducted hierarchical multiple regression analysis to evaluate the contributions of each predictor of variations on PDSS student's examination scores while controlling for the other predictor variables. Consistent with Tabachnick and Fidell (2013a) hierarchical multiple regression analysis is a sequential process involving the entry of predictor variables in steps and the order of variable entry into the analysis is based on theory.

1.12 Conceptual Framework



Source: Researcher (2019)

Figure 1.2: Conceptual Framework

Figure 1.2 illustrates four variables that were conceptualized in this study: Independent, Moderator and Dependent. Predictors of variations was the independent variable for the study. The government of Kenya finances PDSS resources supply side, with the assumption that the demand side, characterized by the student's socio-economic characteristics will be neutralized, thus have no influence on the student's academic achievement. As a result, government financing, support of SFP and NACONEK operations in PDSS would provide an equal opportunity in attainment of secondary education benefiting socio-economically disadvantaged students.

Student's gender and category of primary attended were conceptualized as the moderating variable. The moderating variable interacts with the independent variable, predictors of variations which in this study include student's socio-economic, conduct and school resource characteristics during teaching and learning process and account for variance in student's academic achievement. Variations in students' examination scores predicted only by students' differences in conduct characteristics evidence equality of opportunity in attainment of secondary education in PDSS.

Examination scores in this study evidence students' learning outcomes. They were conceptualized as the dependent variable. The examination scores of students in PDSS depend on the predictors of variations. The study thus conceptualized that the students' differences in socio-economic, conduct and school resources would determine students' examination scores.

1.13 Operational Definition of Terms

Education Inputs – Conduct, socio-economic and school resources that contribute to learning.

Education Outputs –Learning gains expressed as student examination mean scores.

Equity – Non-influence of student's learning outcomes by non-conduct factors.

Free Day Secondary Education – Secondary education provided in public day secondary schools.

Household – Unit of dwelling with one or more people living and sharing resources

Neutral – Non-association of socioeconomic and public day secondary schools' characteristics to learning outcomes operationalized as examination scores.

Conduct characteristics – Student's personal traits such as gender, primary school attended, intelligence and effort employed to learn.

Learning Outcome – Academic achievement evidenced by examination scores.

Public day secondary schools – Non-boarding schools offering secondary education to students who mainly cannot afford boarding costs.

Predictors of variations – Conduct, socio-economic and school resource characteristics.

Residency – The location, place or position of living or existing.

Rural – An area of settlement located outside urban area.

School resources – Teaching and learning materials, and teacher characteristics.

Socio-economic Characteristic – Family and community background features.

Urban – An area of human settlement characterized by high human settlement, diverse trade activities and has administrative offices within.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

In this chapter, literature related to the area of study was reviewed under the following sub-headings: relationship between student's household characteristics and academic achievement; relationship between student's parental characteristics and academic achievement; relationship between student's conduct characteristics and academic achievement; relationship between school resources and academic achievement; summary of the literature review, and gap identification respectively.

2.2 Relationship between student's household characteristics and variations in learning outcomes

A theoretical review of evidence in 363 districts of 30 developing countries explain that students' stay in school is determined by their academic achievement which is influenced by household level factors (Huisman and Smits, 2017). According to Huisman and Smits (2017), interventions to ensure students' stay in school should be differentiated by students' household context. Tharaka Nithi County in Kenya is listed among Counties in ASALs (Republic of Kenya, 2013). In addition to fully financing of PDSS student's tuition costs, the Kenyan government supports lunch costs through jointly working with WFP in facilitating SFPs in ASALs (Republic of Kenya, 2015b). The study thus sought to establish equality of opportunity in the Tharaka Nithi County, Kenya PDSS through establishing the variation in student's academic achievements associated with students' household residence holding other factors constant.

In establishing whether school poverty mediates the effect of neighborhood context on academic achievement during adolescence, Wodtke (2016) analysed students' neighborhood context effect on reading and mathematics abilities in Canada and found differences in student's neighborhood contexts had no effect on student achievement in reading and mathematics. Nevertheless, Wodtke (2016) found that students from disadvantaged neighborhood compared to those from advantaged neighborhood were observed to have minimal exposure to school poverty and had better achievement in reading and mathematics. Albeit, Wodtke (2016) findings are robust, neighborhood context effects on academic achievement are to a great extent as a result of mediating factors unrelated to school poverty, a gap that this study sought to fill. This present study endeavored to establish the contribution of student's residence, an indicator of household characteristics to variations in examination scores in PDSS in Tharaka Nithi County Kenya.

Faught, Williams, Willows, Asbridge and Paul (2017) study aimed to assess the relationship between household food insecurity and academic achievement in Canadian school-aged children. Faught et al. (2017) study adopted a cross-sectional study for both the children and their parents where the parents were asked to complete the short form household food security survey modules, questions on income and their education level. According to Faught et al. (2017) study, questions on income and parents education level measured the children socio-economic status. Children academic achievement was based on standardized exams done by the children at the end of the school year (Faught et al., 2017). The study established that low household food security and poor academic achievement

are associated. Consistent with Faught et al. (2017) study, students from low-income households who reported low food security were less likely to do well in school. According to Maxwell and Caldwell (2008), Coping Strategy Index (CSI) helps in establishing food security impact on food programs designed to provide aid. Reviewed study did not investigate contribution of student's low household food security to the variation in students' academic achievements, a task performed by this study in Tharaka Nithi County PDSS. While reviewed study was conducted in a developed country. In Kenya, the study was conducted in an ASAL County, where the government and the WFP ensure food security in schools through SFPs.

Azumah, Adjei and Nachinaab (2017) in Kumasi Ghana, conducted a case study on family size effect on child education investment. Azumah et al., (2017) case study findings illustrate children of large families have poor performance, enroll late in school, and are most likely to drop out of school. However, the reviewed study failed to model the relationship between the family size and the variations in students' academic achievements in Kumasi, Ghana. This study filled this gap in PDSS in Kenya, Tharaka Nithi County. The reviewed study used qualitative approach, case study design (Azumah et al., 2017). The current study used convergent parallel mixed methods research design to model the relationship between the family size and the variations in students' academic achievements.

Kariuki (2017) study in Kenya sought to establish the relationship between conduct, family and school factors as correlates of form two students' achievement motivation in Nairobi County slum areas established no significant relationship.

The study operationalized family characteristics as household size. It investigated affective domain of student's learning unlike the present study which focused on the cognitive domain. Also, the present study investigated the relationship between students' household size and the variations in students' academic achievements expressed as examination scores in Tharaka Nithi County PDSS.

Abuya, Mutisya, Onsomu, Ngware, and Oketch (2019) research on household characteristics and child's educational attainment in the slums of Nairobi Kenya established that children living with two biological parents outperformed those raised in other family structures. After controlling for socioeconomic variables, Abuya et al. (2019) noted that the effect of family structure on educational attainment of children persisted. The study further established that children from households with two parents were 40% more likely to be in the right age for grade with better education attainment compared to 16% of the children in one parent households. Abuya et al. (2019) study employed logistic regression model to test the hypothesis that two-parent families are most favourable to student's education attainment. Unlike the logistic regression model, hierarchical regression allows examination of the effect of data clustering on outcomes (Rawlings, Pantula, and Dickey, 1998). Present study also conducted a thematic analysis on the qualitative data investigating the influence of PDSS student's household characteristics on variations of examination scores.

2.3 Relationship between student's parental/guardian characteristics and variations in learning outcomes

A study by Chen, Kong, Gao and Mo (2018) in a Chinese province examined the relationship between parental socio-economic status measured by education level of the parents, their occupation and income; and student reading ability. The study established that education level of the parents, their occupation and income are correlated with student's reading ability. Chen et al. (2018) recommended that continued research should also collect qualitative data to explain the quantitative data. The present research collected both quantitative and qualitative data. In addition, it investigated the proportion of variation in students' learning outcomes associated with the student parents' differences in education level, occupation and income in Tharaka Nithi County, Kenya PDSS.

In United States of America, Mwangi et al. (2018) examined the relationship between school academic press and parental involvement in examinations nurturing college readiness. It found that parental involvement had a unique and positive impact on a student's attainment of milestones towards college by 12^{th} grade. It employed analytical approach of structural equations modelling (SEM). The study also aimed to empirically establish direct relationship between the concept of academic press and college readiness. The study established that high school academic press affected neither parental involvement nor readiness for college. Nevertheless, the reviewed study did not define the prediction equations of variations in examination scores nurturing college readiness from school academic press, students' college readiness, and parental involvement. Mwangi et al. (2018)

study measured academic press solely as percentage of teachers with professional degree. In addition to percentage of teachers with professional degree, the present study measured school resource characteristics as teaching and learning process materials, teaching staff size, and school size.

Giannelli and Rapallini (2018) study on OECD countries on the relationship of parent occupation and a child's school outcomes in mathematics found that an increase in 1 standard deviation of a parental attitude in maths increased student performance by more than 40 score points. The study by Giannelli and Rapallini (2018) recommended efforts to improve parental maths attitude so as to enhance their children's school outcomes. This study used PISA test scores for maths administered to 15-year-old students in PISA participating countries. Kenyan 15-year-old students and many other African countries do not participate in PISA thus they are not represented by the study findings. Also, Giannelli and Rapallini (2018) study failed to shed light on the differences in students' math scores as a result of students' parents' differences in occupation which characterized parents' differences in math attitude. This study established differences in students' examination scores, not just math scores, as a result of differences in student's parent occupation in PDSS Tharaka Nithi County, Kenya.

In their study in Jigawa and Kano States Nigeria, Aye, Oforka, Akaneme, Idris and Okolo (2016) focused on the influence of parent's educational background on their educational support of secondary school students. The study established that the parental levels of education had influence on their levels of educational support to

the students (Aye et al., 2016). It thus recommended parents' attainment of high education levels to enhance their support in their children education. Nevertheless, the reviewed study did not establish the proportion of the educational support of secondary school students that is determined by parental level of education. Further, the study related situation in the sample groups thus employed ex-post facto research design to determine the influence of parent's educational background on their educational support of secondary school students in Jigawa and Kano States (Aye et al., 2016). The present study used convergent parallel mixed-methods research design to model the student's parent/guardian education level proportion of variation in student's differences in learning outcomes in Tharaka Nithi County PDSS. Convergent parallel research design was used in the present study to gain an in-depth understanding of the parental education level determination of variations in student's examination scores.

In Kenya Tana River County, a study by Juma (2016) sought to determine the influence of parental socio-economic status on students' academic performance in public secondary schools. The study employed a descriptive survey design to investigate the influence of parent's income, education level, occupation and involvement in education on student's academic performance. It established that parent's income, education level, occupation and involvement in education influenced student's academic performance. Juma (2016) study thus recommended increased bursaries for children from households with parents with low levels of income. However, the reviewed study failed to deal with the multicollinearity effect of its independent variables which included parent's income, education

level, occupation and involvement in education on the study findings. According to Shone (2015), multicollinearity can create inaccurate estimates of regression coefficients, give false significance of p–values thus degrade the model. In this study, independent study variables were selected with care at the outset. The students' differences in parental income, education and occupation measured a single independent variable which is student parental characteristic. Student parental characteristic was used to model the proportion of variation in the student's differences in learning outcomes in PDSS, Tharaka Nithi County.

Thuba (2018) study aimed at determining the effect of parental involvement on quality of education in public day secondary schools in Meru County. The study defined quality education as regular school attendance, higher class grades, placement in colleges and universities. Parental involvement was operationalized as school based, home based and academic socialization (Thuba, 2018). It established a positive and significant relationship between parental involvement indicators and quality of education in public day secondary schools. Although multiple regression was employed in Thuba (2018) study, hierarchical multiple regression was not employed to control for the predictor variables that would determine the effect of parental involvement on quality of education in public day secondary schools. The present study sought to fill the identified gap. In addition, Thuba (2018) study did not establish the variance in quality of education in public day secondary schools that was accounted for by parental involvement indicators in Meru County. This study also endeavoured to define a prediction equation of variation in public day secondary school's examination scores from

parent/guardian, household or school resource characteristics in Tharaka Nithi County.

2.4 Relationship between student's conduct characteristics and variations in learning outcomes

Sebastian and Ricarda (2018) study on conduct and intelligence interaction in the prediction of academic achievement in Europe revealed that conduct interacted with intelligence when predicting academic achievement. According to Sebastian and Ricarda (2018) study, conduct was defined as student character. This study defined student's conduct as personal traits such as gender, primary school attended, intelligence and effort employed to learn. Sebastian and Ricarda (2018) study however did not establish the conduct and intelligence interaction variation of students' examination scores. The study was conducted on 11th grade students in Europe. The present study examined student's intelligence as an indicator of student conduct and further sought to establish student's conduct prediction of variations in learning outcomes.

In O'Dea, Lagisz, Jennions, and Nakagawa (2018) study, meta-analytic advances were employed to establish student gender differences in individual variation in Science, Technology, Engineering and Mathematics (STEM) academic grades. The study had a sample size of over 1.6 million students and longitudinally investigated gender difference in variability for 80 years (1931 -2013). It found that gender difference in variability had not changed noticeably in the period of 80 years, gender differences in grade variability were already present in childhood and did

not increase during adolescence and that gender differences in grade variance were larger for STEM than non-STEM subjects. In this study, student gender was a moderating variable thus not directly investigated but its influence was taken into account when establishing the relationship between student's conduct, household, parental/guardian and school resource characteristics and variations in PDSS students' academic achievement.

In their study in USA, Bai, Ola and Akkaladevi (2018) aimed to establish relationship of student's time spent in class and academic achievement. It thus evaluated the impact of class attendance on the academic performance in two programming courses in Virginia State high schools. The study established a strong relevance between students' class attendance and academic performance (Bai et al., 2018). Reviewed study however did not establish the proportion of the variation in students' examination scores that can be determined by students' class attendance. In addition, the reviewed study was done in high income country while this study was carried out in low-income country. This study identified breaks reviewed study in PDSS in developing country, Kenya, ASAL County, Tharaka Nithi.

In a study conducted in United States of America, Spengler et al. (2018) investigated the role of student's conduct characteristics in predicting educational attainment in 50-year timespan longitudinal. The study controlled for parental socioeconomic status and IQ. Spengler et al. (2018) found that student characteristics in adolescence predicted educational success above and beyond

parental socioeconomic status and IQ. Spengler et al. (2018) study did not define the prediction equations of variations in student's education attainment predicted by student characteristics a gap the present study sought to fill in Tharaka Nithi County in Kenya.

Dahie, Osman, and Mohamed (2015) investigated students' impact of time management and academic performance in high school education in Mogadishu, Somalia. The study utilized explanatory and descriptive design. Dahie et al. (2015) established a significant connection between student's time management and academic performance. Dahie et al. (2015) study also found that time management had a positive impact on academic performance in high school education in Mogadishu, Somalia. Nevertheless, reviewed investigation did not establish the prediction of students' time management on the variations in students' learning outcomes in high school education in Mogadishu, Somalia. It also utilized quantitative data exclusively in establishing the findings. This study sought to fill this gap in Tharaka Nithi County PDSS in Kenya by establishing student's time management as an indicator of student's conduct variation of students' learning outcome. The present study also adopted a mixed method research approach instead of the quantitative research approach adopted by the reviewed study.

According to Donald and Isaac (2019) study on the relative effectiveness of private and public schools in Kenya, private school has positive effect. Donald and Isaac (2019) study found that private school pupils outperform their public-school counterparts by between 0.24 and 0.52 standard deviations. The study targeted

4,433 Grade 6 primary school-children. In the present study, category of primary school attended by the PDSS students was identified as a moderating variable when investigating the relationship between student's conduct, household, parental/guardian and school resource characteristics and variations in PDSS students' academic achievement. This study controlled for predictive impact of primary school category attended by the PDSS students so as to establish the relationship between student's conduct, household, parental/guardian and school resource characteristics and variations in PDSS students' academic achievement.

Ng'ang'a, Mwaura and Dinga (2018) investigated students' conduct factors which contribute towards academic achievement Kiambu County Kenya. The study aimed to determine the relationship between students' achievement goal orientation and academic achievement. It found that all the domains of achievement goal orientation significantly correlated to academic achievement. Ng'ang'a et al. (2018) study adopted convergent parallel mixed methods research design which was used in this study. Students are predisposed to different home and school environments which influence their academic achievement. In finding out the specific conduct aspects that influence their academic achievement, control of their home aspects characterised by their households and their school is key. The reviewed study did not establish the influence of students' domains of achievement goal orientation on variations. Nevertheless, this study sought to model the relation of students' effort in learning to variations in learning outcomes in PDSS, Tharaka Nithi County. It thus controlled for the students' home aspects

characterised by their households and their school to establish the contribution of student conduct characteristics to variations in examination scores.

2.5 Relationship between school resources and variations in learning outcomes

Gustafsson et al. (2018) analysed 50 countries participating in the Trends in International Mathematics and Science Study (TIMSS) Grade 8 mathematics scores. The analysis aimed to identify school characteristics that could reduce relation between socio-economic status and achievement (Gustafsson et al., 2018). It established that socio-economic status was strongest cause of the differences across schools and educational systems. This study was done in Kenya. Kenya does is not a TIMSS's participant thus ideal to establish prediction equations of variations in examination scores from household, parental/guardian conduct and school resource characteristics.

O'Day and Smith (2016) review of disparities within the educational system literature established that the product of institutional structures and cultures that marginalize certain groups of students also decrease quality overall. Despite educational reforms, educational achievement and attainment continue to reflect student's school resource characteristics (O'Day and Smith, 2016). The government of Kenya provides PDSS financing and supports interventions such as SFPs in ASALs to ensure equality of opportunity in education attainment. O'Day and Smith, (2016) notes that inequalities outside schools challenge the function of schools to supply knowledge and skills to all individuals thus undermine

individuals' fair chance of success in adulthood. The reviewed theoretical literature fails to model the proportion of the differences in students' learning outcomes associated with school resource characteristics a task performed by the present study in PDSS, Tharaka Nithi County.

Quin (2017) longitudinal and contextual systematic review on multiple indicators of adolescent students' engagement in school concluded that teacher–student relationships play important although not exclusive role in adolescent students' engagement in school and consequent academic achievement. Quin (2017) systematic review on longitudinal and cross-sectional studies found that teacher–student relationships were associated with adolescent students' enhanced engagement in school. The teacher–student relationships were demonstrated by indicators of student engagement which included examination scores, school attendance and disruptive behaviours. The present study however employed mixed method research approach in establishing the relationship between differences in the number of teachers in PDSS an indicator of school resource characteristics and students' variations in examination scores in PDSS, Tharaka Nithi County. In addition to the Quin (2017) systematic review finding on the association of the teacher–student relationships and adolescent students' engagement in school, this study further sought to establish the percentage contribution of overall school resource characteristics.

In finding out if technology had positive impact on students' examination scores in secondary level of education, Stine and Guro (2017) evaluated a laptop project in

Norway. The laptop project distributed laptops to all the secondary school students to boost their examination scores. Stine and Guro (2017) found no technology benefits in improving students' examination scores at secondary level in Norway. They explained that there was no causal effect of laptop students at secondary level and improvement of students in their examination scores. Present study established the contribution of technology to the variations in Tharaka Nithi County public day secondary schools' examination mean scores, an indicator of school resource characteristics. Stine and Guro (2017) research, was wholly quantitative with no component of qualitative data. Contrary, in this study mixed method research approach was used to complement weaknesses of the qualitative and quantitative research approaches. Qualitative data also provided explanation on the hierarchical multiple regression research design findings.

In an exploratory research in United States by Ingersoll et al. (2018), teaching force in secondary education was found to have become larger, consistent in academic ability, and unstable. Ingersoll et al. (2018) research stated that in public secondary schools, teaching force increased over three times, most teachers had higher education, and that the number of teachers leaving the teaching profession was on increase. According to Ingersoll et al. (2018) study, the research findings were speculative and did not decisively imply possible future trajectories on the secondary schools' teaching force changes. Ingersoll et al. (2018) research thus recommended similar studies in future which not only established the changes in the secondary schools' teaching force but also established the relation of these changes to the variations in secondary school students' examination scores. This

study endeavoured to find association between differences in PDSS number of teachers, teachers' qualifications, as indicators of school resource characteristics, and variations in students' examination scores in PDSS. This research was based in Kenya which is a developing country, different from the reviewed research which was conducted in a developed country, United States of America.

Asif Iqbal et al. (2016) investigated how teachers' job satisfaction related with secondary school students' academic performance in Pakistan. The investigation by Asif Iqbal et al. (2016) established that students' performance was not significantly related with teachers' job satisfaction. Asif Iqbal et al. (2016) investigation involved secondary school teachers completing developed job satisfaction scale and gauging students' performance in accordance to the board of intermediate and secondary education. In the present study, relationship between teachers' terms of employment in PDSS an indicator of school resource characteristics and variations in examination scores among PDSS students was sought in Tharaka Nithi County, Kenya. This study sought to find differences in teacher employment terms to variations in students' examination scores in different PDSS. The present study indicated school resource characteristics, with among other indicators, teachers' terms of employment which would show teachers' job satisfaction and how it contributed to the variations in examination scores among PDSS students.

Additionally, in Iran and Russia, Tastan et al. (2018) investigated the impacts of teacher's efficacy and motivation on student's academic achievement in science

education among high school students. They established a significant impact of teacher self-efficacy and motivation on academic achievement in science education. However, this study investigated PDSS teachers' terms of employment, an indicator of school characteristics contribution to variations in PDSS students' examination scores. Different from Tastan et al. (2018) study, this study was conducted in an African country Kenya.

Cunningham et al. (2019) study compared public investments in school infrastructure, school improvement grants, teacher qualifications and attendance incentives on independently gathered measures of academic skills in India. The study used principal components analysis (PCA) to create composite scores of the type of school infrastructure, grants to schools, teacher number and incentives to children or parents. Incentives for children to attend school were found to associate with arithmetic, reading and writing skills (Cunningham et al., 2019). Cunningham et al. (2019) study established that investment in teachers were associated with greater probability a child could write and do more advanced math. More, the study noted that small improvement grants to schools were associated with better reading skills and writing ability while investments in school infrastructure were only associated with improved writing ability. Cunningham et al. (2019) study did not establish the prediction equations on variations in academic skills from school infrastructure, school improvement grants, teacher qualifications and attendance incentives on independently gathered measures of academic skills in India. This study defined prediction equations on the variations in students' learning outcomes from school resource characteristics in PDSS, Tharaka Nithi County, Kenya.

Bold et al. (2017) investigated on what teachers know, do and on whether it mattered in African primary schools. The investigation by Bold et al. (2017) used data from nationally representative surveys in seven sub-Saharan African countries representing 40 percent of the region's population. It established that many teachers had no mastery of the curricula they were teaching. Bold et al. (2017) observed that the teachers' pedagogical knowledge was low and did not employ good teaching practices while teaching. The reviewed study further established a significant and large positive effects of teacher content and pedagogical knowledge on student achievement (Bold et al., 2017). Reviewed study focused on how teacher subject knowledge and pedagogical skills impacted pupils' knowledge. This study examined how differences in teacher qualifications resulted to variations in PDSS examination scores in Tharaka Nithi County. Also, present study aimed to model the relationship between the teacher qualifications, employment status and the variations of students, examination scores.

Effiong et al. (2015) conducted a study on the impact of instructional materials in teaching and learning of biology in senior secondary schools in Yakurr state in Nigeria. The study revealed a positive achievement in students taught by highly qualified biology teachers and exposed to instructional materials during lessons. It employed descriptive statistical method to determine the impact of teachers' effectiveness (Effiong et al., 2015). The reviewed study data was analysed using simple percentage method to verify the research questions formulated (Effiong et al., 2015). The present study used hierarchical multiple regression analysis to analyse the statistical relationship between predictors of variations and students'

learning outcomes expressed as examination scores. In addition, it modelled the association between instructional materials in teaching and learning of all subjects and the variations in students' examination scores in PDSS Tharaka Nithi County, Kenya.

In Tanzania, Nghambi (2014) study on factors contributing to poor academic performance in certificate of secondary education examination for community secondary schools, found that high teacher-students ratio of (1:65) associated with students' poor performance. More, Nghambi (2014) study noted that teacher-students ratio was positively correlated with the achievement scores. The study by Nghambi (2014) employed descriptive statistics analysis on the quantitative data. It also employed questionnaires, interview and field observation schedules to collect data. Comparable to Nghambi (2014) study, the present study employed a mixed method research approach by collecting both the qualitative and the quantitative data. The present study examined contribution of the variances of number of students in PDSS, an indicator of school resource characteristics, to the differences in PDSS students' examination scores. Nevertheless, contrary to Nghambi (2014) study, the present study used hierarchical multiple regression analysis to analyse the statistical relationship between differences in PDSS resource characteristics and students' learning outcomes expressed as examination scores.

In Makueni County Kenya, Maingi et al. (2017) conducted a study on influence of school physical facilities on students' discipline in public secondary schools. The study established that adequacy of physical facilities has positive relationship of p

value 0.78 with levels of students' discipline in public secondary schools in Makueni County (Maingi et al., 2017). The study recommended that educational stakeholders should expand school physical facilities in order to enhance students' discipline. The reviewed study focussed on the influence of the school facilities on student discipline in Makueni County. Nevertheless, the present study sought to establish the relation of the school facilities on the variations of students' differences in learning outcomes in Tharaka Nithi County PDSS.

Moreover, in Busia County Kenya, Manasi (2018) hierarchical linear model established a no statistically significant effects of school characteristics on students' academic achievement. Manasi (2018) study operationalized school characteristics as school size, location and school type such as day, boarding and co-educational. Unlike Manasi (2018) this study further operationalized students' school characteristics as teaching and learning process materials and teacher's number within a school, qualifications and terms of employment. Also, unlike Manasi (2018) study which operationalized academic achievement as KCSE examination score, this study operationalized academic achievement as PDSS students' examination scores and focused on investigating variations in students' examination scores based on the end of year differences in the students' performance. Manasi (2018) study findings implied that parents needed not to have the perception that school characteristics influence their children's academic achievement. The present study modelled the relation between students' school characteristics and dissimilarities in examinations, Tharaka Nithi PDSS.

2.6 Summary of the literature review and gap identification

Student household level factors, parental/guardian, conduct and school resource characteristics influence student's academic achievement. Furthermore, different students' household level factors, parental/guardian, conduct and school resource characteristics influence student's academic achievement differently. Nevertheless, equitable financing of school characteristics neutralizes the influence of the differences in student's household level factors and parental/guardian on academic achievement and therefore ascertains equality of opportunity in attainment of quality education. Equality of opportunity in attainment of quality education outcome among students is demonstrated by differences in students' conduct characteristics predicting variations in students' examination mean scores only and not differences in student's household level factors, parental/guardian and school resource characteristics.

Various studies confirm that student's household, parental, conduct, and school resources influence student's academic achievement. They point a clear relationship between student's socio-economic characteristics and academic achievement. Student's socio-economic characteristics in most studies were operationalized as student's family background characteristics. Reviewed study findings indicated a significant influence of parental/guardian education on student's academic achievement. Further, school physical facilities, teacher qualifications, student conduct factors and household food availability and income influenced student's academic achievement.

However, while reviewed literature document relationships and influence of student household level factors, parental/guardian, conduct and school resource characteristics on student's academic achievement, it fails to demonstrate the contribution of the relationship to the variations in academic achievement. Moreover, research gaps identified in the reviewed literature included: identification of differences in students' math scores as a result of student's parent differences in occupation; proportion of the educational support of secondary school students, parental/guardian level of education; and predictability of student's examination scores by the students' intelligence operationalized as performance in Kenya Certificate of Primary Education examination scores. Also, none of the reviewed study defined prediction equations of variations in public day secondary school students' examination scores from student's household, parental/guardian, conduct and school resource characteristics. Reviewed studies also failed to employ hierarchical regression to control for the predictor variables. Most of the reviewed studies focused on the quantitative data in establishing their findings.

This study sought to fill reviewed literature gaps identified. It endeavoured to model the relationship between student's household characteristics, student's parental/guardian characteristics, students' conduct characteristics, school resource characteristics and variations in students' academic achievement. It also endeavoured to find out the in-depth knowledge on the relation and prediction of variations in students' academic achievement from the student's household characteristics, student's parental/guardian characteristics, students' conduct

characteristics and school resource characteristics. This was done through employing a convergent parallel mixed method research design during which both the qualitative and quantitative data were collected and analysed. Correspondingly, the study defined a prediction equation of variations in public day secondary school students' examination scores from student's household, parental/guardian, conduct and school resource characteristics.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter presents research design and methodology under the following sub-headings: research design; variables; location of the study; target population; sampling techniques and sample size; research instruments; validity, reliability, pilot study; data collection techniques; data analysis and logical and ethical considerations respectively.

3.2 Research Design

The study employed convergent parallel, a mixed method research design to gain an in-depth understanding of the predictors of variations in learning outcomes in PDSS in Tharaka Nithi County, Kenya. Convergent parallel is a type of mixed method research design (Creswell, 2014). It incorporates qualitative and quantitative data both collected in parallel to enhance understanding of a concept under investigation. According Creswell (2014), both quantitative and qualitative data are equally weighed but examined autonomously and findings construed together.

The study sought to model predictors of variations in students' learning outcomes in PDSS. Hierarchical multiple regression research design of quantitative research approach was used to model and establish variations in students' learning outcomes predicted by students' household, parental/guardian, conduct and school resources characteristics respectively. It is an appropriate tool for analysis when

variance of the dependent variable is explained by predictor variables that are correlated with each other (Tabachnick and Fidell, 2013a). Furthermore, hierarchical regression analyses the effect of a predictor variable after controlling for other variables.

In obtaining in-depth knowledge on the variations in students' learning outcomes predicted by students' household, parental/guardian, conduct and school resources characteristics respectively, case study research design of qualitative research approach was used. Summary of the adopted convergent mixed-parallel design is represented by figure 3.1 below.

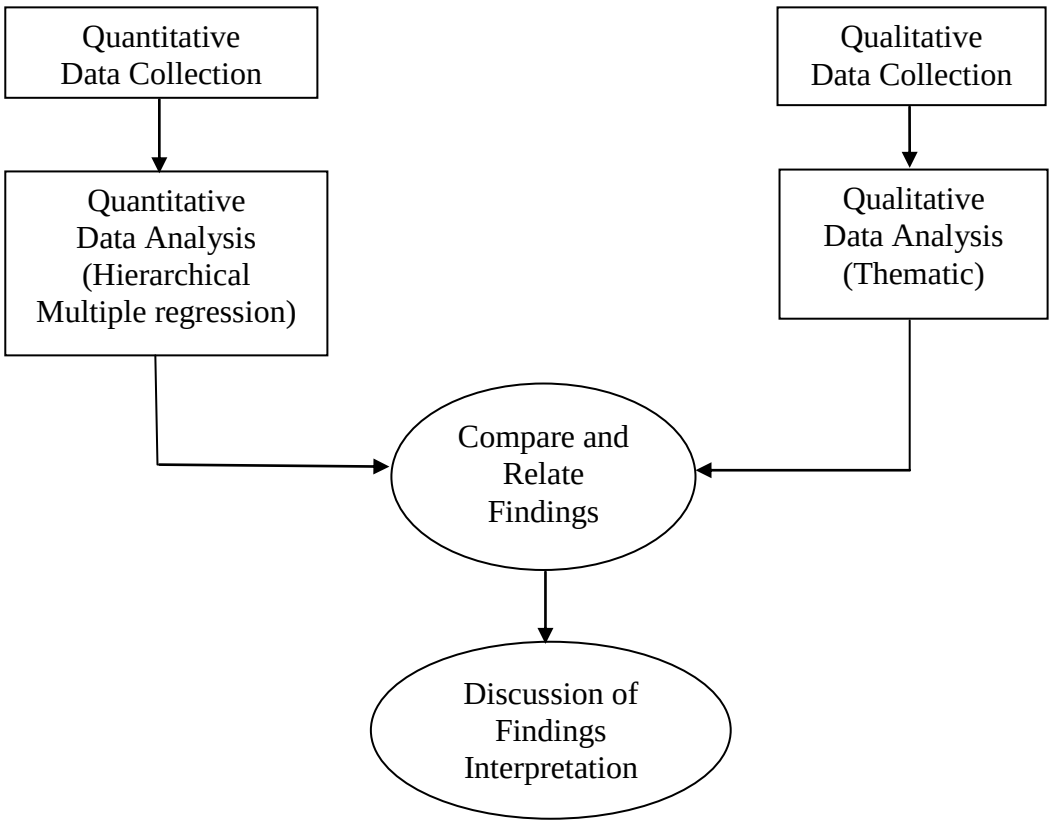


Figure 3.1: Study research process using the Convergent mixed-parallel design

Source: Adapted from (Creswell, 2014)

3.3 Variables

Independent variable for the study was 'Predictors of variations in student's academic achievement.' Predictors of variations in student's learning outcomes were perceived as the socio-economic, student's conduct and school resources. Student's socio-economic characteristics were operationalized as the student's household and parental/guardian characteristics. Student's conduct characteristics were operationalized as the student's effort based on time spent learning and intelligence based on their KCPE marks. Students' household characteristics were measured by household size, residence proximity to social amenities and Coping Strategy Index (CSI) while parental/guardian characteristics were measured by parental/guardian education, income, support to student, relation, gender and occupation. In addition, school resources were operationalized as the teaching and learning materials and teacher characteristics. School resources were measured by teaching and learning materials available, study time, school location, socio-economic composition of student population and school size based on school population.

The study's dependent variable was 'Student's learning outcome.' Student's learning outcome was perceived as the student's performance in formative school examinations. Thus, student's learning outcome is indicated by form 3 student's mean scores in school examination in the end of year one and two. The study's moderating variable was students' gender aspect and category of primary school attended because of its interaction with the independent variable, 'Predictors of

variations in student's academic achievement' in predicting the student's academic achievement.

3.4 Location of the Study

Study location was Tharaka Nithi County, Kenya. Tharaka Nithi County is one of the 47 Counties created by the Kenya Constitution 2010 (KNBS, 2015). It has two main distinct ecological zones KNBS (2015), the highlands region that receive adequate rainfall and the semi-arid regions that receive less rainfall. Among other Kenyan 47 Counties, Tharaka Nithi County has the highest variation in PDSS KCSE mean scores of an average of 5 points consistently for a period of five years (see Appendix vii). Student's variations in examination mean scores related only to student's differences in conduct characteristics evidence equality of opportunity in attainment of quality education outcome (UIS, 2018). The study sought to establish if variations in PDSS end of year examination mean scores demonstrated equality of opportunity in Tharaka Nithi County. This is because school end of year examination mean scores have been found to validly estimate national examination mean scores (Cerdeira et al., 2018). End of year examinations are usually standardized since the subject teachers set the examinations and score using a common set of guidelines, and the students in the same level answer the same questions (Kasembeli and Gathara, 2014).

3.5 Target Population

According to the Tharaka Nithi County Ministry of Education Data 2020 (see Appendix viii: Tharaka Nithi List of Schools) Tharaka Nithi County, has 150

secondary schools (72 PDSS, 69 Public Boarding and 9 Private Boarding). Thus, almost half of the secondary schools in Tharaka Nithi County are PDSS. Moreover, among the public boarding secondary schools, almost half are mixed day and boarding schools but are classified as the boarding schools. Nevertheless, this study was interested in purely public day secondary schools without a boarding facility. The study population comprised 9,495 Form 3 students (4,611 boys and 4,884 girls), 9,495 Form 3 parents (4,611 male and 4,884 female) and 72 PDSS principals in the 72 PDSS in Tharaka Nithi County (KNBS, 2015). The Form 3 students in FDSE schools were targeted in this study because they had been in school longer than the Form 1 and 2 students and they were not as busy as the Form 4 students who were the national examination candidates. The PDSS principals were targeted in the study since they are school managers and therefore familiar with the PDSS students' variations in students' examination scores.

3.6 Sampling Techniques and Sample Size

3.6.1 Sampling Techniques

County Directorate of Education (CDE) school lists formed the sampling frames for this research. Proportionate stratified random sampling application enhanced identification of a quantitative study subjects' sample in different sub-Counties, and of different gender. Purposive sampling was used to select qualitative study subjects to provide focus on particular characteristics of a population interest such as the PDSS size and performance in the years (2014to 2018). Students sampled for the qualitative data collection participation also took part in provision of the

quantitative data to ensure comparison between the two databases (Creswell, 2014).

3.6.2 Sample Size

Quantitative Subjects

According to Gay (1992), a small population has less than 100 subjects and 20% of that population makes a representative sample. The study used 20% of the number of PDSS as the sample size since it was a small population of 72. Although 20% of the 72 PDSS equalled to 14.4, the study rounded of the 14.4 to 15. Thus, the sample size comprised of 15 PDSS sampled from a population of 72 PDSS in Tharaka Nithi County.

In computing the quantitative sample size for PDSS Form 3 students and their Parents to take part in this research, Gay formula was applied to compute PDSS sample size would not be used because PDSS Form 3 students and their Parents population was considered large, more than 100 subjects. Consistent with Gay (1992), a population comprising 100 subjects and above is a large population. Gay formula also does not account for a sampling error in large population sizes (Gay, 1992). This study thus adopted use of Cochran equation to compute quantitative sample size, of Form 3 students and their Parents to participate in the study, since it accounted for a sampling error of large populations (Burmeister and Leanne, 2012). According to Burmeister and Leanne (2012) Cochran equations indicate a sampling error of 0.05. The equation is:

$$n = \frac{N}{1 + N(e)^2}$$

Where; N = Population

n = Sample size

e = Sampling error (0.05)

It gave a sample size of 368 and 370 PDSS Form 3 students sampled from a population of 4,611 male 4,884 female respectively and 368 and 370 PDSS parents/guardians of Form 3 students sampled from a population of 4,611 male 4,884 female respectively (KNBS, 2015). The study used proportionate stratified sampling to compute the PDSS, Form 3 students and their parents sample size for each stratum in each sub-County. According to Burmeister and Leanne (2012) proportionate stratified random sample size of each stratum was proportionate to the population size of the stratum with each stratum having the same sampling fraction.

Qualitative Subjects

Criterion sampling, a purposeful sampling method was used to determine the qualitative sample size. The basic criteria included being a school manager in the PDSS thus familiar with both the PDSS and the students' characteristics. In addition, a group of Form 3 students in each of the sampled PDSS in Tharaka Nithi County comprising of 3 – 7 students willing and available to provide an interview constituted a qualitative group interview sample size. In total, qualitative sample

size comprised of 15 PDSS principals (12 male and 3 female) and 63 Form 3 students (31 male and 32 female), purposively selected based on their willingness and availability to provide an interview. Table 3.1 below indicates a summary of the study population and the sample size.

Table 3.1: Summary of the Study population and Sample size

Tharaka Nithi Sub Counties	Schools/PDSS Principals		Students				Parents/ Guardians			
	Population PDSS	Proportion stratified sample	Population PDSS		Proportion stratified sample		Population PDSS		Proportion stratified sample	
			M	F	M	F	M	F	M	F
Maara	22	5	1969	2258	157	171	1969	2258	157	171
Meru South	21	4	2009	1943	160	147	2009	1943	160	147
Tharaka N	9	2	150	142	12	11	150	142	12	11
Tharaka S	20	4	483	541	39	41	483	541	39	41
Total	72	15	4611	4884	368	370	4611	4884	368	370

Source: Data obtained from CDE Tharaka Nithi County database 2020
Note: M mean Male, and F mean Female

3.7 Research Instruments

Questionnaires, interview schedules and the document analysis guide were research instruments used to aid data collection. Questionnaires were employed because they have the capability to bring together massive information within a short duration of time and space. Respondent anonymity and confidentiality is maintained through use of questionnaires (Fraenkel et al., 2012). The study employed interview schedules since they have ability to collect in depth data in a small group of people establishing subjects' experiences (Orodho, Nzabalirwa, Odundo, Waweru, and Ndayambaje, 2016). Therefore, student questionnaire and interview schedule were administered. Using the document analysis guide, data on

students' school examination mark list for 2019 Form 2 students, form 3 students in 2020 were obtained.

3.7.1 Students' Questionnaire on Predictors of Variations in Academic Achievement

Student questionnaire aimed to collect student data on household characteristics, conduct characteristics and school resource characteristics. It had four sections. Section one was on demographic information, section two on student's academic attainment, section three was on students' household characteristics and section four was on school resources.

3.7.2 Parents' Questionnaire on Predictors of Variations in Students' Academic Achievement

Each of the sampled PDSS Form 3 student's parent or guardian was considered appropriate to provide information on their characteristics. Parent or guardian questionnaire comprised of four parts. Part one was on the parent or guardian support on the student studies in the PDSS, part two was on the parent or guardian education, part three was on the parent or guardian occupation and part four was on parent or guardian approximate income.

3.7.3 PDSS Student Group Interview Schedule

Student group interview schedules collected in-depth data on form 3 students' variations in students' learning outcomes predicted by students' socio-economic, conduct and school resources. The interview schedules comprised of four main

questions from research aims and probe enquiries emanating from each main question. Interview schedule also collected demographic data for the group interview informants.

3.7.4 PDSS Principal Interview Schedule

PDSS principals have a bird's eye view of the functioning of the PDSS and familiar with the schools', students' and parents' characteristics. The study aimed at establishing predictors of variations in students' learning outcomes in PDSS. Thus, as school managers, PDSS principals were key in providing information on the PDSS resources and students' socio-economic characteristics. Their interview schedules comprised of four main questions and probe questions emanating from each main question. Interview schedule also collected demographic data for the PDSS principals in Tharaka Nithi County.

3.8 Validity

3.8.1 Validity of Students' and Parents' Questionnaire

The study ensured face and content validity by seeking the judgement and opinions of experts in educational planning and economics at the department. In addition, content validity was confirmed through literature review to ensure that the items were essential in measuring the study objectives.

3.8.2 Validity of PDSS Principal and Student Group Interview Schedule

In validating the interview schedules, the study presented the developed interview schedules to the experts in research design employed, convergent parallel mixed

research method design, and experts in research field, education learning outcomes, for review. Also, principal interview schedule questions employed probe questions branching from each of the main question. Probe questions provided clarity in terms of the thought process. They were used to generate rich verbatim descriptions.

3.9 Reliability

Research instrument reliability indicates its measurement consistency in different periods of time and items. The study employed test-retest reliability to assess external consistency of the students and parents research questionnaires and inter-rater reliability to assess the internal consistency of specific items measuring research objectives.

In establishing test-retest reliability, the researcher administered the research instrument twice, two different points in time with a time space of two weeks. Consistent with Haradhan (2017), two weeks period in a test-retest interval is large enough that respondents are not likely to be influenced by their first set of responses when they are providing responses to the second test, and it is small enough that their responses are not as a result of change in their condition. Thus, the research instrument was administered to the same individuals randomly sampled; 30 PDSS Form 3 students' and parents' in Tharaka Nithi County. The researcher established the correlation of the two sets of scores using Pearson's Product Moment Correlation Coefficient (PPMCC) Formula. The following formula was used to calculate Pearson's Product Moment Correlation Coefficient (PPMCC):

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[\, n\Sigma x^2 - (\Sigma x)^2 \,][\, n\Sigma y^2 - (\Sigma y)^2 \,]}}$$

Where; r = Pearson's Product Moment Correlation Coefficient.

n = The number of respondents completing the questionnaire.

x = The scores of the first administration.

y = The scores of the second administration after two weeks.

$\sum$ = Summation of

The calculated coefficient (r) for the students' questionnaire was 0.8 and 0.9 for the parents' questionnaires. According to Creswell (2014) if the calculated correlation coefficient is 0.7 and above the research instrument is considered satisfactorily stable. Thus, the students' and parents' questionnaires had external consistency reliability.

Inter-rater reliability was established using Cronbach's alpha measure in items measuring specific research objectives in the students' and parents' research questionnaires. Table 3.2 below summarizes the test results.

Table 3.2: Reliability Test results for Students' and Parents' Questionnaire

S/No.	Variable	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Items per scale	Comments
1.	Student's household characteristics	0.786	0.811	20	Reliable
2.	Student's parental characteristics	0.891	0.897	10	Reliable
3.	Student's conduct characteristics	0.872	0.879	10	Reliable
4.	Student's PDSS resource characteristics	0.837	0.851	18	Reliable

Source: Researcher (2020)

Table 3.2 illustrates that Cronbach alpha for items in research objectives 1, 2, 3 and 4 was 0.786, 0.891, 0.872 and 0.837 respectively, above the threshold of 0.7. According to Haradhan (2017) and Taherdoost (2016), Cronbach alpha values above 0.7 are considered acceptable and satisfactory, 0.8 are considered quiet good and 0.9 are considered to show exceptional internal consistency . Consequently, students' and parents' research questionnaires had reliable internal consistency.

3.10 Pilot Study

Pilot study was done in this study to check if the study participants understood the research questions and the instructions on how they were supposed to respond. On the pilot study sample size, Johanson and Brooks (2010) recommends a pilot study sample size n=10. Thus, the study employed a sample size of n=10 when conducting the pilot study. The researcher distributed research questionnaires to 10 (5 male and 5 female) PDSS Form 3 students and 10 (5 male and 5 female)

parents/guardians of the PDSS Form 3 students selected for the pilot study in Tharaka Nithi County. Pilot study school, students and parents/guardians had comparable features with schools for research, students and parents/guardians. However, the school, students and parents/guardians selected for piloting were excluded from the main study.

Pilot study was found useful in understanding the study participants' experience in their study participation and their recommendations on what needed to be changed in the research instrument and the way the research instrument was administered. The pilot study found that in student questionnaire, students did not clearly understand questions 9, 11, 14 and 15 based on their responses. Also, parents/guardians were found to misinterpret questions 2, and Part 2, 3, and 4 probable options provided. Pilot study findings necessitated seeking of recommendations on these questions from the pilot study participants and thus rephrasing of questions 9, 11, 14 and 15 in students' questionnaire, and questions 2, and Part 2, 3, and 4 questions in the parent/guardian questionnaire. This consequently allowed for the necessary changes in questionnaires and mode of questionnaire administration, which enhanced collection of the required data answering to the study objectives.

3.11 Data Collection Techniques

Collection of both qualitative and quantitative data took place in first term, school calendar period of January-February, 2020. First term of the school calendar, schools are receptive to visitors unlike other terms. The researcher visited each of

the sampled schools each day of data collection and conducted interviews. On the same day, the researcher administered coded research student and parent questionnaires, and also used document analysis guide to review school end of year school examination scores, student enrolment, and number of teachers in each school, terms of employment and qualifications.

3.11.1 Qualitative Data Collection Techniques

Cohen et al. (2007) stresses on the importance of seeking informed consent when collecting data. Thus, permission to collect data from the school principal was sought and the researcher interviewed him or her. In addition, authorisation was sought to make notes throughout the interviewing session and audio record the interview to have whole information provided. More, during tea and or lunch break, the researcher conducted student group interviews constituting of 3 – 7 students from the sample. Consistent with Creswell (2014), group interviews involve unstructured and generally open-ended questions intended to elicit views and opinions from participants. The interview schedules used semi-structured questions to be able to ask additional probe questions so as to analyse the issue in depth and understand the predictors of variations in students' learning outcomes in Tharaka Nithi PDSS.

3.11.2 Quantitative Data Collection Techniques

After obtaining authorisation to give questionnaires to form 3 students from their principal, the researcher administered the questionnaires to sampled form 3 PDSS students in school. Further, the researcher emphasized the need for the students

responding to the questionnaire not to indicate their names on the questionnaire to allow them to be anonymous. Orodho et al. (2016) discusses the significance of anonymity in the ethical planning of research design. It took 20 – 30 minutes for all the sampled students to complete their responses on the questionnaire. Completed parents' questionnaires in each school were picked from the school the following day or day after from the form 3 class teachers.

3.11.3 Document Analysis Data Collection Techniques

Year 2019 class registers for Forms 1 to 4 to were reviewed to identify numeral of students' boys and girls enrolled in respective school, and Form 1 and 2 end of year 2018 and 2019 examination scores respectively. In regard to Cerdeira (2018), school end of year examination mean scores validly estimate national examination mean scores thus, Form 1 and 2 end of year 2018 and 2019 examination scores liken to national examination study base years 2014 – 2018 mean scores. Further, the school administrative documents were examined on number of teachers, their employment position, education qualifications and experience in terms of the number of years served as a teacher. According to Cropley (2015) document analysis provides data verification.

3.12 Data Analysis

Collected quantitative and qualitative data was analysed independently and the results interpreted together.

3.12.1 Quantitative Data Analysis

Using the Statistical Package for the Social Sciences (SPSS) statistics version 25, hierarchical multiple regression was used. Shone (2015) note that hierarchical multiple regression analysis allows control of other factors that affect the dependent variable and make its prediction using one of the factors. The hierarchical multiple regression model used:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \mu$$

Where Y denoted the dependent variable, variations in student's examination scores. Variations in student's examination scores were linearly related to four independent variables. The four independent variables were students' household characteristics, parental/guardian characteristics, conduct characteristics and school resource characteristics. They were operationalized as X_1 (student's household characteristics), X_2 (student's parental characteristics), X_3 (student's conduct characteristics) and X_4 (student's school resources) through the parameters β_1, β_2, β_3 and β_4; β_0 is the intercept. Multiple regression was first performed with the moderator variable, student gender and student primary school attended. Consistent with Tabachnick and Fidell (2013a) hierarchical multiple regression analysis is a sequential process involving the entry of predictor variables in steps and the order of variable entry into the analysis. Consequently, multiple regression was done with a new set of independent variables together with the first step moderator variables allowing estimates of the contributions of the independent

variables to be computed. These steps were repeated until all the independent variables were entered into the regression model.

In modelling relationship between student's household characteristics and examination score dissimilarities, hierarchical multiple regression was employed. A summary of hierarchical regression analysis for students' household characteristics prediction on variations in examination scores partial correlation coefficient was examined to test the hypothesis. In Equation 1, $\beta_{1,}$ was the parameter associated with X_1 (students' household characteristics) and it measured the change in Y (students' examination scores) with respect to X_1, holding other predictor variables constant.

Hierarchical multiple regression was employed in modelling the relationship between student's parental/guardian characteristics and examination score variation. A summary of hierarchical regression analysis for student's parental characteristics prediction on variations in examination scores partial correlation coefficient was examined to test the hypothesis. In Equation 1, $\beta_{2,}$ was the parameter associated with X_2 (student's parental characteristics) and it measured the change in Y (student's examination scores) with respect to X_2, controlling for the other predictor variables.

In modelling the relationship between student's conduct characteristics and variations in student's examination scores, hierarchical multiple regression was employed. A summary of hierarchical regression analysis for student's conduct characteristics prediction on variations in examination scores partial correlation coefficient was examined to test the hypothesis. In Equation 1, β_3, was the parameter associated with X_3 (student's conduct characteristics) and it measured the change in Y (student's examination scores) with respect to X_3, controlling for the other predictor variables. In addition, hierarchical multiple regression was also be used to model the relationship between PDSS resources and variations in student's examination scores, and test the hypothesis. In Equation 1, β_4, was the parameter associated with X_4 (student's school resources) and it measured the change in Y (student's examination scores) with respect to X_4, controlling for the other predictor variables.

The study sought to define significance of the contribution of entire set of independent variables to the dependent variable in the study. The study used hierarchical multiple regression model: $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \mu$. In determining the multiple linear regression, the study sought to establish the unknown parameters β_0, β_1, β_2, β_3, and β_4. More, the study assumed that the μ, error term followed a normal distribution with the mean zero and the variance. Thus, $\mu \approx N(0, \sigma^2)$.

3.12.2 Qualitative Data Analysis

Qualitative data collected through interviews was transcribed and read thoroughly to generate the possible themes. The transcription files were then uploaded to Qualitative Data Analysis (QDA) Miner Lite for open-axial selective coding. Free coding process was employed in the content analysis and then transformed into a tree-code under common themes. Creswell (2014) points that research uncover meaning of lived experiences of research informants through emerging themes and patterns in the data. The QDA Miner Lite enabled the views generated by various informants on the student's socio-economic, conduct and school resources relation to variations in examination scores in PDSS to be compared thematically.

3.12.3 Convergence and Discussion of Quantitative and Qualitative Analysis Findings

During comparison, relation and interpretation, both the quantitative and qualitative data results were converged. Although the two types of data were examined autonomously, comparisons, relations and interpretations of the findings were made collectively. The comparison, relation and interpretation of both qualitative and quantitative data allows exploration of database discussion of the results (Creswell, 2014). Direct quotes able to highly represent participant's views were chosen for the reporting of the hierarchical multiple regression findings for each objective and the predictability findings presented on the tables. The interpretations drawn from research findings were discussed.

3.13 Logistical and Ethical Considerations

Cohen et al. (2007) points that logistics considerations are not enough and that research purposes, content, method, reporting and outcome have to abide by ethical principles and practices. Logistical and ethical considerations were observed to ensure the quality and integrity of the research. On logistical concerns, pre-fieldwork logistics were observed. The researcher applied for National Commission for Science, Technology and Innovation research permit in time and obtained it. More, the researcher certified that all the research instruments were ready to be used, work plan and the budget were feasible.

Field logistics considerations were made. Research instruments were aptly administered. Post-fieldwork logistics were ensured through checking completeness of questionnaires immediately after collecting them from the respondents and that the notes taken during the interviews and the recordings were clear. The researcher numbered completed questionnaires and interview notes appropriately. Orodho et al. (2016) recommend questionnaires numbering in readiness for coding and analysis.

To uphold ethical considerations; participation of the respondents was on voluntary basis. Since Form 3 students are under 18 years, thus children, consent of having them participate in the study was first sought from their school principal after which their own consent was also sought before their participation in accordance to Cohen et al. (2007) endorsement. The study did not indicate the names of the schools, principals and students to enhance anonymity and confidentiality.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, AND DISCUSSION

4.1 Introduction

This chapter presents the data, analysis, discussion of findings and interpretation guided by the study objectives and hypotheses. The overall purpose of this study was to model the relationship between students' household, parental/guardian, conduct and school resource characteristics and academic achievements in PDSS in Tharaka Nithi County. It also endeavoured to investigate how predictors of variations in student's learning outcomes relate.

The study objectives were to: -

i. Model the relationship between student's household characteristics and variations in examination scores in Tharaka Nithi County PDSS
ii. Model the relationship between student's parental/guardian characteristics and variations in examination scores in Tharaka Nithi PDSS
iii. Model the relationship between student's conduct characteristics and variations in examination scores in Tharaka Nithi County PDSS
iv. Model the relationship between the PDSS resources and variations in examination scores in Tharaka Nithi County

The study hypotheses tested included:

H_{O1}: There is no statistically significant relationship between student's household characteristics and variations in student's examination scores in Tharaka Nithi County PDSS.

H_{O2}: There is no statistically significant relationship between student's parental/guardian characteristics and variations in student's examination scores in Tharaka Nithi County PDSS.

H_{O3}: There is no statistically significant relationship between student's conduct characteristics and variations in student's examination scores in Tharaka Nithi County PDSS.

H_{O4}: There is no statistically significant relationship between PDSS resources and variations in student's examination scores in Tharaka Nithi County.

4.2 General and Demographic Information

General information on administered research instruments, questionnaires and interview schedules return rate from the sampling unit (Sub-Counties), and demographic characteristics of research subjects is provided. It also provides description of variations in students' examination scores.

4.2.1 Questionnaires Administered Return Rate

The study targeted to administer 1,476 questionnaires (736 males and 740 females) to both students and parents/guardians in Tharaka Nithi PDSS as per the calculated sample. However, during the actual data collection, the researcher received 1,464 questionnaires (696 males, 695 females and 73 not indicated gender) from both students and parents in Tharaka Nithi PDSS. The questionnaires received included 738 questionnaires from students, of which 352 were from male students, 353 from female students and 33 had no indication of whether from male or female student.

Table 4.1 illustrates complete student questionnaires return rate in each sub-County.

Table 4.1: Students' Questionnaires Return Rate

Tharaka Nithi Sub Counties	Sampled PDSS	Sampled PDSS Form - 3 Students		Actual Study Respondent PDSS Form - 3 Students		Percentage Response Rate per Gender		Returned Questionnaires indicated Gender	Return Rate %
		M	F	M	F	M	F		
Tharaka North	2	12	11	12	10	100	90.9	22	95.7
Tharaka South	4	39	41	34	37	87.2	90.2	71	88.8
Meru South	4	160	147	149	141	93.1	95.9	290	94.5
Maara	5	157	171	157	165	100	96.5	322	98.2
Total	15	368	370	352	353	95.7	95.4	705	95.5

Source: Study Data (N = 705)

Table 4.1 illustrates that 705 (95.5%) student questionnaires were found complete. It also shows that overall, slightly more female students 353 (50.1%) than male 352 (49.9%) had complete questionnaires. This could be explained by a slightly bigger female students' sample than male. Albeit, in regard to gender, slightly more male students 352 (95.7%) than female 353 (95.4%) completed responding to questionnaires and indicated their gender. Thus, slightly more male students than female students indicated their gender on their questionnaires.

Maara sub-County had the highest questionnaires indicated student gender 322 (98.2%) while Tharaka South sub-County had the least 71 (88.8%) questionnaires indicated student gender. In each of the sub-Counties, return rate of complete student questionnaires indicated student gender was more than 85%. Indication of student gender on the student questionnaire was significant since in this study it indicated moderating variable. Thus, as a moderating variable in the study, student gender was controlled for when modelling the relationship between predictors of variations and variations in examination scores.

Moreover, the researcher received 726 questionnaires from parents, of which 344 were from male parents, 342 from female parents and 40 had no indication of whether from male or female parent. Like in student questionnaires, some parents and or guardians had not completed their questionnaires and had not indicated their gender. Table 4.2 illustrates parents/guardians return rate of the questionnaires administered per sub-County.

Table 4.2: Parents'/Guardians' Questionnaires Return Rate

Tharaka Nithi Sub Counties	Sampled PDSS	Sampled PDSS Form - 3 Students' Parents	Actual Study Respondent PDSS Form - 3 Students' Parents		Percentage Response Rate per Gender		Returned Questionnaires indicated Gender		Return Rate %
		M	F	M	F	M	F		
Tharaka North	2	12	11	12	8	100	72.7	20	90.9
Tharaka South	4	39	41	31	35	79.5	85.4	66	82.5
Meru South	4	160	147	148	140	92.5	95.2	288	93.8
Maara	5	157	171	153	159	97.5	93.0	341	95.1
Total	15	368	370	344	342	93.5	92.4	686	93.0

Source: Study Data (N = 686)

Table 4.2 shows that 686 (93.0%) parent questionnaires were found complete. Furthermore, slightly more male parents/guardians 344 (93.5%), than female parents/guardian 342 (92.4%) had complete questionnaires. Parents/guardian gender indication in this study was significant since it was one of the indicators of parental/guardian characteristics. Parent questionnaires found complete were 2.5% slightly less compared to student questionnaires, as depicted in Table 4.1. This could be explained by the fact that compared to students, most parents or guardians are busy trying to meet their family needs thus some parents could not find time to respond to the questionnaire. Besides, female parents/guardians compared to their male counterparts, are believed to be most of the time overwhelmed by the household chores and to have little time to attend to their children school work (Aye et al., 2016).

Maara sub-County, like in the case of students' questionnaire return rate, had the highest number of complete questionnaires indicated parent gender 341 (95.1%) while Tharaka South sub-County had the least 66 (82.5%). In each of the sub-Counties, return rate of complete parent/guardian questionnaires was more than 80%. Both the students and parents/guardians questionnaire return rate was more than 80%. Consistent with Fincham (2008), response rates greater or equal to 80% are standard and should be anticipated. During data cleaning, 33 questionnaires from students and 40 questionnaires from parents were discarded mainly due to incomplete responses. The study analysed complete questionnaires only.

4.2.2 Interview Informants

Face to face individual and group interviews were conducted. The sampled PDSS principals were individually interviewed while the students were interviewed in groups of 3 – 7 from the selected student sample in each school. A summary of the study interview informants is depicted in Table 4.3.

Table 4.3: Summary of the Study Interview Informants

Tharaka Nithi Sub Counties	Sampled PDSS	Students in the Group Interviews		Total Number of Students in the Group Interviews	PDSS Principals		Total Number of PDSS Principals	Interview Informants
		M	F		M	F		
Tharaka North	2	3	4	7	2	0	2	9
Tharaka South	4	8	8	16	3	1	4	20
Meru South	4	8	9	17	3	1	4	21
Maara	5	12	11	23	4	1	5	28
Total	15	31	32	63	12	3	15	78

Source: Study Data (N = 78)

Table 4.3 depicts that a total of 15 PDSS principals and 63 students participated in the study interviews. It also shows that most of the PDSS principals in the sampled schools were males. Table 4.3 illustrates that almost equal number of boys and girls participated in the study student group interviews.

4.2.3 Demographic Characteristics of Study Participants

This data was obtained to describe the study sample characteristics in the quantitative and qualitative data. On the quantitative data sample, student's

characteristics such as the gender, category of school they attended at primary level, year they did their KCPE, their scores and their relationship with their caregiver were cross-tabulated according to the sub-Counties. On the qualitative data sample, PDSS principal characteristics such as the level of education, years of experience as a teacher were analysed.

Student's gender illustrated in Table 4.1, and student's primary school category attended before enrolment in secondary school indicated a moderating variable. Thus, student's indication of primary school category they attended before being enrolled in PDSS was significant in demonstrating moderating variable. In this study, the moderating variable was controlled for when modelling relationship between predictors of variations in students' examination scores and variations in examination scores. Table 4.4 shows a summary of the category of primary school PDSS students attended.

Table 4.4: Students' Primary School Category

Tharaka Nithi Sub Counties	Public Day Primary School		Private Day Primary School		Public Boarding Primary School		Private Boarding Primary School		Total	
	F	%	F	%	F	%	F	%	F	%
Tharaka North	20	90.9	0	0.0	2	9.1	0	0.0	22	100.0
Tharaka South	68	95.8	0	0.0	2	2.8	1	1.4	71	100.0
Meru South	283	97.9	1	0.3	3	1.0	2	0.7	289	100.0
Maara	321	99.4	1	0.3	1	0.3	0	0.0	323	100.0
Total	692	98.2	2	0.3	8	1.1	3	0.4	705	100.0

Source: Students' Questionnaire (N = 705)

Table 4.4 illustrates that majority of the students, 692 (98.2%) in the PDSS attended public day primary school for their primary education. Nevertheless, in Tharaka North 2 (9.1%) and Tharaka South 2 (2.8%), sub-Counties had a greater proportion of students who attended public boarding primary school for their primary education compared to Meru South and Maara sub-Counties. Furthermore, in Tharaka South, 1 (1.4%) student attended a private boarding primary school. According to Wakwabubi et al. (2016), category of primary school attended by students for primary education influence student's KCPE examination performance and transition to secondary education.

Since students in PDSS attended different categories of primary schools before they were enrolled in the PDSS, there was need to control for the influence of student's primary school category attended when modelling predictors of variations in learning outcomes. Also, the study sought to find the year PDSS students did their KCPE to determine if the students did the same KCPE examination. Table 4.5 shows a summary of the year PDSS students did their KCPE.

Table 4.5: Year Students Did KCPE

Tharaka Nithi Sub Counties	2013		2014		2015		2016		2017		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
Tharaka North	0	0.0	0	0.0	1	4.5	3	13.6	18	81.8	22	100.0
Tharaka South	0	0.0	1	1.4	0	0.0	14	20.3	54	78.3	69	100.0
Meru South	2	0.7	1	0.3	7	2.4	31	10.7	249	85.9	290	100.0
Maara	1	0.3	1	0.3	5	1.5	31	9.6	286	88.3	324	100.0
Total	3	0.4	3	0.4	13	1.8	79	11.2	607	86.1	705	100.0

Source: Students' Questionnaire (N = 705)

Table 4.5 show most PDSS schoolchildren, 607 (86.1%) in all the Tharaka Nithi sub-Counties did their KCPE in year 2017. Thus, majority of PDSS students sampled for the study did their KCPE examination the same year and had not repeated classes. This could be as a result of the government directive on 100% primary to secondary school transition after KCPE examination (Republic of Kenya, 2015b).

Nevertheless, Table 4.5 also depicts that Tharaka North and South sub-Counties, 3 (13.6%) and 1 (20.3%) respectively, had a greater proportion of students who had done their KCPE in earlier years compared to Meru South and Maara sub-Counties. These students could have repeated class eight at primary school or some classes in secondary school because of many reasons some of which could be poor performance in KCPE examination. This study perceived performance in PDSS student's KCPE examination as a measure of student's intelligence which indicated student's conduct characteristics. As a result, this study further sought to establish the PDSS students' KCPE scores. Table 4.6 depict PDSS students' KCPE scores.

Table 4.6: Students' KCPE Scores

Tharaka Nithi Sub Counties	100-150 Marks		151-200 Marks		201-250 Marks		251-300 Marks		301-500 Marks		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
Tharaka North	0	0.0	1	4.5	8	36.4	10	45.5	3	13.6	22	100.0
Tharaka South	1	1.4	2	2.8	25	35.2	36	50.7	7	9.9	71	100.0
Meru South	0	0.0	12	4.2	128	44.9	112	39.3	33	11.6	285	100.0
Maara	1	0.3	54	16.5	152	46.5	91	27.8	29	8.9	327	100.0
Total	2	0.3	69	9.8	313	44.4	249	35.3	72	10.2	705	100.0

Source: Students' Questionnaire (N = 705)

Overall, Table 4.6 shows that most students, 313 (44.4%) had their KCPE scores ranging between 201 – 250 marks out of the possible 500 marks. This showed that most students attending PDSS had below average KCPE mean scores. Maara sub-County had the highest proportion, more than half, 207 (63.3%) students with KCPE mean scores below average. Albeit, Tharaka South sub-County had half of the students, 36 (50.7%) with KCPE scores ranging between 251 – 300 marks above average. Compared to other sub-Counties, Tharaka South had highest proportion of students in PDSS with KCPE scores ranging between 251 – 300 marks, above average. To establish if there were statistically significant differences between students KCPE mean scores in different sub-Counties, one-way analysis of variance (ANOVA) was used to test homogeneity of variances. Table 4.7 below illustrates the findings.

Table 4.7: Students' KCPE Mean Scores Test of Variances Homogeneity

Levene Statistic	df1	df2	Sig.
.876	2	688	.043

Source: Students' Questionnaire (N = 705)

Table 4.7 illustrate F value for the Levene's test is (F = .876, p = .043). The significance value is smaller than p = .05. Thus, significant difference in student's KCPE mean scores between sub-Counties in Tharaka Nithi County. As a result, the student sample in different sub-Counties in Tharaka Nithi County had significant intelligence differences based on KCPE mean scores. According to UIS (2018), students differences in intelligence predicting variations in examination scores indicate equality of opportunity in attainment of quality education learning outcome. However, UIS (2018) further elaborate that students differences in

parental/guardian characteristics, school resource characteristics and household characteristics predicting variations in examination scores undermine equality of opportunity in attainment of quality education learning outcome. As demographic information, the study sought to establish the PDSS students' caregiver relationship, an indicator of parental/guardian characteristics.

A student caregiver can either be a parent/guardian and they manage student's affairs at home (Thuba, 2018). In this study, student caregiver is the person who manages the needs of the student most of the time at home as either a parent or a guardian. In this study, a parent can be a mother or father and the student is the biological child while the guardian is not the biological parent but takes care of the student as a mother or a father. Student's caregiver relationship in this study is one of the indicators of the student's parental/guardian characteristics. Parents/guardians who also were student's caregiver indicated their relation with the sampled PDSS student. The study thus sought to establish the PDSS student's caregiver relationship in Tharaka Nithi County. Table 4.8 illustrate the results.

Table 4.8: Student's Caregiver Relationship

Tharaka Nithi Sub Counties	Mother		Father		Guardian mother		Guardian father		Total	
	F	%	F	%	F	%	F	%	F	%
Tharaka North	9	45.0	4	20.0	6	30.0	1	5.0	20	100.0
Tharaka South	20	30.3	29	43.9	8	12.1	9	13.6	66	100.0
Meru South	145	50.3	74	25.7	16	5.6	53	18.4	288	100.0
Maara	132	42.3	92	29.5	32	10.3	56	17.9	312	100.0
Total	306	44.6	199	29.0	62	9.0	119	17.3	686	100.0

Source: Parent/Guardian Questionnaire (N = 686)

Table 4.8 illustrate that majority of the parents/guardians who also were student's caregiver, 306 (44.6%) indicated that they were student's mother. Meru South sub-County had the highest proportion 145 (50.3%) of the parents/guardians who indicated that they were student's mother. Tharaka South sub-County had highest proportion 29 (43.9%) of the parents/guardians who indicated that they were student's father. Additionally, Tharaka North sub-County had highest proportion 6 (30.0%) of the parents/guardians who indicated that they were student's guardian mother. Meru South sub-County had highest proportion 53 (18.4%) of the parents/guardians who indicated that they were student's guardian father. Overall, slightly more than a quarter, 181 (26.4%) of the parents/guardians who also were student's caregiver, indicated that their relationship with the student was a guardian mother and guardian father. Thus, more than a quarter of the student's sample had a caregiver who was not a biological parent. According to Thuba (2018) students' caregiver relationship determined support a student received from home in attainment of quality secondary education.

In PDSS, the principal manages the needs of the students. PDSS principal is a senior teacher and a school manager. In this study, PDSS principal characteristics comprised one of the indicators of PDSS teaching staff qualifications which also showed PDSS resource characteristics. The study sought to establish the PDSS principal characteristics in Tharaka Nithi County. Table 4.9 depict the findings.

Table 4.9: PDSS Principals' Characteristics

Tharaka Nithi Sub Counties	Highest Level of Academic Qualification			Professional Qualification from Kenya Education Management Institute (KEMI)	Number of years' experience as a teacher (Mean years)	Number of years' experience as a PDSS Principal (Mean years)
	Diploma in Education	Bachelor of Education Degree	Masters of Education Degree			
Tharaka North	0 (0.0%)	2 (13.3%)	0 (0.0%)	1 (6.7%)	11.5	6.5
Tharaka South	0 (0.0%)	3 (20.0%)	1 (6.7%)	3 (20.0%)	17.3	8.8
Meru South	1 (6.7%)	3 (20.0%)	0 (0.0%)	2 (13.3%)	15.0	3.8
Maara	1 (6.7%)	4 (26.7%)	0 (0.0%)	1 (6.7%)	20.4	6.2
Total	2 (13.3%)	12 (80.0%)	1 (6.7%)	7 (46.7%)	16.9	6.3

Source: Principal Interview Schedule (N = 15)

Table 4.9 shows that most PDSS principals 12 (80%) were bachelor of education degree holders. It was the peak academic qualification for most principals. Therefore, majority of the PDSS principals' academic qualifications compared. Nonetheless, PDSS principals differed in their attainment of professional qualifications and mean years of service experience as teachers. Among the PDSS in the Tharaka Nithi County sample, only 7 (46.7%) had attained professional qualification from Kenya Education Management Institute (KEMI). Maara sub-County had the highest mean years' (20.4 years) of PDSS principals' service as teachers. Among the sub-Counties in Tharaka Nithi County, Meru South had the least number of mean years' experience, (3.8 years) of the principals in PDSS. Musau and Abere (2015) observed that senior teacher in-service professional course qualifications and increased years of experience improved students' examination performance. Consequently, this study endeavoured to establish variations in PDSS, and the PDSS students' examination scores given the

differences in PDSS principals' attainment of professional qualifications and mean years of service experience as teachers.

4.2.4 Variations in PDSS and PDSS students' examination scores

In this study, examination scores conceptualized as the student's learning outcomes were the study dependent variable. Both PDSS and PDSS students' learning outcomes were indicated by students' end of year examination mean scores in forms 1 and 2. Variations in PDSS examination scores were computed from end of year examination mean scores in forms 2 and 1 in each of the sampled PDSS across the four Tharaka Nithi sub-Counties. Thus, Table 4.10 presents variations in PDSS examination scores in Tharaka Nithi sub-Counties.

Table 4.10: PDSS Variations in examination scores

Tharaka Nithi Sub Counties	Dropped More Than 1 Point (D > 1 point)		Equal to or Dropped Less Than 1 Points (D ≤ 1 point)		Equal to or Added Less Than 1 Point (A ≤ 1 point)		Added More Than 1 Points (A > 1 point)		Total Number of Schools	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Tharaka North	0	0.0	1	50.0	1	50.0	0	0.0	2	100
Tharaka South	1	25.0	2	50.0	1	25.0	0	0.0	4	100
Meru South	0	0.0	3	75.0	0	0.0	1	25.0	4	100
Maara	1	20.0	2	40.0	1	20.0	1	20.0	5	100
Total	2	13.3	8	53.3	3	20.0	2	13.3	15	100

Source: Document Analysis Guide (N = 15)

Table 4.10 shows that most PDSS, 8 (53.3%) had a one (1) point or less equal to or drop, (D ≤ 1 point) in the students' form 2 end of year examinations from form 1 end of year examinations. However, PDSS in Meru South and Maara sub-Counties had PDSS with an addition of more than one (1) point, (A > 1 point). These findings denoted variations in Tharaka Nithi County PDSS learning outcomes. In reference

to Table 4.4 on category of primary school attended by the PDSS students, both Meru South and Maara sub-Counties had highest proportion, 283 (97.9%) and 321 (99.4%) respectively, of PDSS students who indicated that they attended public day primary school. Also, in reference to Table 4.5 on the year students did KCPE examination, Meru South, 249 (85.9%) and Maara, 286 (88.3%) sub-Counties had highest proportion of students who indicated that they did their KCPE examination in the same year, (2017). Thus, the study further sought to establish PDSS students' variations in examination scores.

PDSS students' variations in examination scores were computed from end of year examination mean scores in forms 2 and 1. PDSS students' variations in examination scores were employed in the study to model relationship between students' household characteristics, parental/guardian characteristics, conduct characteristics, school resource characteristics and learning outcomes in PDSS in Tharaka Nithi County. Table 4.11 depict PDSS students' variations in examination scores across Tharaka Nithi County.

Table 4.11: PDSS Students' Variations in examination scores

Tharaka Nithi Sub Counties	Dropped More Than 5 Points (D > 5 points)		Equal to or Dropped Less Than 5 Points (D ≤ 5 points)		No change in points (C = 0 points)		Equal to or Added Less Than 5 Points (A ≤ 5 points)		Added More Than 5 Points (A > 5 points)		Total number of Students	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Tharaka North	13	59.1	4	18.2	4	18.2	1	4.5	0	0.0	22	100
Tharaka South	8	11.3	38	53.5	10	14.1	15	21.1	0	0.0	71	100
Meru South	1	0.4	146	51.2	61	21.4	47	16.5	30	10.5	285	100
Maara	24	7.3	144	44.0	62	19.0	74	22.6	23	7.0	327	100
Total	46	6.5	332	47.1	137	19.4	137	19.4	53	7.5	705	100

Source: Students' Questionnaire (N = 705)

Table 4.11 illustrates, almost half of the students 332 (47.1%) had equal to or had dropped less than 5 points in examination scores. Thus, half of the students had dropped in their form 2 end of year examinations from their form 1 end of year examinations with 5 points or less. This finding compared with the findings demonstrated in Table 4.10 which showed that most PDSS, had a one (1) point or less drop, in the students' form 2 end of year examinations from form 1 end of year examinations.

Maara sub-County had most, 74 (22.6%) of the students who had improved in their examination scores with at most 5 points, $A \leq 5$ and Meru South sub-County with the most, 30 (10.5%) improved students, $A > 5$ points, added more than 5 points. These findings further related to results depicted in Table 4.10 which illustrated that PDSS in Meru South and Maara sub-Counties had PDSS with an addition of more than one (1) point. Tharaka North sub-County had majority, 13 (59.1%) of student who had the most drop of more than 5 points, $D > 5$ points. The finding related to the finding presented in Table 4.10 depicting that among the PDSS in Tharaka North, half of the PDSS had a one point or less drop in students' form 2 end of year examinations from form 1 end of year examinations. Notwithstanding, Table 4.9 depicted that all PDSS sampled in Tharaka North sub-County, had principals with a bachelor of education degree and had highest number of years' experience as PDSS principals. This finding differed from Musau and Abere (2015) observation that senior teacher in-service professional course qualifications and increased years of experience improved students' examination performance.

The study further sought to establish descriptive statistics of the PDSS students' variations in examination scores computed from end of year examination mean scores in forms 2 and 1. This was done to provide summaries of the PDSS students variations in examination scores as the measure of the learning outcomes and study dependent variable. Table 4.12 depict the findings.

Table 4.12: Description of variations in students' examination scores

	Statistic
Mean	-.913
Std. Deviation (SD)	1.696
Minimum	-6
Maximum	5
Range	11
Skewness	.168
Kurtosis	.669

Source: Students' Questionnaire (N = 705)

Table 4.12 shows a standard deviation value greater than one, (SD = 1.696), denoting that variation values in students' examination scores were further away from the Mean (-0.913). Thus, differences in PDSS students' examination scores were spread from the mean. This finding agrees with findings illustrated in Table 4.11 on PDSS students' learning outcomes variations which showed that more than half of the students dropped in examination scores while more than quarter of the students improved in their examination scores. Even though, Table 4.12 show that students' variations in examination scores are normally distributed, given the skewness of 0.168 and a Kurtosis of 0.669. This implies that most of the PDSS students' variations in examination scores were near the mean than the variations in examination scores spread from the mean. According to Hair et al. (2017) normally distributed data has both the skewness and kurtosis values less than +1

but greater than -1. Data in Table 4.12 revealed that the variation in students' examination scores range was 11 with highest drop (minimum) of 6 points and highest gain (maximum) of 5 points.

4.2.5 Tested assumptions in Hierarchical multiple regression

According to Creswell, 2014; Tabachnick and Fidell (2013a) when running a hierarchical multiple regression data needs to be assessed if it meets at least six assumptions to ensure that the study analysis is reliable and valid. Prior to performing the hierarchical multiple regression, the assumptions in hierarchical multiple regression were assessed. They included: linearity in relation of independent variables and dependent variable; multicollinearity; residual values independence; homoscedasticity; normal distribution of the values of the residuals and the presence of the outliers in the data.

Assumption 1: The relationship between the independent variables and the dependent variable is linear. The study established a linear relationship between student's household characteristics, parental/guardian characteristics, student conduct characteristics, school resource characteristics and the variations in the examination scores. This implies that when student's household characteristics, parental/guardian characteristics, student conduct characteristics, school resource characteristics are enhanced; variations in the examination scores are also enhanced. Assumption 2: There was no multicollinearity. The study established that there was no high intercorrelations between student's household characteristics, parental/guardian characteristics, student conduct characteristics

and school resource characteristics. Thus, student's household characteristics, parental/guardian characteristics, student conduct characteristics and school resource characteristics were not too highly correlated with each other.

Assumption 3: The values of the residuals are independent. The study found that the difference between the observed value of the dependent variable and the predicted value (residual), could not predict the next residual. This implies that the difference between observed value of the variations in student's examination score and the predicted variations in student's examination score; could not predict the next difference between observed value of the variations in student's examination score and the predicted variations in student's examination score. Assumption 4: The variance of the residuals is constant showing homoscedasticity. The study established that the error term was the same across all values of the independent variables. This implies that the disturbance in the relationship between the predictors of variations and the variations in the examination scores were equal to all the values of the predictors of variations.

Assumption 5: The values of the residuals are normally distributed. The study found a Normal P-P plot for the school resource characteristics, student conduct characteristics, parental/guardian characteristics and students household characteristics prediction model. Thus, the data points lie close to the diagonal line indicating normal distribution of the residuals. Assumption 6: There are no influential outliers. The study established that there were no individual cases that unduly influenced the model. This implies that all the predictors of variations and

the variations of the examination score values were within the series. All the six hierarchical multiple regression assumptions were met and Appendix vi illustrates the findings.

4.3 Relationship between student's household characteristics and variations in examination scores

The first objective of this study was on modelling relationship between student's household characteristics and variations in examination scores. In analysing quantitative data relating to this objective, hierarchical multiple regression analysis was employed in modelling the relationship between student's household characteristics and variations in student's examination scores controlling for predictor variables. Qualitative data relating to this objective was thematically analysed to further establish the model of the relationship between student's household characteristics and variations in examination scores. The quantitative and qualitative analysis findings, were compared, related and interpreted together.

4.3.1 Student's household characteristics Indicators

Student's household characteristics in this study refer to the features of a dwelling with one or more people living together and sharing resources. As a variable in this study, student's household characteristics, was operationalized by analysing indicated family size, residence, Coping Strategy Index (CSI) and wealth approximation. Students indicated their family size (number of people who eat, drink and sleep in their household), residence (household proximity to the social amenities and school they attended), Coping Strategy Index (CSI) (food availability in the household), and wealth approximation (availability of assets in

the household). Table 4.13 illustrates mean (M), standard deviation (SD), skewness (SK) and kurtosis (Kur) of the indicators of students' household characteristics.

Table 4.13: Student's household characteristics Indicators

Indicators	N	Mean (M)	Std. Deviation (SD)	Skewness (SK)	Kurtosis (Kur)
Students residence	705	1.82	.640	.396	-.908
Coping Strategy Index (CSI)	705	5.39	2.535	-.579	-1.139
Wealth approximation	705	2.03	1.022	.946	-.600
Family size	705	1.67	.519	-1.245	.525
Computed Students household characteristics	705	2.73	1.993	-.431	-.630

Source: Students' Questionnaire (N = 705)

The results presented in Table 4.13 show that computed students' household characteristics were spread far from the mean since standard deviation was greater than 1, (M = 2.73, SD = 1.993). It also illustrates that both the skewness and kurtosis statistics values indicate a normal distribution of the student's indication of their household characteristics (SK = -0.431, Kur = -0.630) less than $\pm$1.0. A normal distribution of the students' indications of their household characteristics indicated that most of their indications clustered near the mean while a few were far from the mean. Thus, although most of the PDSS student's household characteristics compared, some PDSS students' household characteristics varied. All the PDSS principals and students in the group interviews affirmed that most, although not all the PDSS households were poor. This study finding compared with Huisman and Smits (2017) theoretical review findings in 30 developing countries which established that differences in household level factors existed among students.

Table 4.13 further show that students' indication of food availability at their household summarised as the CSI and their wealth approximation indications were also spread far from the mean as shown by a standard deviation greater than 1, (M = 5.39, SD = 2.535) and (M = 2.03, SD = 1.022) respectively. Nevertheless, student's indication of family size distribution is skewed to the left as the SK = -1.245, is greater than -1. This finding indicates that most of the PDSS students' family sizes had a big number of people who ate, drunk and slept in the same household and few family sizes had a small number of people who ate, drunk and slept in the same household. This quantitative finding compared and related with the qualitative finding that most PDSS students' family sizes were large. All the PDSS principals and the students in the group interviews noted that most students in PDSS had large family sizes with more than eight persons. Students' indication of their residence was spread near the mean as shown by a standard deviation less than 1, (M = 1.82, SD = 0.640).

Student's household characteristics pointers indications of students varied in spread, some near and others far from the mean. Some of the student's household characteristics pointers indications were skewed to the left and others were not skewed. Thus, the study sought to establish the inter-relationship between indicators of student's household characteristics to establish if they measured the same construct, in this case student's household characteristics.

4.3.2 Inter-relationship between indicators of Student's household characteristics

Partial correlation analysis was conducted to establish the inter-relationship between indicators of students' household characteristics. The inter-relationship between indicators of students' household characteristics indicated their equivalence and whether they measured the same construct. Table 4.14 demonstrate correlation matrix

Table 4.14: Inter-relationship between indicators of Student's household characteristics

Indicators	1	2	3	4	5
1. Family size	-				
2. Residence	.664*	-			
3. Coping Strategy Index	.708*	.703**	-		
4. Wealth Approximation	.696*	.842*	.879*	-	
5 Computed students household characteristics	.783**	.858**	.891**	.773**	-

*Correlation is significant at $p < .05$ (2-tailed)
**Correlation is significant at $p < .01$ (2-tailed)
Source: Students' Questionnaire (N = 705)

The results in Table 4.14 indicate that the computed students' household characteristic had a strong positive statistically significant correlation with all the indicators at $p < .01$. Furthermore, Table 4.14 show that the correlations between the indicators of students' household characteristics were strong, positive and statistically significant. The strongest correlation was noted between Coping Strategy Index and Wealth approximation which was statistically significant at $p < .05$ since $r = .879$, and $p = .013$). This finding compared and related to the qualitative data finding. All the students in the group interviews and seven PDSS

principals confirmed that students from large family sizes with inadequate resources opted to seek casual jobs to raise enough money for their basic needs such as food. The PDSS principals and fifty-four students in the group interviews also noted that most students in the PDSS did not afford everyday meals in their homes thus the school provided meals at a cost. Thus, confirming a relationship between Coping Strategy Index and Wealth approximation in this study.

Moreover, a statistically strong correlation was also established in the relationship between Residence and Wealth approximation, at $p < .05$ since ($r = .842$ and $p = .021$). The weakest but statistically significant correlation was found between Family size and Residence, at $p < .05$ since ($r = .664$ and $p = .038$). The comparatively high relations of students' household characteristics indicators indicate considerable equivalence thus measured matching concept, students' household characteristics.

4.3.3 Model on student's household characteristics and variations in examination scores

The study modelled relation between student household characteristics and examination score variations. It therefore, controlled for the effect of other predictor variables on the variance of student's examination scores. Hierarchical multiple regression analysis was employed. Table 4.15 illustrates a summary model of students' household characteristics and variations in examination scores.

Table 4.15: Model on student's household characteristics and variations in examination scores

Model[f]	R	R^2	ΔR^2	ΔF	$\Delta df1$	$\Delta df2$	Sig.ΔF
1	.025[a]	.001	.001	.215	2	702	.807
2	.790[b]	.625	.624	116.092	1	701	.000
3	.818[c]	.669	.044	93.053	1	700	.000
4	.931[d]	.868	.199	105.714	1	699	.000
5	.962[e]	.926	.059	555.905	1	698	.000

a. Predictors: (Constant), Category of primary school attended, Gender;
b. Predictors: (Constant), Category of primary school attended, Gender, Students Parental Guardian Characteristics;
c. Predictors: (Constant), Category of primary school attended, Gender, Students Parental Guardian Characteristics, Student Conduct Characteristics;
d. Predictors: (Constant), Category of primary school attended, Gender, Students Parental Guardian Characteristics, Student Conduct Characteristics, School Resource Characteristics;
e. Predictors: (Constant), Category of primary school attended, Gender, Students Parental Guardian Characteristics, Student Conduct Characteristics, School Resource Characteristics, Students Household Characteristics
f. Dependent Variable: Variations in examination scores

Source: Study Data

Table 4.15 illustrates five-stage hierarchical multiple regression model result summary. The model result summary depicted a relationship between student's household characteristics and variations in examination scores after controlling for the effects of other predictor variables. Predictor variables' effect controlled for included moderating variable indicated by student's gender and category of primary school attended, parent/guardian characteristics, conduct characteristics, and school resource characteristics.

Model 1 depicted in Table 4.15 with student gender and category of primary school attended had R value 0.025, thus a positive relationship with variations in

students' examination scores. This implied that being a male or female student and having attended a public, private, public or private boarding primary school contributed to variations in PDSS students' examination scores. However, Model 1 depicted a weak relationship. The R^2 (0.001 or 0.1%) was not statistically significant at F (2, 702), p >.05. This shows that the first set of predictors (student gender and category of primary school attended) although contributing to 0.1% of variations in PDSS students' examination scores could not predict variations in students' examination scores. Holding constant the contribution of other predictor variables on the variations of students' examination scores in the EPF model, this model meets Rawls theory of justice difference principle. Notwithstanding, a positive relationship between student gender, category of primary school attended and variations in students' examination scores was observed and needed to be controlled for. Student's parental/guardian characteristics, a construct in the EPF model was added to Model 1, resulting to Model 2.

Model 2, was an improvement over the earlier Model 1, with three predictor variables (Category of primary school attended, Gender and Students' Parental Guardian Characteristics) and an R of 0.790 and change of R^2, 0.624. The change in R^2 was statistically significant at F (1, 701) = 116.092, p < .01. Student's parental/guardian characteristics could therefore account for 62.4% of the variance in students' examination scores in this model. However, other predictor variables of variations in student's examination scores had not been controlled for thus the variance in students' examination scores in this model could also be attributed to

them. Student's conduct characteristics, a construct in the EPF model was added to Model 2, resulting to Model 3.

Model 3, was also an improvement over the earlier Model 2. It had four predictor variables (Category of primary school attended, Gender, Students Parental Guardian Characteristics and Student Conduct Characteristics), and an R value 0.818, with a change in R^2 (0.044 or 4.4%). The change in R^2 was significant at F (1, 700) = 93.053, $p < .01$. Thus, student conduct characteristics in the model could account for 4.4% of variance. Students' examination scores variance of 4.4% accounted for by student's conduct characteristics when all the other predictor variables of variations in student's examination scores are controlled for would evidence equality of opportunity in attainment of PDSS learning outcomes. This was however not the case in this model as all the predictor variables of variations in students' examination scores had not been controlled for. School resource characteristics, a construct in the EPF model was added to Model 3, resulting to Model 4.

Model 4 was improved Model 3. It had five predictor variables (Category of primary school attended, Gender, Students Parental Guardian Characteristics, Student Conduct Characteristics, and School Resource Characteristics), with R value 0.931. A change in R^2 (0.199 or 19.9%) was significant at F (1, 699) = 105.714, $p < .01$. Thus, School Resource Characteristics in the model could account for 19.9% of the variance. Nevertheless, student household characteristics

had not been controlled for thus the variance in students' examination scores in this model could also be attributed to this predictor variable.

Model 5 had student household characteristics thus all the six predictor variables (Category of primary school attended, Gender, Students Parental Guardian Characteristics, Student Conduct Characteristics, School Resource Characteristics, Students Household Characteristics). The R value 0.962, had a change in R^2 (0.059 or 5.9%) significant at $F(1, 698) = 555.905$, $p < .01$. Thus, controlling for all the other predictor variables, Students Household Characteristics in this model account for 5.9% of variance in students' examination scores. This study thus established that differences in PDSS student's household characteristics contributed to variations in student's examination scores. Contribution of Students household characteristics to variations in students' examination scores, violates Rawls theory of justice difference and equality of opportunity principles in this model. Rawls theory of justice difference principle supports differences in outcomes are not accounted for by factors beyond individual control. Equality of opportunity principle also supports that all individuals have equal rights to quality outcomes irrespective of their household characteristics. This model finding was echoed in the qualitative data findings. Qualitative data findings revealed that all the student's household characteristics indicators (family size, residence, Coping Strategy Index (CSI) and wealth) were attributed to the differences in students' examination scores in all the Tharaka Nithi sub-County PDSS.

All the PDSS principals and the students in the group interviews reported that students' family sizes contributed to the differences in students' examination scores when the family had inadequate resources. Although PDSS students from large family size were observed to perform poorly compared to students from small family size, PDSS students from large family size households with more wealth approximations were found to perform equally well with PDSS students from small family size. This finding concurred with Azumah et al. (2017) case study in Kumasi Ghana which reported that large family sizes with financial problems enrolled students late in school and students performed poorly. However, unlike Azumah et al. (2017) study, the present study employed convergent parallel mixed methods research design to establish the relationship between students' household characteristics and their differences in examination scores.

All the PDSS principals and students in the group interviews noted that PDSS students from poor households lacked a supportive study environment. Thirteen PDSS principals and fifty-nine students in the group interviews stated that the homes of most PDSS students from poor households lacked lighting equipment at night to help students do their school assignment leading to poor performance in their examinations. One PDSS principal stated the following:

> Some students' homes lack lighting at night therefore they are not able to do teachers' assignments, they also lack a seat or a chair for the student to work on, such students perform poorly in school and their examination scores are always lower than of those who have proper lighting in their homes at night (PDSS Principal 9, 2020).

These present study findings do not compare with Kariuki (2017) research findings which established lack of association between family characteristics

operationalized as household characteristics and form two students' achievement motivation in Nairobi County slum areas. However, participants of the present study were all form 3 students in the Kenyan rural set up unlike the participants in Kariuki's study who were from an urban set up. Thus, a comparison of different set up participants, for instance among the urban and rural setup of students in form 2 and form 3 is more likely to yield different results.

Student's residence was found to contribute to differences in PDSS students' examination scores. Students residing near town centres were observed to have lower examination scores compared to those who resided far from the town centres. Consistent with the thirteen PDSS principals and sixty students in the group interviews, most students whose households were far from the school did better in their examination scores compared to those students whose households were near the school. In line with eleven PDSS principals and forty-two students in the group interviews, most of the students whose home was near the school were found to sneak from school anytime of the day and go to their homes. These students were found to miss some lessons thus perform poorly in their overall examination performance. One PDSS student in the group interview stated the following:

> Most of my friends residing near the school do not do well in their examinations because during the day they run away from school and go home. Sometimes they come back and other times they do not come back to school until the following day. (PDSS Student Group Interview 5, 2020).

These findings related to Wodtke (2016) findings on analysis of circumstantial reading and mathematics capabilities among the adolescents. Wodtke (2016) found

alterations in students' inhabited zones, noting influence on their education attainment. According to Wodtke (2016), students from disadvantaged neighborhood compared to those from advantaged neighborhood and had better achievement in reading and mathematics achievements.

PDSS student's household coping strategy index and wealth approximation were observed to contribute to differences in PDSS students' examination scores. All the PDSS principals and students in Tharaka North and Tharaka South sub-Counties during the interviews noted that students' households with small wealth experienced difficulty in having sufficient food for every household member. PDSS principals in Tharaka North and Tharaka South Sub-Counties affirmed that their schools received one bag of maize and beans food donation on termly basis through the school feeding programme government support. However, they noted that the food donation was not sufficient for all the students in their school. According to these principals, the received food donation did not cushion students from lunch cost expenses since most students could also not afford carrying food from their homes to school. Moreover, government intervention on provision of PDSS in ASALs with food failed to deter the influence of PDSS students' differences in household characteristics on variations in examination scores. These findings reinforced Gustafsson et al. (2018) analysis findings which established that student's socio-economic status were the strongest determinant of the differences in students educational achievement. Gustafsson et al. (2018) analysis operationalized student's socio-economic status as household size and income.

4.3.4 Hypothesis Testing on relationship between student's household characteristics and variations in student's examination scores

In modelling relation of student's household characteristics and dissimilarities in examination, the following null hypothesis was tested:

H_{O1}: There is no statistically significant relationship between student's household characteristics and variations in student's examination scores in Tharaka Nithi County's PDSS.

In order to test this hypothesis, a summary of hierarchical regression analysis for students' household characteristics prediction on variations in examination scores partial correlation coefficient was examined. Table 4.16 below illustrates the findings.

Table 4.16: Relationship between student's household characteristics and Variations in examination scores

	B	Beta	t	Sig.	Partial Correlations
Students Household Characteristics	.433	.438	23.578	.000	.662
Dependent Variable: Variations in Examination Scores					

Source: Students' Questionnaire (N = 705)

Table 4.16 depicts that there was a statistically significant positive relationship, r = 0.662 at $p < .01$ between student's household characteristics and variations in student's examination scores in Tharaka Nithi County PDSS. The null hypothesis was therefore rejected and a conclusion made that students' household characteristics were significantly related to variations in students' examination scores. Majority of the PDSS principals and students supported this conclusion. They opined that differences in students' household family size, coping strategy

index, residence and wealth approximation related to the variations in PDSS students' examination scores. PDSS principals and students explained that the government school feeding programme initiative did not shield PDSS students from the influence of their differences in household characteristics on their examination scores.

Consequently, PDSS in Tharaka Nithi County did not guarantee equality of opportunity in the attainment of secondary education. Rawls theory of justice difference principle indicates that variations in students' examination scores should have no relationship with the differences in the student's household characteristics. Moreover, the government school feeding programme initiative does not shield PDSS students from the influence of their differences in household characteristics on their examination scores.

4.4 Relationship between student's parental/guardian characteristics and variations in examination scores

The second objective of this study was on modelling relation between student's parental/guardian characteristics and differences in examination scores. Hierarchical multiple regression analysis was employed to analyse quantitative data relating to this objective while controlling for predictor variables. Predictor variables controlled for included student's household, conduct and school resource characteristics.

Qualitative data relating to this objective was thematically analysed. Thematic analysis aided finding out the relation between student's parental/guardian characteristics and variations in academic achievement. Both the quantitative and qualitative analysis findings, were compared, related and interpreted together.

4.4.1 Student's parental/guardian characteristics Indicators

Student's parental/guardian characteristics in this study refer to features of someone who brings up and cares for a student. The variable, student's parental/guardian characteristics was operationalized by analysing indicated parent's/guardian's gender, relation to the student (parent/guardian), support to the student, education, income and occupation. Parents/guardians of the form 3 students indicated their gender, relation to the student (parent/guardian), support to the student, education, income and occupation. The results were analysed to obtain the mean, standard deviation, skewness and kurtosis. Table 4.17 illustrates the results.

Table 4.17: Student's parental/guardian characteristics Indicators

Indicators	N	Mean (M)	Std. Deviation (SD)	Skewness (SK)	Kurtosis (Kur)
Gender	686	1.66	.474	-.684	-.537
Student Relation	686	2.66	.800	.627	.132
Student Support	686	1.92	.454	-.305	1.648
Education Level	686	2.95	1.191	-.303	-.374
Income Level	686	2.22	.750	-.244	.056
Occupation Level	686	2.24	.715	-.011	-.438
Computed Students Parental/Guardian Characteristics	686	2.28	.547	.302	-.893

Source: Parents'/Guardians' Questionnaire

Table 4.17 present findings of computed students' parents/guardians characteristics spread near the mean since standard deviation was less than 1, (M = 2.28, SD = 0.547). Nevertheless, parents'/guardians' indication of their education level was spread far from the mean as shown by a standard deviation greater than 1, (M = 2.95, SD = 1.191). This finding compared and related to the qualitative finding that students' parents/guardians' education levels differed. Consistent with thirteen PDSS principals and fifty-nine students in the group interviews, PDSS parents/guardians had different education levels. Table 4.17 further illustrates that both the skewness and kurtosis statistics values indicate a normal distribution of the computed students' parents/guardians' characteristics (SK = 0.302, Kur = -0.893) less than $\pm$1.0. A normal distribution of the students' parents/guardians' characteristics indicators showed that they clustered near the mean while a few were not near mean. The study also established inter-relationship between students' parents/guardians' characteristics indicators.

4.4.2 Inter-relationship between indicators of Student's parental/guardian characteristics

Partial correlation analysis was conducted to establish the inter-relationship between indicators of students' parental/guardian characteristics. The inter-relationship between indicators of students' parental/guardian characteristics indicated their equivalence and whether they measured the same construct. The resultant correlation matrix is presented in Table 4.18.

Table 4.18: Inter-relationship between indicators of Student's parental/guardian characteristics

Indicators	1	2	3	4	5	6	7
1. Gender	-						
2. Student Relation	.081*	-					
3. Student Support	-.106**	-.875**	-				
4. Education Level	.005	.643**	-.643**	-			
5. Income Level	-.088*	-.693**	.550*	-.777	-		
6. Occupation Level	-.092*	-.756**	.541	-.545**	.853**	-	
7. Computed Students' Parental/Guardian Characteristics	-.020	-.850**	.741**	-.657**	.677**	.706**	-

Correlation is significant at the 0.05* and 0.01** level (2-tailed).

Source: Parents'/Guardians' Questionnaire (N = 686)

Table 4.18 demonstrate computed students' Parental/Guardian characteristic strong positive statistically significant correlation with all the indicators at $p < .01$. It further indicates that the correlations between the indicators of students' parental/guardian characteristics were moderate to strong except for the gender which had the lowest correlations with all the indicators. The strongest correlation was noted between student relation and support which was statistically significant at $p < .01$ since ($r = .875$, $p = .000$). In their interviews, both PDSS principals and students stated that differences in student's parental/guardian relation resulted to students' variations in education support. Thuba (2018) study also observed that students' caregiver relationship determined support in attainment of quality secondary education.

Moreover, a statistically significant relationship between income level and occupation level, at $p < .01$ since ($r = .853$, $p = .000$) was established. Some PDSS principals and PDSS students in the group interview associated parental/guardian occupation and parental/guardian income level. They explained that parents/guardians with established business premises had higher incomes compared to parents/guardians who were employed as casual labourers. Students' parental/guardian characteristics indicators were highly inter-related illustrating substantial equivalence in measuring similar concept.

4.4.3 Model on parental/guardian characteristics and variations in examination scores

The study modelled relation between students' parental/guardian characteristics and variations in examination. It therefore, controlled for the effect of other predictor variables on the variance of student's examination scores to model the variance in student's examination scores attributed to students' parental/guardian characteristics. Hierarchical multiple regression analysis was employed. Table 4.19 illustrates a summary model of students' parental/guardian characteristics and variations in examination scores.

Table 4.19: Model on parental/guardian characteristics and variations in examination scores

Model[f]	R	R^2	ΔR^2	ΔF	$\Delta df1$	$\Delta df2$	Sig.ΔF
1	.025[a]	.001	.001	.215	2	702	.807
2	.907[b]	.822	.821	323.056	1	701	.000
3	.912[c]	.831	.009	38.723	1	700	.000
4	.936[d]	.876	.045	255.716	1	699	.000
5	.962[e]	.926	.050	472.823	1	698	.000

a. Predictors: (Constant), Category of primary school attended, Gender;
b. Predictors: (Constant), Category of primary school attended, Gender, Students Household Characteristics;
c. Predictors: (Constant), Category of primary school attended, Gender, Students Household Characteristics, Student Conduct Characteristics;
d. Predictors: (Constant), Category of primary school attended, Gender, Students Household Characteristics, Student Conduct Characteristics, School Resource Characteristics;
e. Predictors: (Constant), Category of primary school attended, Gender, Students Household Characteristics, Student Conduct Characteristics, School Resource Characteristics, Students Parental Guardian Characteristics;
f. Dependent Variable: Variations in examination scores

Source: Study Data

Table 4.19 illustrates five-stage hierarchical multiple regression model result summary. The model result summary depicted relationship between student's parental/guardian characteristics and variations in examination scores after controlling for the effects of other predictor variables. Predictor variables' effect controlled for included student's gender, category of primary school attended, student's household characteristics, conduct characteristics, and school resource characteristics.

Model 1 depicted in Table 4.19 with student gender and category of primary school attended had R value 0.025, thus a positive relationship with variations in

students' examination scores. Nevertheless, the relationship was weak. The R^2 (0.001 or 0.1%) was not statistically significant at F (2, 702), p >.05; this shows that the first set of predictors (student gender and category of primary school attended) could contribute 0.1% of variations in PDSS students' examination scores. As moderating variables in this study, student's Category of primary school attended and Gender variables were controlled for since they had a positive relationship with variations in students' examination scores. Student's Household Characteristics, a construct in the EPF model was added to Model 1 resulting to Model 2.

Model 2, with three predictor variables (Category of primary school attended, Gender, Student's Household Characteristics) was an improvement over the earlier Model 1, with an R of 0.907 and change of R^2, 0.821. The change in R^2 was statistically significant at F (1, 701) = 323.056, p < .01. Student's Household Characteristics could therefore account for 82.1% of the variance in students' examination scores in this model. Nonetheless, other predictor variables of variations in students' examination scores had not been controlled for in this model. Thus 82.1% of the variance in students' examination scores in this model could also be attributed to the uncontrolled predictor variables. Thus, Student Conduct Characteristics, a construct in the EPF model was added to Model 2 resulting to Model 3.

Model 3, with four predictor variables (Category of primary school attended, Gender, Students Household Characteristics, Student Conduct Characteristics), had

an R value 0.912, with a change in R^2 (0.009 or 0.9%). The change in R^2 was significant at F (1, 700) = 38.723, $p < .01$. Thus, Student Conduct Characteristics in the model could account for 0.9% of variance. The variance, 0.9% in student's examination scores attributed to student's conduct characteristics in this model could evidence Rawls theory of justice difference and equality of opportunity principle if all the predictor variables of variations in students' examination scores are controlled for. However, in this model it is not the case. School Resource Characteristics a predictor variable of variations in students' examination scores and a construct in the EPF model was added to this model, Model 3, resulting to Model 4.

Model 4 had five predictor variables (Category of primary school attended, Gender, Students Household Characteristics, Student Conduct Characteristics, School Resource Characteristics), and R value 0.936. The change in R^2 (0.045 or 4.5%) was significant at F (1, 699) = 255.716, $p < .01$. Thus, School Resource Characteristics in this model could account for 4.5% of the variance. However, Students Parental/Guardian Characteristics, a predictor variable of variations in students' examination scores was still missing in the model. Thus, 4.5% of students' variance in examination scores could not just be attributed to School Resource Characteristics in this model. Students Parental/Guardian Characteristics variable was added to this model, Model 4 resulting to Model 5.

Model 5, with six predictor variables (Category of primary school attended, Gender, Students Household Characteristics, Student Conduct Characteristics,

School Resource Characteristics, Students Parental/Guardian Characteristics), had R value 0.962. It had a change in R^2 (0.050 or 5.0%) significant at F (1, 698) = 472.823, $p < .01$. In this model, all the predictor variables of variations in students' examination scores had been controlled for. Thus, Students Parental/Guardian Characteristics in this model account for 5.0% variance in students' examination scores. A contribution of a 5.0% variance in students' examination scores by Students Parental/Guardian Characteristics in this model defy Rawls theory of justice difference and equality of opportunity principle. According to Rawls theory of justice difference and equality of opportunity principle, Students Parental/Guardian Characteristics should not account for the variations in students' examination scores. Moreover, qualitative data findings compared and related with this model findings.

Qualitative data findings revealed that all the student's parental/guardian characteristics indicators (gender, relation to the student, support, occupation, income level and education level) were found to contribute to variations in students' examination scores in PDSS, Tharaka Nithi County. Most PDSS principals and students in the group interviews mentioned that PDSS students who worked equally hard, their examination scores were differentiated by their differences in their parents'/guardians' income. They also reported that most of the students with high parental/guardian income had better examination scores compared to the students with low parental/guardian income. All the PDSS principals and students in the group interviews stated that lunch fee required from the PDSS students was not equally affordable by all the PDSS students. Thus, it

led to absenteeism of the students who could not afford, resulting to their low scores in examinations. One PDSS principal stated the following:

> Parents/guardians differences in income among students makes all the difference since students are required to pay for their lunch cost so those who cannot pay find it difficult to remain in school as they are required to pay like other students. Such students are absent from school most of the time and therefore their examination scores are lower compared to those who can pay comfortably for their lunch cost (PDSS Principal 11, 2020).

These findings concurred with Juma's (2016) study findings which established that parent's income, education level, occupation and involvement in education influenced student's academic performance. Contrary, majority of the PDSS principals and students in the group interviews reported that PDSS students whose parents/guardians had high education levels did not perform exceptionally well. This finding differed with Aye et al. (2016) findings which established that parental levels of education had influence on level of educational support to the students.

PDSS, students' parents'/guardians' support was noted to contribute to differences in students' examination scores. More than half PDSS principals and majority of the students in the group interviews mentioned that PDSS students whose caregivers were parents were observed to do better in their examination scores compared to students whose caregiver was a guardian. Also, they noted that students whose care giver was a mother, received much support in their education thus performed well in their examination. One PDSS student in the group interview stated the following:

> "Most students with the caregiver as a mother have better support in school and they tend to do better than those whose caregiver is a father or a relative" (PDSS Student Group Interview 3, 2020).

The present study established that PDSS students whose caregiver was a parent, PDSS student was the biological child of the caregiver, received more support for their education and differences in PDSS students' examination scores were associated with support they received. These study findings concurred with Abuya et al. (2019) findings in a research on household characteristics and child's educational attainment in the slums of Nairobi Kenya. Abuya et al. (2019) study controlled for socioeconomic variables and found that family structure had an effect on educational attainment of children. The study further established that children from households with a parent were more likely to attain better education learning outcomes compared to the children in guardian households.

In addition, the present study observed that differences in student's parental/guardian relation, resulted to students' variations in examination scores, since parental/guardian relation contributed to PDSS education support. PDSS student's parent's/guardian's relation to the student and support that PDSS student received were stated to contribute to variations in examination scores more than differences in PDSS student's parent's/guardian's education, income and occupation. These findings related with Giannelli and Rapallini (2018) study findings which established that an increase in 1 standard deviation of a parental attitude in maths increased student performance by more than 40 score points.

While Giannelli and Rapallini (2018) study employed international examination scores, PISA, the present study employed PDSS examination scores.

Almost half of the PDSS principals and students in the group interviews observed no differences in PDSS students' examination scores contribute to by differences in PDSS students' parents'/guardians' occupation. They explained that most the PDSS students' parents'/guardians' livelihood was small scale agriculture, employment in casual jobs and others remained unemployed. Besides, slightly half PDSS principals and students in the group interviews reported that most PDSS students whose parents/guardians had well established businesses attained higher examination scores compared to the students whose parents/guardians did not have established businesses. They further explained that such students regularly attended school thus performed well in their examinations. Thus, notwithstanding, PDSS student's differences in parental/ guardian income were found to contribute to the variations in students' examination scores in agreement with Juma (2016) study findings.

On the other hand, unlike Aye et al. (2016), Giannelli and Rapallini (2018) and Juma (2016) studies, the present study employed hierarchical multiple regression analysis to model the relation of students' parents'/guardians' characteristics and their differences in examination. Predictor variables were controlled for to obtain the contribution of students' parents'/guardians' characteristics to variations in examination scores. The present study defined the proportion of variance in PDSS student's examination score contributed by students' parental/guardian

characteristics while controlling for the effect of other predictor variables. This study found that differences in PDSS student's parental/guardian characteristics contributed to variations in students' examination scores. Student's parental/guardian characteristics are beyond the control of students in their academic attainment. Thus, government funding aimed to shield PDSS students' variations in examination scores from being contributed to by students differences in parental/guardian characteristics remained a mirage.

4.4.4 Hypothesis Testing on relationship between student's parental/guardian characteristics and variations in student's examination scores

To model relationship between student's parental/guardian characteristics and variations in examination scores, the following null hypothesis was tested:

H_{O2}: There is no statistically significant relationship between student's parental/guardian characteristics and variations in student's examination scores in Tharaka Nithi County PDSS.

In order to test this hypothesis, a summary of hierarchical regression analysis for student's parental/guardian characteristics prediction on variations in examination scores partial correlation coefficient was examined. Table 4.20 below illustrate findings.

Table 4.20: Relationship between student's parental/guardian characteristics and variations in examination scores

	B	Beta	t	Sig.	Partial Correlations
Students Parental/Guardian Characteristics	1.055	.341	21.744	.000	.635

a. Dependent Variable: Variations in Examination Scores

Source: Parents'/Guardians' Questionnaire (N = 686)

Table 4.20 depicts that there was a statistically significant positive relationship, r = 0.635 at p < .01 between student's parental/guardian characteristics and variations in student's examination scores in Tharaka Nithi County PDSS. The null hypothesis was therefore rejected and a conclusion made that students' parental/guardian characteristics were significantly related to variations in students' examination scores. The present study findings concurred with Thuba's (2018) study findings which established that parental/guardian characteristics related to students' academic achievement.

This study also established that PDSS students' parental/guardian characteristics indicators (gender, relation to the student, support, occupation, income level and education level) related to variations in students' examination scores. The positive relationship between student's parental/guardian characteristics and variations in student's examination scores implied that improved parental/guardian characteristics resulted to increased variations in student's examination scores. Further, the present study findings indicate that students enrolled in Tharaka Nithi County PDSS are not guaranteed equality of opportunity in attainment of secondary education.

4.5 Relationship between student's conduct characteristics and variations in examination scores

The third objective of this study was on modelling relationship between student's conduct characteristics and variations in examination. In analysing quantitative data relating to this objective, hierarchical multiple regression analysis was employed in modelling of relation between student's conduct characteristics and variations in student's examination controlling for predictor variables. Qualitative data relating to this objective was thematically analysed to establish the relation of student's conduct characteristics and examination scores variations. Further, both the quantitative and qualitative analysis findings, were compared, related and interpreted together.

4.5.1 Student's conduct characteristics Indicators

Student's conduct characteristics in this study refers to student's personal traits such as effort employed to learn, intelligence and motivations/ambition. The variable was operationalized by analysing indicated student effort, intelligence based on KCPE scores, and ambitions. In their questionnaires, students indicated effort they employed in learning through specifying time in hours spent learning. Their intelligence was estimated by their KCPE scores indication while their motivations/ambitions in education were estimated by their indications of achievements, they could make through PDSS education. Data were examined to obtain mean (M), standard deviation (SD), skewness (SK) and kurtosis (Kur). Table 4.21 illustrates the findings.

Table 4.21: Student's conduct characteristics Indicators

Indicators	N	Mean (M)	Std. Deviation (SD)	Skewness (SK)	Kurtosis (Kur)
Student Effort	705	2.66	.648	-.133	-.102
Student Intelligence	705	2.02	.582	.994	.269
Student Ambition	705	2.63	.656	-.002	-.228
Computed Student Conduct Characteristics	705	2.44	.594	-.801	-.608

Source: Students' Questionnaire (N=705)

The results presented in Table 4.21 show that computed students' conduct characteristics, were spread near the mean (M = 2.44, SD = 0.594). Table 4.21 also depicts that all indicators of the students' conduct characteristics were spread near the mean since standard deviation was less than 1. This implies that the PDSS students' conduct characteristics indicators and successive computed students' conduct characteristics, were comparable. Contrary, majority of the PDSS principals and PDSS students during their interviews observed that students in PDSS whose KCPE scores were higher compared to other students had less ambition and motivation to study in PDSS. They further noted that such students did not spend as much time to study.

Both the skewness and kurtosis statistic values indicate a normal distribution of all the indicators of students' conduct characteristics with (SK = -0.801, Kur = -0.608) less than $\pm$1.0. These findings imply that students' conduct characteristics clustered near the mean while a few were far from the mean. Thus, although most of the PDSS student's conduct characteristics indicators compared, some PDSS students' conduct characteristics varied.

4.5.2 Inter-relationship between indicators of Student's conduct characteristics

Partial correlation analysis was conducted to establish the inter-relationship between indicators of students' conduct characteristics. The inter-relationship between indicators of students' conduct characteristics indicated their equivalence and whether they measured the same construct. Table 4.22 illustrate correlation matrix.

Table 4.22: Inter-relationship between indicators of Student's conduct characteristics

Indicators	1	2	3	4
1. Student Effort	-			
2. Student Intelligence	.725**	-		
3. Student Ambition	.958**	.720**	-	
4. Computed student Conduct Characteristics	.861**	.784**	.859**	-

**. Correlation is significant at the 0.01 level (2-tailed).
Source: Students' Questionnaire (N = 705)

Table 4.22 indicate computed students conduct characteristic had a strong positive statistically significant correlation with all the indicators at $p < .01$. The correlations between the indicators of students' conduct characteristics were strong, positive and statistically significant. This suggests that the PDSS students' conduct characteristics indicators related with each other. The strongest correlation was noted between Student Effort and Ambition which was statistically significant at $p < .01$ since ($r = .958$, $p = .000$). This infers that PDSS students who spent much time studying were also found to indicate high achievements they could make through PDSS education. Moreover, eleven PDSS principals and fifty-eight

students in the group interviews reported that students who had high ambitions in life were self-motivated to work hard by spending much of their time learning.

Lowest but statistically significant correlation was found between Student Intelligence and Ambition, at $p < .01$ since ($r = .720$, $p = .000$). This finding indicates that PDSS students who had scored high KCPE scores, thus considered more intelligent, indicated small achievements they could make through PDSS education. This finding thus concurred with the qualitative finding that students in PDSS whose KCPE scores were high had less ambition and motivation to study in PDSS. Consequently, they did not spend much time studying. Nevertheless, the moderately high inter-correlations between students' conduct characteristics indicators show equivalence in the measured concept of students' conduct characteristics. Thus, students' conduct characteristics indicators collectively measure students' conduct characteristics.

4.5.3 Model on student's conduct characteristics and variations in examination scores

The study modelled the relationship between students' conduct characteristics and examination score variation. It therefore, controlled for the effect of other predictor variables on the variance of student's examination scores to model the variance in student's examination scores attributed to students' conduct characteristics. Hierarchical multiple regression analysis was employed. Table 4.23 illustrates a summary model of student's conduct characteristics and variations in examination scores.

Table 4.23: Model on student conduct characteristics and variations in examination scores

Model[f]	R	R^2	ΔR^2	ΔF	$\Delta df1$	$\Delta df2$	Sig.ΔF
1	.025[a]	.001	.001	.215	2	702	.807
2	.741[b]	.549	.549	853.472	1	701	.000
3	.935[c]	.874	.325	180.635	1	700	.000
4	.961[d]	.923	.049	441.183	1	699	.000
5	.962[e]	.926	.004	33.417	1	698	.000

a. Predictors: (Constant), Category of primary school attended, Gender;
b. Predictors: (Constant), Category of primary school attended, Gender, School Resource Characteristics;
c. Predictors: (Constant), Category of primary school attended, Gender, School Resource Characteristics, Students Household Characteristics;
d. Predictors: (Constant), Category of primary school attended, Gender, School Resource Characteristics, Students Household Characteristics, Students Parental Guardian Characteristics;
e. Predictors: (Constant), Category of primary school attended, Gender, School Resource Characteristics, Students Household Characteristics, Students Parental Guardian Characteristics, Student Conduct Characteristics;
f. Dependent Variable: Variations in examination scores

Source: Study Data

Table 4.23 illustrates five-stage hierarchical multiple regression model result summary examining the relationship between student's conduct characteristics and variations in examination scores after controlling for the effects of predictor variables. Predictor variables' effect controlled for included student's gender, category of primary school attended, school resource characteristics, student's household characteristics, and parent/guardian characteristics.

Model 1 shown in Table 4.23 with student gender and category of primary school attended had R value 0.025, thus a positive relationship with variations in students'

examination scores. This implied that being a male or female student and having attended a public, private, public or private boarding primary school contributed to variations in PDSS students' examination scores. However, the relationship was weak. The R^2 (0.001 or 0.1%) was not statistically significant at F (2, 702), p >.05. This shows that the first set of predictors (student gender and category of primary school attended) could contribute 0.1% of variations in PDSS students' examination scores but could not predict variations in students' examination scores in this model. Nevertheless, there being a positive relationship with variations in students' examination scores, student gender and category of primary school attended was controlled for. School Resource Characteristics variable, a construct in the EPF model was added to this model, Model 1 resulting to Model 2.

Model 2, with three predictor variables (Category of primary school attended, Gender and School Resource Characteristics) was an improvement over the earlier model, with an R of 0.741 and change of R^2, 0.549. The change in R^2 was statistically significant at F (1, 701) = 853.472, p < .01. School Resource Characteristics could therefore account for 54.9% of the variance in students' examination scores in this model. Albeit, in this model, 54.9% variance in students' examination scores could not be attributed to School Resource Characteristics only since other predictor variables were not controlled for in this model. Students Household Characteristics a construct in the EPF model was added to this model, Model 2, resulting to Model 3.

Model 3, with four predictor variables (Category of primary school attended, Gender, School Resource Characteristics, Students Household Characteristics), had a R value 0.935, with a change in R^2 (0.325 or 32.5%). The change in R^2 was significant at F (1, 700) = 180.635, p < .01. Thus, Students Household Characteristics in the model could account for 32.5% of variance in students' examination scores. However, Students Parental/Guardian Characteristics and Student Conduct Characteristics constructs in the EPF model had not been added to this model. Accordingly, Students Parental/Guardian Characteristics was added to Model 3 resulting to Model 4.

Model 4, with five predictor variables (Category of primary school attended, Gender, School Resource Characteristics, Students Household Characteristics, Students Parental Guardian Characteristics), had R value 0.961. It had a change in R^2 (0.049 or 4.9%) significant at F (1, 699) = 441.183, p < .01. Thus, Students Parental/Guardian Characteristics in the model could account for 4.9% of the variance. Still, Student Conduct Characteristics had not been added to the model thus 4.9% variance in students' examination scores could not be exclusively attributed to Students Parental/Guardian Characteristics in the model. Student Conduct Characteristics was therefore added to Model 4 resulting to Model 5.

Model 5, with six predictor variables (Category of primary school attended, Gender, School Resource Characteristics, Students Household Characteristics, Students Parental Guardian Characteristics, Student Conduct Characteristics), had R value 0.962. It had a change in R^2 (0.004 or 0.4%) significant at F (1, 698) =

33.417, $p < .01$. Thus, controlling for all the other predictor variables, Students Conduct Characteristics account for only 0.4% variance in students' examination scores in this model. Consistent with the Rawls theory of justice difference principle, variations in students' examination scores explained by the student conduct characteristics evidence equality of opportunity. The variance, 0.4% of students' examination scores attributed to Students Conduct Characteristics in this model after controlling for all the predictor variables depict Rawls theory of justice equality of opportunity principle. However, only a small proportion of the variance in the variations in PDSS students' examination scores is explained by the student's conduct characteristics of less than 1%. This further implies that differences in PDSS student's conduct characteristics marginally explain variations in PDSS students' examination scores. The model findings compared and differed with the qualitative study data findings on the contribution of student's conduct characteristics to the variations in the examination scores. In this study, qualitative data findings revealed that student's conduct characteristics indicators either contributed to or did not contribute to variations in the examination scores.

Most PDSS principals and students in the group interviews reported that students who had high ambitions in life ended up attaining better examination scores than those who did not. They explained that PDSS students with high ambitions in life were self-motivated to work hard by spending much of their time learning, thus associated differences in PDSS student's examination scores with the differences in PDSS student's ambitions. These findings related to findings made by Ng'ang'a

et al. (2018) study which established that all the domains of achievement goal orientation significantly correlated to academic achievement.

Nearly half PDSS principals and a quarter of the students in the group interviews explained that not all the PDSS students who spent much time learning did well or poorly in their examination scores. They also said that some students with high ambitions did not do very well in their examinations whereas others with low ambitions did very well in their examinations. Therefore, in the case of the nearly half PDSS principals and a quarter of the students in the group interviews, differences in PDSS students' conduct characteristics did not contribute to variations in PDSS students' examination scores. These findings differed from Sebastian and Ricarda (2018) study findings in Europe. Sebastian and Ricarda (2018) study investigated student's conduct characteristics in the prediction of academic achievement. The study established that student's conduct characteristics predicted academic achievement.

Nevertheless, consistent with almost half of the PDSS principals and the students in the group interviews, most of the PDSS students who attained high scores in KCPE examinations did not perform as well in their examination scores. They explained that PDSS students who had attained high scores in their KCPE examinations were not motivated to learn in PDSS. More, all the PDSS principals and sixty students in the group interviews noted that students admitted in the PDSS with low marks in the KCPE examination performed better in their examination

scores compared to those who were admitted with high marks. One PDSS student in the group interview stated the following:

> Most students who performed highly in their KCPE are not motivated to learn in the PDSS. They remain sorry for themselves not being able to join secondary school of their choice because they cannot afford and end up performing poorly in their examinations (PDSS Student Group Interview 6, 2020).

Contrary, slightly more than half PDSS principals and twenty-three students in the group interviews affirmed that in PDSS, students with high performance in their KCPE examination performed better than those who had low performance in KCPE examination. Comparable to Spengler et al. (2018) study findings, present study established that the PDSS student's conduct characteristics predicted students variations in examination scores. Spengler et al. (2018) investigated the role of student's conduct characteristics in predicting educational attainment in a 50-year timespan longitudinal study. Like the present study, Spengler et al. (2018) study controlled for parental socioeconomic status and found that student's conduct characteristics in adolescence predicted educational success above and beyond parental socioeconomic status.

4.5.4 Hypothesis Testing on relationship between student's conduct characteristics and variations in student's examination scores

To model the relationship between student's conduct characteristics and variations in examination scores, the following null hypothesis was tested:

H_{O3}: There is no statistically significant relationship between student's conduct characteristics and variations in student's examination scores in Tharaka Nithi County PDSS.

In order to test this hypothesis, a summary of hierarchical regression analysis for students' conduct characteristics prediction on variations in examination scores partial correlation coefficient was examined. Table 4.24 illustrates the findings.

Table 4.24: Relationship between student's conduct characteristics and variations in examination scores

	B	Beta	t	Sig.	Partial Correlations
Students Conduct Characteristics	-.041	-.063	-5.781	.000	-.214
a. Dependent Variable: Variations in Examination Scores					

Source: Students' Questionnaire (N = 705)

Table 4.24 depicts that there was a statistically significant negative relationship, $r = -0.214$ at $p < .01$ between student's conduct characteristics and variations in student's examination scores in Tharaka Nithi County PDSS. Therefore, the null hypothesis was excluded. This research determined that Student's conduct characteristics indicated by student effort, intelligence based on KCPE scores, and ambitions were related to differences in PDSS students' examination scores. The study findings related to the findings by Dahie et al., (2015) study that established a significant correlation between student's conduct characteristics such as time management and academic performance.

The present study established a relation between student's high KCPE scores and variations in students' examination scores. It established a relation between student's time spent learning and variations in examination scores and a relation between student's motivation or ambition, student's time spent learning and the

variations in students' examination scores. These findings agreed with Bai et al. (2018) study findings which established a strong significant relation amid students' class attendance and academic performance. Notwithstanding, the negative relationship established in the present study between student's conduct characteristics and variations in student's examination scores in Tharaka Nithi County PDSS, implies that heightened student's conduct characteristics resulted to lowered variations in student's examination scores. As a result, equality of opportunity in provision of secondary education in Tharaka Nithi County PDSS is thwarted since according to Rawls theory of justice, variations in students' examination scores should be explained by increased differences in student's conduct characteristics. Students are able to take charge of their conduct characteristics thus differences associated with differences in their conduct characteristics evidence equality of opportunity controlling for other predictors of examination score variations.

4.6 Relationship between School Resource Characteristics and variations in examination scores

The fourth objective of this study was on modelling the relation between school resource characteristics and examination score variations. Hierarchical multiple regression analysis was employed to examine quantitative data relating to this objective. Predictor variables were controlled for when modelling the relationship between school resource characteristics and variations in student's examination scores Qualitative data relating to this objective was thematically analysed to establish the relationship between school resource characteristics and variations in

examination scores. Further, both the quantitative and qualitative analysis findings, were compared, related and interpreted together.

4.6.1 School resource characteristics Indicators

School resource characteristics variable was operationalized by analysing the indicated teaching and learning process resources, namely: teaching staff qualifications, teaching staff terms of employment, teaching staff size (number of teachers in a PDSS), and school size. Students indicated teaching and learning process resources in their school class while document analysis guide obtained data on sampled schools' teaching staff qualifications, teaching staff terms of employment, teaching staff size, and school size. Data were examined to obtain the mean (M), standard deviation (SD), skewness (SK) and kurtosis (Kur). Findings are illustrated in Table 4.25.

Table 4.25: School resource characteristics Indicators

Indicators	Mean (M)	Std. Deviation (SD)	Skewness (SK)	Kurtosis (Kur)
Teaching and learning process resources	1.91	.490	-.206	.965
Teaching staff qualifications	5.42	2.128	-.325	-1.010
Teaching staff terms of employment	5.55	2.035	-.408	-.789
Teaching staff size	5.34	2.193	-.252	-1.135
School size	5.48	2.120	-.343	-.983
Computed School Resource Characteristics	5.38	2.154	-.298	-1.058

Source: Study Data

The results demonstrated in Table 4.25 depict computed school resource characteristics spread far from the mean since standard deviation was more than 1, (M = 5.38, SD = 2.154). Nevertheless, students' indication of teaching and learning process resources in their class were spread near the mean as shown by a standard deviation less than 1, (M = 1.91, SD = 0.490). This implies that the overall teaching and learning process resource characteristics in different PDSS in Tharaka Nithi County were comparable with each other.

Table 4.25 further illustrates that both the skewness and kurtosis statistics values of the indicated teaching and learning process resources, data obtained on teaching staff terms of employment and School size, indicated a normal distribution (SK = -0.206, Kur = 0.965); (SK = -0.408, Kur = -0.789); and (SK = -0.343, Kur = -0.983) respectively, since both the SK and Kur were less than $\pm$1.0. Nonetheless, normal distribution of the teaching and learning process resource characteristics indicated that they clustered near the mean while a few were far from the mean. A normal distribution of the school resource characteristics indicated that most of the indications on school resource characteristics clustered near the mean while some were far from the mean. Although most of the PDSS resource characteristics compared, some PDSS characteristics varied. Thus, the need of finding relation of school resource characteristics indicators to further determine equivalence.

4.6.2 Inter-relationship between indicators of School resource characteristics

Partial correlation analysis was conducted to establish the inter-relationship between indicators of school resource characteristics. The inter-relationship between indicators of school resource characteristics indicated their equivalence and whether they measured the same construct. Table 4.26 on Inter-relationship between indicators of School resource characteristics show correlation matrix.

Table 4.26: Inter-relationship between indicators of School resource characteristics

Indicators	1	2	3	4	5	6
1. Teaching and learning process resources	-					
2. Teaching staff qualifications	.520**	-				
3. Teaching staff terms of employment	.559**	.929**	-			
4. School size	.530**	.930**	.865**	-		
5. Teaching staff size	.462**	.926**	.869**	.889**	-	
6. Computed School Resource Characteristics	.514**	.985**	.927**	.947**	.941**	-

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

Table 4.26 indicate that the computed school resource characteristics had strong positive statistically significant correlation with all the indicators at $p < .01$ except teaching and learning process. Teaching and learning process had moderate but significant correlations with all the school resource characteristic indicators. Most

PDSS principals during their interviews reported that the government sufficiently provided teaching and learning materials in PDSS. Nevertheless, some PDSS principals in Tharaka Nithi County reported that they lacked adequate teaching and learning materials. Comparable to Effiong et al. (2015) study findings, present study established varying distribution of teaching, instructional and learning materials in PDSS.

Table 4.26 also depicted that the correlations between the indicators of school resource characteristics were positive, moderate to strong and statistically significant with all the indicators. Among the indicators, the strongest correlation was noted between the teaching staff qualifications and the school size which was statistically significant at $p < .01$ ($r = .930$, $p = .000$). This finding implied that teachers with higher qualifications in Tharaka Nithi PDSS were in PDSSs with higher student enrolment. This was followed by a statistically significant relationship between teaching staff qualifications and teaching staff terms of employment, at $p < .01$ ($r = .929$, $p = .000$). This implies that in Tharaka Nithi PDSS teachers with high qualifications had permanent employment with the Teacher Service Commission (TSC). The comparatively high inter-relations between school resource characteristic indicators demonstrate significant equivalence. This also intimate that the indicators of school resource characteristics measure school resource characteristics as a single concept.

4.6.3 Model on school resource characteristics and variations in examination scores

The study modelled relationship between school resource characteristics and examination score variation. It therefore, controlled for the effect of other predictor variables to model the variance in student's examination scores attributed to school resource characteristics. Hierarchical multiple regression analysis was employed. Table 4.27 illustrates a summary model of school resource characteristics and variations in examination scores.

Table 4.27: Model on school resource characteristics and variations in examination scores

Model[f]	R	R^2	ΔR^2	ΔF	$\Delta df1$	$\Delta df2$	Sig.ΔF
1	.025[a]	.001	.001	.215	2	702	.807
2	.292[b]	.085	.085	64.956	1	701	.000
3	.912[c]	.831	.746	309.255	1	700	.000
4	.930[d]	.865	.034	175.417	1	699	.000
5	.962[e]	.926	.061	580.341	1	698	.000

a. Predictors: (Constant), Category of primary school attended, Gender;
b. Predictors: (Constant), Category of primary school attended, Gender, Student Conduct Characteristics;
c. Predictors: (Constant), Category of primary school attended, Gender, Student Conduct Characteristics, Students Household Characteristics;
d. Predictors: (Constant), Category of primary school attended, Gender, Student Conduct Characteristics, Students Household Characteristics, Students Parental Guardian Characteristics;
e. Predictors: (Constant), Category of primary school attended, Gender, Student Conduct Characteristics, Students Household Characteristics, Students Parental Guardian Characteristics, School Resource Characteristics;
f. Dependent Variable: Variations in examination scores

Source: Study Data

Table 4.27 illustrates five-stage hierarchical multiple regression model result summary examining the relationship between school resource characteristics and variations in examination scores after controlling for the effects of predictor variables. Predictor variables' effect controlled for included student's gender, category of primary school attended, student's household characteristics, student's parental/guardian characteristics, and student's conduct characteristics.

Model 1 depicted in Table 4.26 with student gender and category of primary school attended had R value 0.025, thus a positive relationship with variations in students' examination scores. However, the relationship was weak. The R^2 (0.001 or 0.1%) was not statistically significant at F (2, 702), p >.05; this shows that the first set of predictors (student gender and category of primary school attended) could contribute 0.1% of variations in PDSS students' examination scores but could not predict variations in students' examination scores in this model. Notwithstanding, student gender and category of primary school in this model had a positive relationship with variations in students' examination scores thus need to be controlled for. Student Conduct Characteristics, a construct in the EPF model, was added to Model 1 resulting to Model 2.

Model 2, with three predictor variables (Category of primary school attended, Gender, and Student Conduct Characteristics) was an improvement over Model 1, with an R of 0.292 and change of R^2, 0.085. The change in R^2 was statistically significant at F (1, 701) = 64.956, p < .01. Student Conduct Characteristics could therefore account for 8.5% of the variance in students' examination scores in this

model. Albeit, 8.5% of the variance in students' examination scores in this model cannot be wholly attributed to Student Conduct Characteristics since all the predictor variables had not been controlled for in this model. Students Household Characteristics a construct in the EPF model was added to Model 2 resulting to Model 3.

Model 3, with four predictor variables (Category of primary school attended, Gender, Student Conduct Characteristics, Students Household Characteristics), had an R value 0.912, with a change in R^2 (0.746 or 74.6%). The change in R^2 was significant at $F (1, 700) = 309.255$, $p < .01$. Thus, Students Household Characteristics in the model could account for 74.6% of variance. Like in Model 2, in Model 3 all the predictor variables had not been controlled for thus 74.6% of variance in examination scores could not be attributed absolutely to Students Household Characteristics. Students Parental/Guardian Characteristics, one of the uncontrolled predictor variables, a construct in the EPF model was added to Model 3 resulting in Model 4.

Model 4, with five predictor variables (Category of primary school attended, Gender, Student Conduct Characteristics, Students Household Characteristics, Students Parental Guardian Characteristics), had R value 0.930. It had a change in R^2 (0.034 or 3.4%) significant at $F (1, 699) = 175.417$, $p < .01$. Thus, Students Parental/Guardian Characteristics in the model could account for 3.4% of the variance. While, 3.4% of the variance in students' examination scores in this model could not be solely attributed to Students Parental/Guardian Characteristics in the

model, School Resource Characteristics was added to Model 4 resulting to Model 5.

Model 5, with six predictor variables (Category of primary school attended, Gender, Student Conduct Characteristics, Students Household Characteristics, Students Parental Guardian Characteristics, School Resource Characteristics), had R value 0.962. It had a change in R^2 (0.061 or 6.1%) significant at F (1, 698) = 580.341, $p < .01$. Thus, controlling for all the other predictor variables, School Resource Characteristics in this model account for 6.1% variance in students' examination scores.

School resource characteristics contribution to variations in students' examination scores defy Rawls theory of justice difference and equality of opportunity principle in this model. Consistent with Rawls theory of justice difference principle, interventions should be variated to benefit the most disadvantaged and equality of opportunity principle indicate that differences in outcomes should not be contributed to by factors beyond individual student control. School resource characteristics are beyond student control thus the Kenyan government effort to provide school financing in PDSS. The government of Kenya applies differentiated school financing in PDSS through supporting NACONEK activities and school feeding programmes in ASAL communities besides fully financing of tuition costs in all PDSS. Thus, PDSS resource characteristics contribution to variations in students' examination scores evidence inequity in the Kenyan government school financing policy in PDSS in Tharaka Nithi County.

These findings related to and differed from qualitative data findings on the contribution of school resource characteristics indicators: teaching and learning process resources; teaching staff qualifications, teaching staff terms of employment, teaching staff size, and school size, to variations in the students' examination scores. All the PDSS principals and the students in the group interviews were in agreement that differences in PDSS availability of laboratory facilities differentiated examination scores. Nine PDSS principals and fifty-four students in the group interviews reported that they had some laboratory equipment but they lacked a laboratory room to conduct experiments. They explained that classrooms were used as laboratory rooms by the science teachers and that much of the science content that would have been taught through practical experiments was theoretically taught. Thus, PDSS with no laboratory facilities and teaching and learning materials were reported to perform poorly. These findings agreed with the Cunningham et al. (2019) study findings. Cunningham et al. (2019) study established that investments in school infrastructure were associated with improved writing ability. However, unlike the present study, Cunningham et al. (2019) independently measured academic skills according to the Indian education system and not according to examination score attainment.

Both the PDSS and students during interviews, stated that variance in PDSS examination scores were contributed by PDSS school size defined as the number of students enrolled, number of teachers and PDSS teachers' terms of employment. According to the majority of the PDSS principals in Tharaka Nithi County, high enrolments of students in PDSS attracted more and better school physical facilities

such as laboratories which enhanced students' performance. Maingi et al. (2017) study found that adequacy of physical facilities had positive relationship with levels of students' discipline in public secondary schools in Makueni County. Contrary to (Cunningham et al., 2019; Maingi et al., 2017) studies, the present study employed hierarchical multiple regression analysis to model the relationship. Thus, government financing of the PDSS teaching and learning materials did not shield PDSS students from the influence of their differences in their examination scores.

Moreover, PDSS principals stated that PDSS with higher students' enrolment attracted greater support from the government. Two PDSS principals stated the following:

> "PDSS with higher enrolments do better than those with small enrolments because of their muscle to gain teaching and learning resources through government support" (PDSS Principal 3, 2020).
> "Most PDSS with high enrolment have better resources and their students perform better" (PDSS Principal 14, 2020).

Though, the finding that school characteristics was related to the differences in PDSS examination scores, it diverged from Manasi's (2018) study findings. Manasi's (2018) study employed hierarchical linear model to establish that there were no statistically significant effects of school characteristics on students' academic achievement. Manasi (2018) study operationalized school characteristics as school size, location and school type such as day, boarding and co-educational. The study by Manasi (2018) was also conducted in all types of secondary schools including boarding and co-educational. Manasi (2018) study operationalized

students' academic achievement as the KCSE scores contrary to the present study which operationalized student learning outcome as PDSS examination scores. Differences in the study subjects' characteristics and the measure of the variable of investigation between Manasi (2018) and present study may be responsible for the difference in the study findings.

Majority of the PDSS principals and students in the interviews reported that use of technology in PDSS did not differentiate PDSS examination scores. They explained that PDSS in the County did not exclusively use technology in teaching and learning process. Most principals and students in the interviews said that they had one computer in their PDSS and it was only used for office work. All the PDSS principals and the students in the group interviews stated that PDSS with computers for students, did not perform exceptionally well. However, the study found that use of technology, an indicator of school characteristics in PDSS was not found to differentiate PDSS students' examination scores. This finding matched Stine and Guro (2017) investigation findings. They established no effect on students' examination scores as a result of technology use in the secondary education. Although Stine and Guro (2017) investigation on effects of technology on students' academic performance in secondary education was done in high income country, similar findings were established in a low income country, Kenya. Present study nonetheless, investigated contribution of employing technology in PDSS classroom to variations in PDSS students' examination scores and not finding the cause and effect of technology in PDSS.

Most PDSS principals and students in the interviews mentioned that government teaching and learning materials availed by the government in PDSS was sufficient thus would not account for the differences in PDSS examination scores. One PDSS principal stated the following:

> "The government provision of teaching and learning materials is sufficient in PDSS thus it would not contribute to the differences in student's performance" (PDSS Principal 1, 2020).

However, some PDSS principal and students in the interview noted that teaching and learning materials in PDSS accounted for the differences in PDSS examination scores. They stated that parents/guardians in PDSS provided teaching and learning materials in PDSS. These findings concurred with O'Day and Smith (2016) literature review findings that educational achievement and attainment continue to reflect student's school resource characteristics. O'Day and Smith (2016) reviewed literature on the disparities within the educational system literature while the present study conducted convergent parallel mixed method research in Tharaka Nithi County PDSS

All the PDSS principals noted that differences in teacher-student ratio differentiated examination scores in different PDSS. They noted that PDSS with the required number of teachers did much better in their examination scores than the PDSS with inadequate number of teachers. They also associated differences in PDSS examination scores with the differences in number of teachers in PDSS. They explained that differences in PDSS examination scores could not be associated with the differences in PDSS teacher qualifications. Consistent with

seven PDSS principals, teachers employed by schools' Board of Management (BOM) had no job security and therefore strived to teach better so as to secure their jobs compared to those employed on permanent and pensionable terms by the government via the Teacher Service Commission (TSC).

Nonetheless, thirteen PDSS principals stated that there was no much difference in PDSS examination scores associated with the differences in the PDSS teachers' employer, that is whether TSC or BOM. Nevertheless, the study also established that teachers in PDSS employed by the BOM tried to secure their job by maintaining high PDSS students' examination scores thus differentiated PDSS students' examination scores in PDSS in Tharaka Nithi County, Kenya. These findings partly agreed with Tastan et al. (2018) and Asif Iqbal et al. (2016) study findings. Tastan et al. (2018) study found a significant impact of teacher self-efficacy and motivation on academic achievement in science education in Iran and Russia. Contrary, Asif Iqbal et al. (2016) study established that there was no significant correlation between teachers' job satisfaction and secondary school students' academic performance in Pakistan.

Additionally, the present study found that differences in the number of teachers in PDSS contributed to PDSS examination score differences. PDSS with adequate number of teachers were found to perform better than PDSS with inadequate number of teachers. These findings coincided with Nghambi (2014) study findings in Tanzania which noted association of students' poor performance with high teacher-students ratio in community secondary schools. Nghambi (2014) study

employed descriptive statistics analysis on the quantitative data while the present study employed hierarchical multiple regression analysis.

The study found similarity in the level of teacher qualifications in the Tharaka Nithi County PDSS. Majority of the PDSS principals did not report contribution of PDSS differences in teacher qualifications to variations in students' examination scores. These study findings differed with the Bold et al. (2017) study findings which recognised that differences in teachers' qualifications evidenced by their mastery of the curricula differentiated schools' examination performance. A study by Bold et al. (2017) was focused on finding out what teachers know, do and on whether it mattered in African primary schools contrary to the present study which was conducted in PDSS. Bold et al. (2017) study employed nationally representative surveys in seven sub-Saharan African countries representing 40 percent of the region's population distinct from present study which only focussed on a one of the sub-Saharan African countries, Kenyan County. These differences could contribute to the differences in the findings. The present study findings could also evidence equity on the quality of teachers teaching in PDSS.

4.6.4 Hypothesis Testing on relationship between school resource characteristics and variations in student's examination scores

To model the relationship between school resource characteristics and variations in academic achievement, the following null hypothesis was advanced:

H_{O4}: There is no statistically significant relationship between PDSS resources and variations in student's examination scores in Tharaka Nithi County.

In order to test this hypothesis, a summary of hierarchical regression analysis for school resource characteristics prediction on variations in examination scores partial correlation coefficient was examined. Table 4.28 below illustrates the findings.

Table 4.28: Relationship between school resource characteristics and variations in examination scores

	B	Beta	t	Sig.	Partial Correlations
School Resource Characteristics	.258	.328	24.090	.000	.674

a. Dependent Variable: Variations in Examination Scores

Source: Study Data

Table 4.28 depicts that there was a moderately strong statistically significant positive relationship, $r = 0.674$ at $p < .01$, between school resource characteristics and variations in students' examination scores in Tharaka Nithi County PDSS. Therefore, improvement in school resource characteristics in Tharaka Nithi County would result to increase in students' variations in examination scores. The null hypothesis was therefore rejected and a conclusion made that school resource characteristics were significantly related to variations in students' examination scores.

This study also found that teachers' qualifications in PDSS were not related to the differences in PDSS examination scores. In Tharaka Nithi County, PDSS teachers were not found to be significantly differentiated in their qualifications. Differences

in PDSS teachers' qualifications were not associated with PDSS differences in students' examination scores.

Albeit, relationship between school resource characteristics and variations in students' examination scores in Tharaka Nithi County PDSS was established in this study. This finding evidence limitation of equality of opportunity among students enrolled in different PDSS in Tharaka Nithi County in attainment of secondary education. Along with Rawls theory of justice, variations in students' examination scores should not be related to school resource characteristics.

4.7 Prediction equations of variations in examination scores

The overall aim of this study, sought to establish and investigate the relationship between predictors of variations in student's examination scores (students' household characteristics, students' parental/guardian characteristics, students' conduct characteristics and students' school resource characteristics) and student's examination scores in PDSS. Hierarchical multiple regression analysis was employed to model prediction equations of variations in examination scores in PDSS in Tharaka Nithi County. Variance in students' examination scores as a result of the contribution of all the predictor variables (students' household characteristics, students' parental/guardian characteristics, students' conduct characteristics and students' school resource characteristics) was analysed controlling for the students' gender and category of primary school attended, the moderating variable. Qualitative data relating to this objective was thematically analysed. Further, both the quantitative and qualitative analysis findings, were compared, related and interpreted together.

4.7.1 Cross-tabulation of students' household, parental/guardian, conduct and school resource characteristics, and variations in examination scores

Predictor variables included students' household characteristics, students' parental/guardian characteristics, students' conduct characteristics and school resource characteristics. Each predictor variable was further operationalized into three categories (Low, Middle and High). Low status in each predictor variable signified poorest student's condition, Middle status showed average conditions, while High status indicated the best student's state.

Low students' household characteristic status showed that students indicated that: their family size had more than 8 persons; they did not have sufficient food at home and had to take various actions to survive; they lacked more than five family assets that indicated wealth; and, that approximate distance from their home to school and social amenities identified was above 2 kilometres. Middle students' household characteristic status denoted that: their family size had between 4 to 8 persons; half of the days they had sufficient food at home and half of the other days they had to take various actions to survive; they had at most five family assets that indicated wealth; and, that approximate distance from their home to school and social amenities identified was between 1-2 kilometres. High students' household characteristic status shows that student indicated that: their family size had between 1 to 3 persons; none of the days did the family miss food or apply various actions to survive; they had all family assets that indicated wealth; and, that

approximate distance from their home to school and social amenities identified was below 1 kilometre.

In categorising indicators of students' parental/guardian characteristics, parental/guardian characteristics indicators of caregiver gender and category were omitted. This is because they were dichotomous. Low students' parental/guardian characteristics status showed that parents/guardians indicated that they did not attend school on their education level, their monthly income was below Ksh. 10,000 per month and that they disagreed in providing support to the student. Middle students' parental/guardian characteristics status showed that parents/guardians indicated that their education level was either primary or secondary, their income level was between Ksh. 10,001 and Ksh. 49,999 per month was employed in a persons' home or was self-employed, and moderately agreed to give student support in education. High students' parental/guardian characteristics status showed that parents/guardians indicated that their education level was either college or university, their income level was above Ksh. 50,000 per month was self-employed, employed by the government, or employed in a private company, and strongly agreed to give student support in education.

Low students' conduct characteristics status showed that students indicated that they spent no time at all, or less than thirty minutes on daily basis personally studying outside school, they scored below 150 marks in their KCPE examinations and that they were not motivated to study. Middle students' conduct characteristics status showed that students indicated that they spent less than two hours but more

than thirty minutes on daily basis personally studying outside school, they scored between 151 and 250 marks in their KCPE examinations and that they were averagely motivated to study. High students' conduct characteristics status showed that students indicated that they spent more than two hours on daily basis personally studying outside school, they scored above 251 marks in their KCPE examinations and that they were strongly motivated to study.

Low students' school resource characteristics status showed that students, PDSS principals and school documents reviewed indicated that the teaching and learning process materials were not available in the PDSS or used; there was inadequate number of teachers in the PDSS, more than half of the teachers in the PDSS had certificates or degrees not in education; the school size comprised of below one hundred students. Middle students' school resource characteristics status showed that students, PDSS principals and school documents reviewed indicated that the teaching and learning process materials were moderately available in the PDSS and used; there was less than half the number of teachers in the PDSS with diploma in education and none of the teachers with certificates and or degree not in education; the school size comprised of between 101-250 students. High students' school resource characteristics status showed that students, PDSS principals and school documents reviewed indicated that the teaching and learning process materials were adequately available in the PDSS and used to a large extent; there was adequate number of teachers in the PDSS, all the teachers in the PDSS had either a degree, post graduate diploma, master and or doctorate degree in education and

were employed by the TSC; the school size comprised of 251 and above students. The data results are illustrated in Table 4.29.

Table 4.29: Cross-tabulation of students' household, parental/guardian, conduct and school resource characteristics, and variations in examination scores

Predictor Variable	Status	Dropped More Than 5 Points (D > 5 points)		Dropped Less Than 5 Points (D < 5 points)		No change in points (C = 0 points)		Added Less Than 5 Points (A < 5 points)		Added More Than 5 Points (A > 5 points)		Total number of Students	
		F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Student's household characteristics	Low	24	3.4	160	22.7	10	1.4	0	0.0	0	0.0	83	11.8
	Middle	17	2.4	123	17.4	54	7.7	13	1.8	10	1.4	217	30.8
	High	5	0.7	49	7.0	73	10.4	124	17.6	43	6.1	405	57.4
Student's parental/guardian characteristics	Low	20	2.9	218	31.8	31	4.5	7	1.0	6	0.9	282	41.1
	Middle	16	2.3	100	14.6	91	13.3	105	15.3	19	2.8	331	48.3
	High	10	1.5	14	2.0	15	2.2	25	3.6	28	4.1	92	13.4
Student's Conduct Characteristics	Low	10	1.4	86	12.2	10	1.4	20	2.8	11	1.6	137	19.4
	Middle	13	1.8	103	14.6	50	7.1	32	4.5	16	2.3	214	30.4
	High	23	3.3	143	20.3	77	10.9	85	12.1	26	3.7	354	50.2
School resource characteristics	Low	18	2.6	154	21.8	23	3.3	33	4.7	16	2.3	244	34.6
	Middle	14	2.0	100	14.2	56	7.9	57	8.1	19	2.7	246	34.9
	High	14	2.0	78	11.1	58	8.2	47	6.7	18	2.6	215	30.5

Source: Study Data, 2020

Findings portrayed in Table 4.29, overall describe a majority of the students 238 (34.7%) whose parents/guardians indicated low characteristics status to have also dropped in their performance. Most of the students 160 (22.7%) who indicated low household characteristic status, indicated that they had dropped in their performance with at most 5 points (D < 5 points). Twenty-four (3.4%) students who indicated low characteristics status closely followed by students in the high student's conduct characteristics status 23 (3.3%) indicated that they had dropped with more than 5 points (D > 5 points). Additionally, most 218 (31.8%) students

whose parents/guardians indicated low characteristic status and 154 (21.8%) students who indicated low school resource characteristic status, also indicated a drop in their examination scores of more than 5 points (D > 5 points). Majority of the students, 91 (13.3%) whose parents/guardians indicated middle parental/guardian characteristics status, indicated that they neither dropped nor added points in their examination scores (C=0). Most students, 124 (17.6%) who indicated high household characteristics status also indicated that they had added some points (A < 5 points) in their examination scores and 43 (6.1%) of the students in the same status also indicated that they had added more than 5 points (A > 5 points).

4.7.2 Inter – Correlations among the Predictor Variables

Bivariate Pearson's correlations were calculated to establish the inter-relations between predictor variables. This tested the presence or absence of multicollinearity amidst different variables. The results are presented in Table 4.30.

Table 4.30: Inter – Correlations among the Predictor Variables

Predictors	Correlations			
	1	2	3	4
1. SHC	-			
2. SP/GC	.543	-		
3. SCC	.434**	.467*	-	
4. ScRC	-.424**	.531**	.348	-

Note. SHC = Student's Household Characteristics, SP/GC = Student's Parental/Guardian Characteristics, SCC = Student's Conduct Characteristics, and ScRC = School Resource Characteristics.
Source: Study Data, 2020

The findings in Table 4.30 illustrate that the correlations among the predictor variables were weak. Student's Household Characteristics and Student's Parental/Guardian Characteristics had the highest positive correlation, although weak and not significant ($r = 0.543$, $p = 0.127$), since $p > 0.05$. The lowest correlation was negative and significant at $p < 0.01$ since ($r= -0.424$, $p = 0.000$) between Student's Household Characteristics and School Resource Characteristics. Largely, low associations between predictor variables explained absence of multicollinearity, that is relations between predictor variables.

4.7.3 Hierarchical regression analysis summary for variables predicting variations in examination scores

Overall, to define the prediction equation of variations in examination scores from students' household characteristics, students' parental/guardian characteristics, students' conduct characteristics and school resource characteristics the following null hypothesis was tested:

$H_{Ooverall}$: There is no statistically significant equations for predicting variations in examination scores from students' household characteristics, students' parental/guardian characteristics, students' conduct characteristics and school resource characteristics in Tharaka Nithi County.

In order to examine overall null hypothesis, hierarchical multiple regression analysis was employed to establish prediction of the four independent variables on variations in examination scores in PDSS. The linearity assumptions were affirmed with partial scatter plots of the predictor variables (students' household characteristics, students' parental/guardian characteristics, students' conduct characteristics and school resource characteristics) and the outcome variable

(variations in examination scores in PDSS). All the assumptions were met (see Appendix vi). Moreover, the variance inflation factors (VIF) were all less than 2, suggesting that there was no multicollinearity as per criteria advanced by (Tabachnick and Fidell 2013). Table 4.31 portray the results.

Table 4.31: Hierarchical regression analysis summary for variables predicting variations in examination scores

Model		Unstd. Coeffs.	Std. Coeffs.	t	Sig.	Tolerance	VIF
		B	Beta				
1	Constant	-.957		-4.428	.000		
	Gender	-.028	-.009	-.236	.813	.973	1.028
	CPSA	.079	.025	.642	.521	.973	1.028
2	Constant	-6.462		-48.540	.000		
	Gender	.014	.004	.277	.782	.972	1.028
	CPSA	-.009	-.003	-.172	.864	.972	1.029
	SHC	.896	.907	56.842	.000	.999	1.001
3	Constant	-6.534		-53.825	.000		
	Gender	.043	.014	.939	.348	.970	1.031
	CPSA	-.044	-.014	-.921	.357	.968	1.033
	SHC	.704	.713	32.876	.000	.749	1.230
	SP/GC	.811	.262	12.048	.000	.847	1.239
4	Constant	-5.689		-36.402	.000		
	Gender	.026	.008	.581	.562	.967	1.034
	CPSA	-.087	-.027	-1.898	.058	.955	1.047
	SHC	.669	.677	31.895	.000	.729	1.332
	SP/GC	.856	.276	13.245	.000	.843	1.256
	SCC	-.076	-.117	-8.081	.000	.929	1.077
5	Constant	-6.173		-52.628	.000		
	Gender	.018	.006	.563	.574	.967	1.034
	CPSA	-.112	-.035	-3.307	.001	.954	1.048
	SHC	.433	.438	23.578	.000	.921	1.086
	SP/GC	1.055	.341	21.744	.000	.936	1.069
	SCC	-.041	-.063	-5.781	.000	.974	1.027
	ScRC	.258	.328	24.090	.000	.888	1.126

Dependent variable: Variations in examination scores

Note: CPSA = Category of primary school attended; SHC = Student's Household Characteristics; SP/GC = Student's Parental/Guardian Characteristics; SCC = Student's Conduct Characteristics; ScRC = School Resource Characteristics.

Table 4.31 illustrate five models of predicting variations in examination scores. In all predictive models, students' household characteristics predicting variable had uppermost noteworthy positive predictive value (β = .438, p = 0.000), p < 0.01. More, in all predictive models, students' conduct characteristics predicting variable had the lowest significant negative predictive value (β =. -.063, p = 0.000), p < 0.01.

Model 1 comprised of moderating variables of the study, student's gender and category of primary school attended. The model did not present a statistically significant prediction equation, at (F (2, 702) = .215, p >.05), with (adjust. R^2 = 0.001) for the variations in examinations from the moderating variables. Although, constant β = -0.957, t = -4.428, p = 0.000 is significant, both student's Gender, β = -0.009, t = -.236, p = 0.813 and category of primary school attended (CPSA) β = 0.025, t = 0.642, p = 0.521 are not significant. Equation (1) indicates that student's variations in examinations scores reduced by 0.957 and 0.009 points of each standard deviation of student's gender but increased by 0.025 of each standard deviation of student's category of primary school attended respectively. The resultant moderating variables hierarchical regression equation (1) is presented as:

Y = -0.957-(0.009(Gender) + 0.025(CPSA)) MV (1)

(Where Y is the predicted variations in examination scores in PDSS; CPSA = Category of primary school attended) and MV = Moderating Variables)

Moderating variables (students' gender and category of primary school attended) did not present a significant prediction equation of the variations in examination

scores in Tharaka Nithi County PDSS. The moderating variables prediction equation indicated that students' variations in examinations scores reduced, since the constant was negative, and further reduced by standard deviation of each student's gender unit, but increased by a standard deviation of each category of primary school attended unit respectively. These findings related to O'Dea et al. (2018) study findings on the student gender differences in individual variation in academic grades but contrasted with the Donald and Isaac (2019) study findings on the relative effectiveness of private and public schools in Kenya. Along with the O'Dea et al. (2018) study, gender difference in variability had not changed noticeably in the period of 80 years and that gender differences in grade variability were already present in childhood and did not increase during adolescence. However, present study findings differed with Donald and Isaac (2019) finding of a positive private school effect where private school pupils outperformed their public-school counterparts. The present study findings indicated that student's gender and category of school attended at primary differences did not significantly account for the PDSS students' variations in examination scores.

Model 2 comprised of students' household characteristics with moderating variables; student's gender and category of primary school attended controlled for. Constant $\beta = -6.462$, $t = -48.540$, $p = 0.000$ is significant. Moderating variables: student's Gender, $\beta = .004$, $t = .277$, $p = 0.782$ and category of primary school attended (CPSA) $\beta = -.003$, $t = -.172$, $p = 0.864$ are not significant. Students' household characteristics (SHC) $\beta = .907$, $t = 56.842$, $p = 0.000$ is significant. The

resultant students' household characteristics hierarchical regression equation (2a) is presented as:

Y = -6.462 + 0.004 (Gender) - 0.003 (CPSA) + 0.907(SHC) (2a)

(Where Y is the predicted variations in examination scores in PDSS; CPSA = Category of primary school attended; SHC = Student's Household Characteristics)

Equation (2a) indicates that students' variations in examinations scores reduced by 6.462 when the moderating variables were controlled for but other predictor variables (students' parental/guardian, conduct and school resource characteristics) were not controlled for. Also, the students' variations in examinations scores improved by 0.004 points of each standard deviation of student's gender, reduced by 0.003 of each standard deviation of student's category of primary school attended, and increased by 0.907 of each standard deviation of student's household characteristics. After controlling for all the other predictor variables (students' parental/guardian, conduct and school resource characteristics), a statistically significant prediction equation, at ($F (1, 698) = 555.905$, $p < .01$) with (adjust. $R^2 = 0.059$), for the variations in examinations from the students' household characteristics was established. Equation (2b) indicates that student's variations in examinations scores increased by 0.438 of each standard deviation of student's household characteristics. Additionally, the null hypothesis, that specified no statistically significant equation for predicting variations in examination scores from students' household characteristics, was therefore rejected. The resultant students' household characteristic variables hierarchical regression equation (2b) is presented as:

$$Y = -6.173 + (0.006\ (Gender) - 0.035(CPSA))\ MV + 0.341(SP/GC) - 0.063(SCC) + 0.328(ScRC) + 0.438(SHC) \quad (2b)$$

(Where Y is the predicted variations in examination scores in PDSS; CPSA = Category of primary school attended; MV = Moderating Variables; SP/GC = Students' Parental/Guardian Characteristics; SCC = Student's Conduct Characteristics; ScRC = School Resource Characteristics and SHC = Student's Household Characteristics).

All PDSS principals and the students in the group interviews were in agreement that all indicators of student's household characteristics differentiated examination scores among PDSS students in different extents. They reported that limited wealth in most PDSS students' households contributed more to the differences in students' examination scores compared to other indicators of student's household characteristics. According to twelve PDSS principals and fifty students in the group interviews, family size differences differentiated students in the examination scores. They explained that family sizes were further differentiated by the differences in the wealth approximation. Ten PDSS principals and fifty-three students in the group interviews explained that students from large family sizes lacking basic commodities such as food were not also able to meet the required lunch fee in school. Such students they said were absent from school most of their time and thus performed poorly in class. Students' residence was also reported to contribute to some extent to the differences among students' examination scores. Thirteen PDSS principals and sixty students in the group interviews averred that some students who travelled far from their home to attend school performed better than those who lived near the school and sometimes, the vice versa was true.

Students who indicated low household, parental/guardian and school resource characteristics also reported a drop in their examination scores. The study respondents reported that indicators of household contributed to the differences in examination scores among PDSS students. In all predictive models, students' household characteristics predicting variable was had high significant positive predictive value. Students' household characteristics presented a significant prediction equation of the PDSS students' variations in examination scores in Tharaka Nithi County. This was established after controlling for the moderating variables. The moderating variables prediction equation indicated that students' variations in examinations scores reduced, since the constant was negative, but increased by a standard deviation of each student's household characteristics unit. Differences in the PDSS students' examination scores were associated with the PDSS students' differences in their household characteristics. These findings relate to Abuya et al. (2019) research findings on household characteristics and child's educational attainment in the slums of Nairobi Kenya. The study found that a student's household characteristics influenced education achievement. Nonetheless, the study findings differed from Kariuki's (2017) study which found no significant relationship between student's family characteristics and achievement motivation in Nairobi County slum areas. Both studies, Abuya et al. (2019) and Kariuki (2017) were conducted in urban setup unlike the present study which was conducted in the rural.

Model 3 comprised of students' parental/guardian characteristics with moderating variables (student's gender and category of primary school attended), and student's

household characteristics controlled for. Other predictor variables (students' conduct and school resource characteristics) were not controlled for. Constant β = -6.534, t = -53.825, p = 0.000 is significant, moderating variables; student's Gender, β = .014, t = .939, p = 0.348 and category of primary school attended (CPSA) β = -.014, t = -.921, p = 0.357 are not significant, students' household characteristics (SHC) β = .713, t = 32.876, p = 0.000 is significant and students' parental/guardian characteristics (SP/GC) β = .262, t = 12.048, p = 0.000 is significant. The resultant students' parental/guardian characteristics hierarchical regression equation (3a) is presented as:

Y = -6.534 + 0.014 (Gender) - 0.014 (CPSA) + 0.713 (SHC) + 0.262 (SP/GC) (3a)

(Where Y is the predicted variations in examination scores in PDSS; CPSA = Category of primary school attended; SHC = Student's Household Characteristics; SP/GC = Students' Parental/Guardian Characteristics).

Equation (3a) indicates that students' variations in examinations scores reduced by 6.534, enlarged by 0.014 points of every standard deviation of student's gender, reduced by 0.014 points of every standard deviation of student's category of primary school attended, increased by 0.713 points of each standard deviation of student's household characteristics and increased by 0.262 points of every standard deviation of students' parental/guardian characteristics. After controlling for all the other predictor variables (students' conduct and school resource characteristics), a statistically significant prediction equation, at (F (1, 698) = 472.823, p < .01) with (adjust. R^2 = 0.050), for the variations in examinations from the students' parental/guardian characteristics was established. Equation (3b) indicates that

student's variations in examinations scores increased by 0.341 of each standard deviation of student's parental/guardian characteristics. The Null hypothesis (there is no statistically significant equation for predicting variations in examination scores from students' parental/guardian characteristics) was therefore rejected. The resultant students' parental/guardian characteristic variables hierarchical regression equation (3b) is presented as:

$$Y = -6.173 + (0.006\ (\text{Gender}) - 0.035(\text{CPSA}))\ MV + 0.438(\text{SHC}) - 0.063(\text{SCC}) + 0.328(\text{ScRC}) + 0.341\ (\text{SP/GC}) \quad (3b)$$

(Where Y is the predicted variations in examination scores in PDSS; CPSA = Category of primary school attended; MV = Moderating Variables; SP/GC = Students' Parental/Guardian Characteristics; SCC = Student's Conduct Characteristics; ScRC = School Resource Characteristics and SHC = Student's Household Characteristics).

The PDSS principals and the students in the group interviews stated that student's parental/guardian characteristics differences contributed to the differences in examination scores. They stated that differences in parental/guardian support to a greater extent contributed to the differences in examination scores compared to differences in parental/guardian gender, income and relation. Moreover, thirteen PDSS principals and 59 students in the group interviews indicated that differences in parent/guardian interest of student education contributed much to the differences in examination scores. Additionally, students' parental/guardian characteristics were found to present a significant prediction equation of the PDSS students' variations in examination scores in Tharaka Nithi County. The results indicated that in PDSS, variations in examination scores increased as a result of the differences in student's parental/guardian characteristics. Students' differences in

examination scores in PDSS was mainly associated with the differences in student's parental/guardian support on student's education.

The study findings further, supported the assertion by Abuya et al. (2019) that children from households with two parents were more likely to be in the right age for grade with better education attainment compared to children from one parent households. Also, Thuba (2018) study established a positive and significant relationship between parental involvement indicators and quality of education in public day secondary schools. In addition, the findings supported Chen et al. (2018) study findings on the relationship between parental socio-economic status indicated by parent's education level, occupation and income; and student reading ability. More, this study rejected the null hypothesis which stated that there was no statistically significant equation for predicting variations in examination scores from students' parental/guardian characteristics. The present study findings thus concurred with Juma's (2016) study findings which established that parent's income, education level, occupation and involvement in education influenced student's academic performance. Juma's (2016) study independent variables included parent's income, education level, occupation and involvement in education while in the present study, parent's income, education level, occupation and involvement in education indicated parental characteristics.

Model 4 comprised of students' conduct characteristics with moderating variables; student's gender and category of primary school attended, and student's household and parental/guardian characteristics controlled for. Students' school resource

characteristics were not controlled for. Constant β = -5.689, t = -36.402, p = 0.000 is significant, moderating variables; student's Gender, β = .008, t = .581, p = 0.562 and category of primary school attended (CPSA) β = -.027, t = -1.898, p = 0.058 are not significant, students' household characteristics (SHC) β = .677, t = 31.895, p = 0.000 is significant, students' parental/guardian characteristics (SP/GC) β = .276, t = 13.245, p = 0.000 is significant and student's conduct characteristics (SCC) β = -.117, t = -8.081, p = 0.000 is significant. The resultant students' conduct characteristics hierarchical regression equation (4a) is presented as:

Y = -5.689 + 0. 008 (Gender) - 0. 027 (CPSA) + 0. 677 (SHC) + 0. 276 (SP/GC) – 0.117 (SCC). (4a)

(Where Y is the predicted variations in examination scores in PDSS; CPSA = Category of primary school attended; SHC = Student's Household Characteristics; SP/GC = Students' Parental/Guardian Characteristics; SCC = Student's Conduct Characteristics).

Equation (4a) indicates that students' variations in examinations scores reduced by 5.689, increased by 0.008 points of each standard deviation of student's gender, reduced by 0.027 points of each standard deviation of student's category of primary school attended, increased by 0.677 points of each standard deviation of student's household characteristics, increased by 0.276 points of each standard deviation of students' parental/guardian characteristics and reduced by 0.117 points of each standard deviation of student's conduct characteristics. After controlling for students' school resource characteristics, a statistically significant prediction equation, at (F (1, 698) = 33.417, p < .01) with (adjust. R^2 = 0.004), for the variations in examinations from the students' conduct characteristics was established. Equation (4b) indicates that students' variations in examinations

scores reduced by 0.063 of each standard deviation of student's conduct characteristics. The null hypothesis, that stated that there is no statistically significant equation for predicting variations in examination scores from students' conduct characteristics, was therefore rejected. The resultant students' conduct characteristics hierarchical regression equation (4b) is presented as:

$$Y = -6.173 + (0.006\ (\text{Gender}) - 0.035(\text{CPSA}))\ MV + 0.438(\text{SHC}) + 0.341\ (\text{SP/GC}) + 0.328(\text{ScRC}) - 0.063\ (\text{SCC}) \quad (4b)$$

(Where Y is the predicted variations in examination scores in PDSS; CPSA = Category of primary school attended; SHC = Student's Household Characteristics; SP/GC = Students' Parental/Guardian Characteristics; SCC = Student's Conduct Characteristics).

In all predictive models, students' conduct characteristics were found to have the lowest significant negative predictive value. PDSS principals and the students in the group interviews noted that differences in student's time spent learning and intelligence based on the KCPE marks contributed to differences in examination scores among PDSS students. All PDSS principals and the students in the group interviews observed that differences in students' ambition/motivations differentiated students' examination scores performance. They observed that students admitted in PDSS with high KCPE marks performed poorly in their examinations because they lacked the ambition to attain their secondary education in the PDSS. However, most students' who indicated high student conduct characteristics noted a drop in their examination scores. Most students in the low household characteristics status indicated that they had dropped in their performance with more than 5 points, followed by students in the high student's conduct characteristics status. All PDSS principals and the students in the group

interviews observed that differences in students' ambition/motivations differentiated students' examination score performance. They explained that students admitted in PDSS with high KCPE marks performed poorly in their examinations. Students' conduct characteristics were found to reduce predicted variations in examination scores in PDSS. According to the study informants, differences in students' effort and intelligence were reported to have minimal contribution to the differences in students' examination scores.

Model 5 comprised of students' school resource characteristics with moderating variables (students' gender and category of primary school attended), and all other predictor variables (student's household characteristics, student's conduct characteristics and student's parental/guardian characteristics) controlled for. Constant $\beta = -6.173$, $t = -52.628$, $p = 0.000$: significant; Gender, $\beta = 0.006$, $t = 0.563$, $p = 0.574$: not significant; Category of primary school attended (CPSA), $\beta = -0.035$, $t = -3.307$, $p = .001$: significant; Students Household characteristics (SHC), $\beta = 0.438$, $t = 23.578$, $p = .000$: significant; Students Parental/Guardian characteristics (SP/GC), $\beta = 0.341$, $t = 21.744$, $p = .000$: significant; Student Conduct characteristics (SCC), $\beta = -0.063$, $t = -5.781$, $p = .000$: significant; School Resource characteristics (ScRC), $\beta = 0.328$, $t = 24.090$, $p = .000$: significant. The resultant school resource characteristics hierarchical regression equation (5) was presented as:

$Y = -6.173 + 0.006$ (Gender) $- 0.035$ (CPSA) $+ 0.438$ (SHC) $+ 0.341$ (SP/GC) $- 0.063$ (SCC) $+ 0.328$ (ScRC).

(5)

(Where Y is the predicted variations in examination scores in PDSS; CPSA = Category of primary school attended; SHC = Student's Household Characteristics; SP/GC = Students' Parental/Guardian Characteristics; SCC = Student's Conduct Characteristics and ScRC = School Resource Characteristics).

Equation (5) indicates that students' variations in examinations scores reduced by 6.173, increased by 0.006 points of each standard deviation of student's gender, reduced by 0.035 points of each standard deviation of student's category of primary school attended, increased by 0.438 points of each standard deviation of student's household characteristics, increased by 0.341 points of each standard deviation of students' parental/guardian characteristics and reduced by 0.063 points of each standard deviation of student's conduct characteristics and increased by 0.328 points of each standard deviation of school resource characteristics. A statistically significant prediction equation, at ($F (1, 698) = 580.341$, $p < .01$) with (adjust. $R^2 = 0.061$) was found.

Indicators of the school resource characteristics were noted to contribute to the differences in the PDSS examination scores. Majority, of the PDSS principals and students during their interviews reported that the government supplied PDSS with the teaching and learning materials such as exercise books and some textbooks thus their differences would not contribute to differences in PDSS examination scores. Nevertheless, they all noted that availability of laboratory facilities in PDSS differentiated examination scores among students in different PDSS. All the PDSS principals further reported that the differences in the number of teachers and students enrolled in the PDSS differentiated examination scores in different PDSS.

Majority of the PDSS principals noted that teacher's terms of employment did not contribute to the differences in PDSS students' examination scores.

This study established that students' school resource characteristics had a significant prediction equation for the variations in examinations from the students' school resource characteristics. The finding that PDSS resource characteristics had statistically significant equation for predicting variations in examination scores in PDSS examination scores filled in the gap of a recent study findings in India by Cunningham et al. (2019). Cunningham et al. (2019) study endeavoured to create composite scores of the type of school infrastructure, grants to schools, teacher number and incentives to children and establish if they associated with arithmetic, reading and writing skills. Although Cunningham et al. (2019) study established that investment in teachers were associated with greater probability a child could attain more skills, it did not define prediction equation of the variations in skills from the investment in teachers. Similarly, the current study findings also indicated that PDSS variations in examination scores increased as a result of the differences in school resource characteristics. The study's null hypothesis that there is no statistically significant equation for predicting variations in examination scores from school resource characteristics, was therefore rejected. These findings elucidate that despite the Kenyan government efforts in financing PDSS resource characteristics, variations in examination scores among PDSS students were still associated with the differences in PDSS resource characteristics. According to Rawls theory, variations in examination scores among PDSS students are to everyone's advantage in equitably financed school resources.

This study found that students in PDSS were not differentiated in examination scores because of their differences in teaching and learning materials, an indicator of school resource characteristics. Students' differences in examination scores in PDSS were however attributed to differences in their school laboratory facilities which indicated school resource characteristics. More, differences in number of the teachers and enrolment in PDSS was found to differentiate different PDSS examination scores. These findings supported Maingi et al. (2017) conclusions that school physical facilities contributed to differences in secondary school students' academic achievement.

Overall, statistically significant equations for predicting variations in examination scores from student's household characteristics, student's parental/guardian characteristics, student's conduct characteristics and student school resource characteristics were established. Rawls (1999) explains that inequality is acceptable in education outcome if the education inputs are distributed in such a way that they improve the condition of the least advantaged members of the society. The study theories, Rawls theory of justice and EPF model, point that equitably financed school resources counterbalance influence of students' socio-economic (household and parental/guardian) characteristics on variations in examination scores. As a result, variations in examination scores among students are only attributed to differences in students' conduct characteristics. Nevertheless, the study established statistically significant equations for predicting variations in examination scores from students' household, parental/guardian and school resource characteristics.

Controlling for the moderating variables, student's household, parental/guardian and school resource characteristics, students' conduct characteristics were found to have minimal prediction of variations in examination scores in PDSS compared to the students' household, parental/guardian and school resource characteristics. However, a significant prediction equation was established. In the PDSS, students' variations in the examination scores associated with their differences in conduct characteristics counterbalanced their prediction value. The present study findings differed from Spengler et al. (2018) study findings on the role of student's conduct characteristics in predicting educational attainment in United States of America. According to Spengler et al. (2018) study, student characteristics in adolescence predicted educational success above and beyond parental socioeconomic status and IQ. Differences in the Spengler et al. (2018) study findings and the present study findings are ascribed to the variances in study locales. This research was done in the Kenyan PDSS. Kenya is a evolving country while United States of America is a developed country where school resources are more equitably financed, hence their influence counterbalance influence of students' socio-economic on academic attainment.

In the overall prediction equation, differences in student's household characteristics increased the variation in PDSS students' examination scores most. Differences in the students' Parental/Guardian and PDSS resource characteristics were also found to increase the variation in PDSS students' examination scores. These findings supported Gustafsson et al. (2018) study findings that socio-economic status was strongest cause of the differences across schools and

educational systems. The present study findings answered the two-study questions, first, 'Do variations in students examination scores in PDSS demonstrate equality of opportunity?', and second, 'What models of predictors of variations in students' examination scores in PDSS in Tharaka Nithi County have the highest predictive values?' In answering the first question, the present study findings demonstrate that variations in student's examination scores in PDSS do not evidence equality of opportunity in Tharaka Nithi County. The study found contribution of student's household characteristics and student's parental/guardian characteristics on the variations of students' examination scores in PDSS demonstrating that the school resource characteristics were not equitably financed in Tharaka Nithi County PDSS. Thus, in Tharaka Nithi County, PDSS failed to demonstrate equality of opportunity. Consistent with Rawls' theory of justice, equitably financed school resources counterbalance influence of both the household and parental/guardian characteristics on student's examination scores. Further, in answering the second question, the present study findings reveals that the model on students' household characteristics predicting variable has the highest significant positive predictive value ($\beta = .438$, $p = 0.000$), $p < 0.01$, followed by the model on students' parental/guardian characteristics ($\beta = .341$, $p = 0.000$), $p < 0.01$, followed by the model on students' school resource characteristics ($\beta = .328$, $p = 0.000$), $p < 0.01$, and the model on students' conduct characteristics had the lowest significant negative predictive value ($\beta =$. -.063, $p = 0.000$), $p < 0.01$.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter is divided into four sections. The first section summarizes the study findings. The second section presents the implications of the findings. This is followed by the conclusions based on the research findings. The final section gives the study recommendations for policy and areas for further research.

5.2 Summary of the Findings

This study was designed to model the relationship between students' socio-economic characteristics, students' conduct characteristics and school resource characteristics and learning outcomes in PDSS in Tharaka Nithi County. The goal was to establish if the variations in student's examination scores in PDSS demonstrate equality of opportunity thus respond to the two study questions, first, 'Do variations in students examination scores in PDSS demonstrate equality of opportunity?', and second, 'What models of predictors of variations in students' examination scores in PDSS in Tharaka Nithi County have the highest predictive values?' The study's aim was achieved through modelling the relationship between students' socio-economic, student's conduct and school resource characteristics and variations in academic achievements in Tharaka Nithi County PDSS. Student socio-economic characteristics were indicated by student's household and parental/guardian characteristics while student learning outcome was indicated by student examination scores. The study employed hierarchical multiple regression analysis on the quantitative data to determine relationships between PDSS

students' household, parental/guardian, conduct, school resource characteristics and students' variations in examination scores. It further used thematic analysis on the qualitative data to understand the relations. Four study objectives and four propositions guided the study.

5.2.1 Model of the relationship between student's household characteristics and variations in examination scores

The first objective of the study was on the modelling of the relationship amid student's household characteristics and variations in academic achievement. Student's household characteristics were indicated by analysing family size, residence, Coping Strategy Index (CSI) and wealth approximation. Coping Strategy Index (CSI) further indicated food availability in the household. The study found high inter-correlations among the indicators of students' household characteristics demonstrating that they measured the same construct, students' household characteristics. The study resolved that there was a statistically noteworthy positive connection amid student's household characteristics and variations in student's examination scores in Tharaka Nithi County PDSS. Further analysis revealed that student's household characteristics model, accounted for 5.9% variance in PDSS students' examination scores controlling for the effect of other predictor variables, which included student's parental/guardian characteristics, student's conduct characteristics, and school resource characteristics.

5.2.2 Model of the relationship between student's parental/guardian characteristics and variations in examination scores in Tharaka Nithi County PDSS

The next objective of the study was on modelling of the relationship amid student parental/guardian characteristics and variations in academic achievement. Student's parental/guardian characteristics were indicated by analysing parent's/guardian's gender, relation to the student (parent/guardian), support to the student, education, income and occupation. This study found high inter-correlations among the indicators of students' parental/guardian characteristics. The high inter-correlations among the indicators of students' parental/guardian characteristics demonstrated that they measured the same construct, students' parental/guardian characteristics. The study findings indicated that there was a statistically significant positive relationship between student's parental/guardian characteristics and variations in student's examination scores in Tharaka Nithi County PDSS. After controlling for the effect of other predictor variables (student's household characteristics, student's conduct characteristics, and school resource characteristics), additional analysis revealed that student's parental/guardian characteristics accounted for 5.0% variance in students' examination scores.

5.2.3 Model of the relationship between student's conduct characteristics and variations in examination scores in Tharaka Nithi County PDSS

The third objective of the study was on modelling relationship between student's conduct characteristics and variations in academic achievement. Student's conduct

characteristic was indicated by analysing student effort, intelligence based on KCPE scores, and ambitions. This study established moderately high inter-correlations among the indicators of students' conduct characteristics. Moderately high inter-correlations among the indicators of students' conduct characteristics showed that they measured same construct, students' conduct characteristics. A statistically significant negative relationship between student's conduct characteristics and variations in student's examination scores in Tharaka Nithi County PDSS was found. Further analysis revealed that after controlling for all the other predictor variables (that is student's household characteristics, student's parental/guardian characteristics, and school resource characteristics) student's conduct characteristics accounted for only 0.4% variance in students' examination scores.

5.2.4 Model of the relationship between the PDSS resources and variations in examination scores in Tharaka Nithi County

The fourth research objective was to model relationship amongst school resource characteristics and variations in academic achievement. School resource characteristics was indicated by analysing teaching and learning process resources, teaching staff qualifications, terms of employment and size, and school size. Further, teaching and learning process was indicated by the PDSS availability of teaching and learning materials, technology use and laboratory facilities. Teaching and school size were defined as the sum of PDSS teachers and number of students registered in PDSS respectively. This study found relatively high inter-correlations among the indicators of school resource characteristics. Thus, the indicators of the

school resource characteristics measured the same construct in this case, school resource characteristics. A moderately strong statistically significant positive relationship between school resource characteristics and variations in student's examination scores in Tharaka Nithi County PDSS was established. Differences in PDSS resource characteristics were observed to contribute to variations in examination scores between PDSS. Additional analysis revealed that PDSS resource Characteristics accounted for 6.1% variance in students' examination scores after controlling for all the predictor variables which included student's household characteristics, student's parental/guardian characteristics, and student's conduct characteristics.

5.2.5 Prediction equations of variations in examination scores

Overall, the present study also sought to establish the prediction equation of variations in examination scores from student's household characteristics, student's parental/guardian characteristics, student's conduct characteristics and school resource characteristics. Generally, majority of the students whose parents/guardians indicated low characteristics status also noted a drop in their performance. Most of the students who indicated low household characteristic status, indicated that they had dropped in their performance. More, greatest drop in the PDSS examination scores was noted among students who indicated low household characteristic status and the students who indicated high conduct characteristic status. Additionally, most students' whose parental/guardian's indicated low characteristic status and low school resource characteristic status, also indicated a drop in their examination scores. Majority, of the students in the

middle student's parental/guardian characteristics status indicated that they neither dropped nor added points in their examination scores. Most students who indicated high student's household characteristics status also indicated that they had improved in their examination scores. However, correlations among the predictor variables, student's household characteristics, student's parental/guardian characteristics, student's conduct characteristics and school resource characteristics were found to be weak and none was significant.

In examination of the overall study, null hypothesis stated that there was no statistically substantial equations for predicting variations in examination scores from student's household characteristics, student's parental/guardian characteristics, student's conduct characteristics and school resource characteristics in Tharaka Nithi County from the five models of predicting variations in examination scores modelled. Model 1 included moderating variables of the study. The moderating variables, (students' gender and category of primary school attended) prediction equation of the study was not statistically significant at ($F(2, 702) = .215$, $p > .05$), with (adjust. $R^2 = 0.001$).

The moderating variables could predict only 0.1% variations in students' examination scores in Tharaka Nithi County PDSS. The resultant moderating variables hierarchical regression equation (1) was presented as:

$$Y = -0.957+(-0.009(\text{Gender}) + 0.025(\text{CPSA}))\ MV \quad (1)$$

Equation (1) indicates that students' variations in examinations scores reduced by 0.957 and 0.009 points of each standard deviation of student's gender

but increased by 0.025 of each standard deviation of student's category of primary school attended respectively in Model 1.

Model 2 encompassed of students' household characteristics with moderating variables (students' gender and category of primary school attended), and all other predictor variables (students' parental/guardian, conduct and school resource characteristics) controlled for. A statistically significant prediction equation, at ($F(1, 698) = 555.905$, $p < .01$) with (adjust. $R^2 = 0.059$) was found. Students' household characteristics could predict 5.9% variations in students' examination scores in Tharaka Nithi County PDSS. The resultant students' household characteristic variables hierarchical regression equation (2) was presented as:

$$Y = -6.173 + (0.006\,(\text{Gender}) - 0.035(\text{CPSA}))\,MV + 0.341(\text{SP/GC}) - 0.063(\text{SCC}) + 0.328(\text{ScRC}) + 0.438(\text{SHC}) \quad (2)$$

Equation (2) indicates that students' variations in examinations scores increased by 0.438 of each standard deviation of student's household characteristics.

Model 3 included students' parental/guardian characteristics with moderating variables (students' gender and category of primary school attended), and all other predictor variables (student's household characteristics, conduct and school resource characteristics) controlled for. A statistically significant prediction equation, at ($F(1, 698) = 472.823$, $p < .01$) with (adjust. $R^2 = 0.050$) was found. Students' parental/guardian characteristics could predict 5.0% variations in

students' examination scores in Tharaka Nithi County PDSS. The resultant students' parental/guardian characteristic variables hierarchical regression equation (3) was presented as:

$$Y = -6.173 + (0.006\ (\text{Gender}) - 0.035(\text{CPSA}))\ \text{MV} + 0.438(\text{SHC}) - 0.063(\text{SCC}) + 0.328(\text{ScRC}) + 0.341\ (\text{SP/GC}) \quad (3)$$

Equation (3) indicates that students' variations in examinations scores increased by 0.341 of each standard deviation of student's parental/guardian characteristics.

Model 4 comprised of students' conduct characteristics with moderating variables (students' gender and category of primary school attended), and all other predictor variables (student's household characteristics, parental/guardian and school resource characteristics) controlled for. A statistically significant prediction equation, at ($F\ (1, 698) = 33.417$, $p < .01$) with (adjust. $R^2 = 0.004$) was found. Students' conduct characteristics could predict 0.4% variations in students' examination scores in Tharaka Nithi County PDSS. The resultant students' conduct characteristics hierarchical regression equation (4) was presented as:

$$Y = -6.173 + (0.006\ (\text{Gender}) - 0.035(\text{CPSA}))\ \text{MV} + 0.438(\text{SHC}) + 0.341\ (\text{SP/GC}) + 0.328(\text{ScRC}) - 0.063\ (\text{SCC}) \quad (4)$$

Equation (4) indicates that students' variations in examinations scores reduced by 0.063 of each standard deviation of student's conduct characteristics.

Model 5 comprised of students' school resource characteristics with moderating variables (students' gender and category of primary school attended), and all other

predictor variables (student's household characteristics, conduct and students' parental/guardian characteristics) controlled for. A statistically significant prediction equation, at ($F(1, 698) = 580.341$, $p < .01$) with (adjust. $R^2 = 0.061$ was found. Students' school resource characteristics could predict 6.1% variations in students' examination scores in Tharaka Nithi County PDSS. The resultant school resource characteristics hierarchical regression equation (5) was presented as:

$$Y = -6.173 + 0.006\,(\text{Gender}) - 0.035\,(\text{CPSA}) + 0.438\,(\text{SHC}) + 0.341\,(\text{SP/GC}) - 0.063\,(\text{SCC}) + 0.328\,(\text{ScRC}). \quad (5)$$

Equation (5) indicates that students' variations in examinations scores increased by 0.328 of each standard deviation of student's school resource characteristics.

5.3 Conclusions

The study aimed at establishing equality of opportunity in PDSS student's variations in examination scores in Tharaka Nithi County. Modelling of the relationship that exists between student's household characteristics, student's parental/guardian characteristics, student's conduct characteristics, school resource characteristics and variations in examination scores in Tharaka Nithi County was done to achieve the study aim. Thus, the study modelled the relationship between PDSS students' household characteristics, students' parental/guardian characteristics, students' conduct characteristics, school resource characteristics and variations in examination scores. In keeping with the research objectives, this part provides results conclusion.

5.3.1 Model of the relationship between student's household characteristics and variations in examination scores in Tharaka Nithi County PDSS

Objective one in this study was on modelling of the relationship between PDSS students' household characteristics and variations in examination scores while controlling for the other predictor variables. Findings of this research conclude that students' household characteristics and variations in the examination scores have a statistically positive relationship in the Tharaka Nithi County PDSS. The study concludes that student's household characteristics, explain 5.9% of the variance, a significant proportion of the variations in students' examination scores in Tharaka Nithi County PDSS compared to other predictor variables. Further, based on this objective, this research settles that all the student's household characteristics indicators relate to the variations in student's examination scores in Tharaka Nithi County PDSS.

5.3.2 Model of the relationship between student's parental/guardian characteristics and variations in examination scores in Tharaka Nithi County PDSS

Objective two was on modelling of the relationship between PDSS student's parental/guardian characteristics and variations in examination scores while controlling for the predictor variables. Informed by research findings, this research determined that students' parental/guardian characteristics and variations in the examination scores have a statistically positive relationship in the Tharaka Nithi County PDSS. The study concludes that student's parental/guardian characteristics account for 5.0% variations in students' examination scores in Tharaka Nithi

County PDSS, a considerable proportion of students' variations in examination scores compared to student's conduct characteristics. Thus, differences in PDSS student's parental/guardian characteristics indicated by the parental/guardian education level, income level, occupation level, support to the student, gender and relation to the student differentiate PDSS students in examination performance.

5.3.3 Model of the relationship between student's conduct characteristics and variations in examination scores in Tharaka Nithi County PDSS

Objective three was on modelling of the relationship between PDSS students' conduct characteristics and variations in examination scores while controlling for the other predictor variables. Supported by research findings, this study concludes that students' conduct characteristics and variations in the examination scores have a statistically negative relationship. The study concludes that PDSS student's conduct characteristics account for 0.4% variations in students' examination scores, the least proportion of the variance in the student's examination scores in Tharaka Nithi County PDSS.

5.3.4 Model of the relationship between the PDSS resources and variations in examination scores in Tharaka Nithi County

Objective four was on modelling of the relationship between PDSS resource characteristics and variations in examination scores while controlling for the predictor variables. Evidenced by research findings, this study concludes that PDSS resource characteristics and variations in examination scores have a statistically positive relationship in Tharaka Nithi County. This study concludes

that PDSS resource characteristics account for 6.1% variations in students' examination scores, the most variance in Tharaka Nithi County PDSS student's examination scores.

5.3.5 Prediction equations of variations in examination scores

The study's overall aim was to model statistically significant prediction equations for predicting variations in examination scores from student's household characteristics, student's parental/guardian characteristics, student's conduct characteristics and school resource characteristics in Tharaka Nithi County. Supported by evidence from the research findings, this study concluded that prediction equations of predicting variations in examination scores from student's household, parental/guardian, and school resource characteristics have positive predictive values. However, the study concludes that prediction equation of predicting variations in examination scores from student's conduct characteristics has negative predictive values. Prediction equations for predicting variations in examination scores provided the parameters in student's gender (X_0), Category of primary school attended by student enrolled in PDSS (X_1), Students Parental/Guardian characteristics (X_2), Student Conduct characteristics (X_3), School Resource characteristics (X_4), and Students Household characteristics (X_5) to compute variations in examination scores in Tharaka Nithi County PDSS. Further, supported by findings from this objective, the study concluded that the established parameters predict variation in PDSS students' examination scores for each standard deviation change in student's gender; category of primary school attended by student enrolled in PDSS, student parental/guardian characteristics,

student conduct characteristics, school resource characteristics and student household characteristics. Also, the study concluded that the moderating variables, students' gender and category of primary school attended; prediction equation of the study is not statistically significant. Thus, overall, the study concluded that variations in student's examination scores in PDSS do not evidence equality of opportunity in attainment of quality secondary education in Tharaka Nithi County PDSS. It also concluded that the financing of PDSS in Tharaka Nithi County was not equitable since it did not counterbalance the influence of student's household and parental/guardian characteristics on learning outcomes.

5.4 Recommendations

Conclusions of this research hold a number of inferences for education policy makers, instructors and students in PDSS in Kenya on how student's household characteristics, student's parental/guardian characteristics, student's conduct characteristics, school resource characteristics predict students' variations in examination scores. The ensuing endorsements were made for deliberation in policy and further research.

5.4.1 Policy Recommendations

Consistent with research findings, two categories of policy recommendations were made. One for the government and the other for practice.

Study policy recommendations for the Government:

PDSS Financing

The study recommends that the government should employ funding formula to ensure equity in financing PDSS. PDSS students are differentiated in their household, parental/guardian, conduct and school resource characteristics. A blanket financing of PDSS does not ensure equality of opportunity in attainment of quality secondary education outcome among students in PDSS. The study recommends that the financing model for secondary schools should focus on equity rather than per capita. In line with this recommendation, the study proposes revision of PDSS financing policy to embrace equity concept. This can be done by considering differences in PDSS student's household characteristics, student's parental/guardian characteristics and differences in PDSS resource characteristics when financing PDSS students. Contribution of PDSS student's household characteristics, student's parental/guardian characteristics and PDSS resource characteristics on learning outcomes would be neutralized. Thus, students' variations in examination scores in Tharaka Nithi PDSS would be to everyone's advantage. This would help achieve equality of opportunity in attainment of quality secondary education outcome among students in Tharaka Nithi County PDSS.

PDSS School Feeding Programme (SFP)

This study recommends that the government should adequately provide each PDSS student who cannot afford lunch cost in PDSS with food. Students whose households cannot afford each day meal have challenges in raising money for their

lunch costs. This study established that Government efforts such as lunch cost support through WFP SFPs in ASALs do not shield PDSS students from the influence of their differences in household, parental/guardian, and school resource characteristics on their variations in examination scores. In proportion to this recommendation, this study proposes that the government of Kenya should identify PDSS students whose households cannot afford or have much difficulty raising money for their children lunch costs and fully provide these students with food for lunch.

PDSS Staffing

Given the government's role under the current legal framework governing education of ensuring adequate staffing in all the public schools through the Teacher Service Commission (TSC), this study recommends that the government should ensure adequate staffing in Tharaka Nithi County PDSS. PDSS with adequate number of teachers in respect to their school sizes defined as the number of students enrolled in the school reduce variations in examination scores among students enrolled in different PDSS. Consequently, this would ensure equality of opportunity in attainment of quality secondary education outcome among students in PDSS. In so doing, the government will ensure that all PDSS students have food for lunch thus minimize PDSS student's absenteeism and variations in examinations scores associated.

Study policy recommendations for Practice:

PDSS Principals and Teachers

The study recommends that PDSS to have students' welfare department that would provide student psychological support through counsellors and motivation talks to help students admitted in the PDSS with high KCPE scores to do well. PDSS students conduct characteristics indicated by student effort, intelligence based on KCPE scores, and ambitions were found to account for the least proportion of the variance in students' examination scores. Thus, differences in PDSS student's conduct characteristics had minimal contribution instead of having maximum contribution to students' variations in examination scores. Equality of opportunity in attainment of quality secondary education outcome among students in PDSS would then be demonstrated by only students' conduct characteristics predicting variations in examination mean scores and having maximum contribution to variations.

Parents/Guardians

The study recommends that all the Parents/Guardians in PDSS in as much as they can to provide their children enrolled in PDSS with maximum support in their attainment of secondary education. If all the Parents/Guardians in PDSS are motivated to support students in attainment of secondary education in Tharaka Nithi County PDSS, differences in the Parents/Guardians support in PDSS among students would be minimized. Minimized differences in the Parents/Guardians PDSS student support result to reduced variations in students' examination scores contributed to by the student's parental/guardian characteristics. Variations in

students' examination scores contributed to by student's parental/guardian characteristics defy equality of opportunity in attainment of secondary education in PDSS. Consistent with this recommendation, the study proposes that parents/guardians should ensure that their children enrolled in PDSS have enough food to eat, they meet PDSS school supplies and that students do their school work at home. Thus, parents/guardians should provide conducive study environment at home.

PDSS Students

The study recommends that the students enrolled in the PDSS with high KCPE examination scores to study equally hard as those enrolled with lower KCPE scores by having more time to study outside school. The study proposes to the students enrolled in the PDSS with high KCPE examination scores that they can achieve their life goals through secondary education attained in the enrolled PDSS thus should be self-motivated to learn in PDSS. It also recommends that students who live near the school should keep off their homes during school hours. Thus, all students are able to attend all lessons and perform equally well in their studies. This would enhance learning outcomes of students enrolled with high KCPE marks and those who live near the school compounds in PDSS thus enhance quality secondary education outcome among students in PDSS.

5.4.2 Recommendations for Further Research

The subsequent proposals were made for deliberation for future study:

i. The study was limited to Tharaka Nithi County. A national study on the same would be necessary for crosschecking the consistency of predictors of variations in PDSS examination scores.

ii. This study investigated PDSS students' household, parental/guardian, conduct, school resource characteristics as predictors of students' variations in examination scores. Further research is also needed to in addition investigate PDSS student's culture, health and parental/guardian intelligence differences as predictors of variations in examination scores.

iii. Present study focussed on the predictors of variations in PDSS examination scores. Future research needs to establish predictors of variations in PDSS value addition on students indicated by both academic, examination scores and non-academic measures such as co-curricular activities.

iv. While the present study based PDSS student intelligence on the performance in KCPE examination scores, future research needs to establish PDSS student intelligence by determining the Intelligence Quotient.

REFERENCES

Abuya, B., Mutisya, M., Onsomu, E., Ngware, M., & Oketch, M. (2019). Family Structure and Child Educational Attainment in the Slums of Nairobi, Kenya. *SAGE*, 1–10. https://doi.org/10.1177/2158244019855849

Anna, V., & Arthur, P. (2017). Personality and Academic Performance. *Research Gate*, *3*(8), 1–23. https://doi.org/DOI: 10.1007/978-3-319-28099-8_989-1

Asif Iqbal, Fakhra Aziz, Tahir Farooqi, & Shabbir Ali. (2016). Relationship between Teachers' Job Satisfaction and Students' Academic Performance. *Eurasian Journal of Educational Research*, *65*, 335–344.

Aye, N., Oforka, M., Akaneme, N., Idris, M., & Okolo, A. (2016). Influence of Parents' Educational and Occupational Background on Educational Support of Secondary School Students in Jigawa and Kano States, Nigeria. *Medwell Journals*, *10*(22), 5376–5386.

Azumah, F., Adjei, E., & Nachinaab, J. (2017). The Effects of Family Size on The Investment of Child Education, Case Study at Atonsu-Buokro, Kumasi. *Researchjournali's Journal of Sociology*, *5*(4), 1–17.

Bai, X., Ola, A., & Akkaladevi, S. (2018). Examination of the relationship between class attendance and student academic performance. *Issues in Information Systems*, *19*(3), 101–109.

Baker, D. B., & Levin, H. J. (2014). Educational Equity, Adequacy, and Equal Opportunity in the Commonwealth: An Evaluation of Pennsylvania's School Finance System. *American Institutes for Research*.

Berkowitz, R., & Benbenishty, R. (2017). A Research Synthesis of the Associations Between Socioeconomic Background, Inequality, School Climate, and Academic Achievement. *AERA*, *87*(2), 425–469. https://doi.org/10.3102/0034654316669821

Bold, T., Filmer, D., & Martin, G. (2017). What Do Teachers Know and Do? Does It Matter? Evidence from Primary Schools in Africa. *Education Global Practice Group Development Research Group Africa Region*, *7956*(Policy Research Working Paper), 1–37.

Bowles, S. (1970). *Towards an Educational Production Function. In Hansen W.L (1970)* (Vol. 9). Education, Income and Human Capital.

Burmeister, E., & Leanne, M. A. (2012). Sample size: How many is enough? *Australian Critical Care*. https://doi.org/10.1016/j.aucc.2012.07.002

Cerdeira, J., Nunes, L., Reis, A., & Seabra, M. (2018). Predictors of Student Success in Higher Education: Secondary School Internal Scores versus

National Exams. *Nova School of Business and Economics, Universidade Nova de Lisboa*.

Chen, Q., Kong, Y., Gao, W., & Mo, L. (2018). Effects of Socio-economic status, Parent-Child Relationship and Learning Motivation on Reading Ability. *Frontiers in Psychology*, *9*(1297), 1–12. https://doi.org/10.3389/fpsyg.2018.01297

Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education* (6th ed.). Routledge 2 Park Square.

Creswell, J. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. SAGE.

Cropley, A. (2015). *Introduction to Qualitative Research Methods*.

Cunningham, C., Solveig, C., Halim, N., & Yount, K. (2019). Public Investments in Education and Children's Academic Achievements. *The Journal of Development Studies*, *55*(11), 2365–2381.

Dahie, A., Osman, A., & Mohamed, R. (2015). Time Management and Academic Performance: Empirical Survey from High Education in Mogadishu - Somalia. *International Journal in Management and Social Science (Impact Factor- 4.358)*, *3*(12), 376–388.

Dewey, Husted, & Kenny. (2000). The Ineffectiveness of School Inputs: A Product of Misspecification? *Economics of Education Review*.

Donald, B., & Isaac, R. (2019). The relative effectiveness of private and public schools: Evidence from Kenya. *An International Journal of Research, Policy and Practice*, *30*(3), 104–130. https://doi.org/10.1080/09243453.2018.1520132

Dooley, T. P., & Schreckhise, D. W. (2016). Evaluating Social Cognitive Theory in Action: An Assessment of the Youth Development Program's Impact on Secondary Student Retention in Selected Mississippi Delta Communities. *SAGE*, *48*(3), 383–401. https://doi.org/10.1177/0044118X13493445

Effiong, Oji, E., & Igiri, C. (2015). Impact of Instructional Maerials in Teaching and Learning of Biology in Senior Secondary Schools in Yakurr LG A. *International Letters of Social and Humanistic Sciences*, *62*(4), 27–33. https://doi.org/10.18052/www.scipress.com/ILSHS.62.27

Faught, E., Williams, P., Willows, N., Asbridge, M., & Paul, V. (2017). The association between food insecurity and academic achievement in Canadian school-aged children. *Public Health Nutrition*, *20*(15), 2778–2785. https://doi.org/10.1017/S1368980017001562

Fincham, J. (2008). Response Rates and Responsiveness for Surveys, Standards, and the Journal. *American Journal of Pharmaceutical Education*, *2*(72), 1–3.

Fraenkel, R. J., Wallen, E. N., & Hyun, H. H. (2012). *How to Design and Evaluate Research in Education* (8th ed.). McGraw-Hill.

Gay, L. R. (1992). *Educational Research: Competence for Analysis and Applications.* (4th ed.). Macmillan.

Getange, K. N. (2013). *Financing of Public Day Secondary Schools Education and its Implications on the Quality of learning in Kisii Central District, Kenya* [Doctorial Dissertation]. Kenyatta University.

Giannelli, G., & Rapallini, C. (2018). Parental Occupation and Children's School Outcomes in Math. *IZA Institute of Labor Economics*, *11395*.

Gustafsson, J.-E., Nilsen, T., & Kajsa, H. (2018). School characteristics moderating the relation between student socio-economic status and mathematics achievement in grade 8. Evidence from 50 countries in TIMSS 2011. *Studies in Educational Evaluation*, *57*, 16–30.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modelling (PLS-SEM)* (2nd ed.). Sage.

Hansen, W. L. (1970). *Education and Production Functions*. National Bureau of Economic Research. http://www.nber.org/chapters/c3276

Hanushek, E. A. (1979). Conceptual and empirical issues in the estimaion of educational production functions. *Journal of Human Resources*, *14*(351), 88.

Hanushek, E. A. (1999). Some findings from an independent investigation of the Tennesse STAR experiment and from other investigations of class size effects. *Educational Evaluation and Policy Analysis*, *21*(143), 63.

Hanushek, E. A. (2008). *Education production functions. The New Palgrave Dictionary of Economics*. (Second). Palgrave Macmillan.

Haradhan, M. (2017). Two Criteria for Good Measurements in Research: Validity and Reliability. *MPRA, Annals of Spiru Haret University*, *17*(3), 58–82.

Henderson, C. (2015). Can formative quizzes predict or improve summative exam performance? *Education Research Service*, *29*(1), 16–21. https://doi.org/10.7899/JCE-14-12

Huisman, J., & Smits, J. (2017). *Keeping children in school: Effects of household and context characteristics on school dropout in 363 districts of 30 developing countries*. Nijmegen Center for Economics (NiCE).

Hungi, N. (2012). Accounting for Variations in the Quality of Primary School Education. *UNESCO International Institute for Educational Planning*, 44.

Hyman, J. (2016). Does Money Matter in the Long Run? Effects of School Spending on Educational Attainment. *University of Michigan Mimeo*.

Ingersoll, R., Merrill, E., Stuckey, D., & Collins, G. (2018). *Seven Trends: The Transformation of the Teaching Force* (p. 28) [Consortium for Policy Research in Education (CPRE)]. University of Pennsylvania. https://repository.upenn.edu/cpre_researchreports/108

International Budget Partnership. (2017). *Processes for Financing Public Basic Education in South Africa*. Cornerstone Economic Research.

Isaac, A. (2016). Socio-economic Background as Correlates on Academic Performance of Students: A Case of Agricultural Science Students in University of Mpumalanga. *J Sociology Soc Anth*, *7*(4), 244–249.

Johanson, A. G., & Brooks, P. G. (2010). Initial Scale Development: Sample Size for Pilot Studies. *SAGE*, *70*(3), 394–400. https://doi.org/DOI: 10.1177/0013164409355692

Juma, O. S. (2016). *Influence of Parental Socio-Economic Status on Students' Academic Performance in Public Secondary Schools in Tana River County, Kenya.* [Thesis]. University of Nairobi.

Kapur, R. (2018). Factors Influencing the Students Academic Performance in Secondary Schools in India. *Research Gate*. https://www.researchgate.net/publication/324819919

Kariuki, D. (2017). *Personal, Family and School Factors As correlates of Achievement Motivation Among Form two students in Nairobi County, Kenya*. Kenyatta University.

Kasembeli, D., & Gathara, P. (2014). Partnership in Secondary School Assessment Examinations and Kenya Certificate of Secondary Education Examinations:Dilemma in Evaluation. *Asian Journal of Educational Research*, *2*(1), 28–38.

Kenya National Bureau of Statistics (KNBS). (2015). *County Statistical Abstract: THARAKA NITHI COUNTY*. Tharaka Nithi County Statistical Office.

Kivilu, M. (2015). *Politics of public examinations in Africa: The Role of Assessment in the Implementation of National Education Policy*. The 22nd

Annual Conference of the Association for Educational Assessment in Africa, Botswana.

KNEC Data. (2018). *Kenya Certificate of Secondary Education (KCSE) Top and Bottom Five Schools per County Analysis*. Government Printer.

Konow, J., Saijo, T., & Akai, K. (2016). Equity versus Equality. *Kiel University, Loyola Marymount University, Kochi Institute of Technology, University of Tokyo, 75376*. https://mpra.ub.uni-muenchen.de/75376/

Kyriakides, L., Devine, D., & Papastylianou, D. (2017). Quality and Equity in Education: Theories, Applications and Potentials. *Erasmus*, *1*(1), 5.

Levitan, J. (2016). The Difference Between Educational Equality, Equity and Justice; and why it Matters. *AJE Forum of the American Journal of Education*.

Maingi, D., Mulwa, D., Maithya, R., & Migosi, J. (2017). Influence of School Physical Facilities on Students' Discipline in Public Secondary Schools in Makueni County, Kenya. *American Journal of Education and Learning*, *2*(1), 34–42.

Malusa, G. (2017). Equity in educational systems and policies: A difficult social justice choice. *Research Gate*, *21*(47), 86–122.

Manasi, E. (2018). A Hierarchical Linear Modeling of the Effects of School characteristics on Students' Academic Achievement in Busia County, Kenya. *Greener Journal of Educational Research*, *8*(2), 035–046.

Massey, S. (2011). The relationship between formative and summative examinations; can the past predict the future. *Research Gate*. https://doi.org/10.1097/01367895-201122010-00007

Maxwell, D., & Caldwell, R. (2008). *The Coping Strategies Index Field Methods Manual*. TANGO International.

Musau, L., & Abere, M. (2015). Teacher qualification and students' academic performance in science mathematics and technology subjects in Kenya. *International Journal of Educational Administration and Policy Studies*, *7*(3), 83–89. https://doi.org/10.5897/IJEAPS2014.0386

Mutegi, R., Muriithi, M., & Wanjala, G. (2017). EDUCATION POLICIES IN KENYA: DOES FREE SECONDARY EDUCATION PROMOTE EQUITY IN PUBLIC SECONDARY SCHOOLS? *International Journal of Development Research*, *7*(11), 16696–16699.

Mwangi, G., Cabrera, A., Kurban, E., & Chrystal, A. (2018). Connecting school and home: Examining parental and school involvement in readiness for

college through multilevel SEM. *Research in Higher Education*, *20*. https://doi.org/10.1007/s11162-018-9520-4

Mwangi, Z., Kiteme, B., & Wiesmann, U. (2016). *Socio-Economic Atlas of Kenya* (Second). Kenya National Bureau of Statistics (KNBS).

Ng'ang'a, M., Mwaura, P., & Dinga, J. (2018). Relationship Between Achievement Goal Orientation and Academic Achievement Among Form Three Students in Kiambu County, Kenya. *International Journal of Education and Research*, *6*(4), 53–68.

Nghambi, G. (2014). *Factors contributing to poor academic performance in certificate of secondary education examination for community secondary schools in Urambo District, Tabora, Tanzania* [Master of Education in Administration, Planning and Policy Studies (M.ED – APPS)]. Open University of Tanzania.

Ntawiha, P. (2016). *Educational Inputs and their Implications for Output in Public Secondary Schools in Nyarugenge and Nyamasheke Districts Rwanda* [Doctorial Dissertation]. Kenyatta University.

O'Day, A. J., & Smith, S. M. (2016). Quality and Equality in American Education: Systemic Problems, Systemic Solutions. *Educational Testing Service*, 297–358. https://doi.org/10.1007/978-3-319-25991-8-9

O'Dea, R., Lagisz, M., Jennions, M., & Nakagawa, S. (2018). Gender differences in individual variation in academic grades fail to fit expected patterns for STEM. *Nature Communications*, *9*(3777), 1–8. https://doi.org/DOI: 10.1038/s41467-018-06292-0

OECD. (2018). *The future of education and skills: Education 2030*. OECD Publishing.

Orodho, J., Nzabalirwa, W., Odundo, P., Waweru, P., & Ndayambaje, I. (2016). *Quantitative and Qualitative Research Methods* (1st ed.). Kanezja Publishers and Enterprises.

Polcyn, J., & Gawrysiak, M. (2017). Education Inputs Index as the Background of Education Outcomes at Secondary Education Level. *Research Gate*, *1*(72), 23.

Psacharopoulos, G., & Patrinos, H. (2018). Returns to investment in education: A decennial review of the global literature. *Research Gate*, *26*(5), 445–458. https://doi.org/10.1080/09645292.2018.1484426

Quin, D. (2017). Longitudinal and Contextual Associations Between Teacher–Student Relationships and Student Engagement: A Systematic Review.

Review of Educational Research, *87*(2), 345–387. https://doi.org/10.3102/0034654316669434

Rawlings, J., Pantula, S., & Dickey, D. (1998). *Applied Regression Analysis: A Research Tool* (2nd ed., Vol. 3). Springer - Verlag.

Rawls, J. (1999). *A Theory of Justice*. The Belknap Press of Havard University Press.

Republic of Kenya. (2008). *The Development of Education: National Report of Kenya*. Government Printer.

Republic of Kenya. (2009). *Revised Policy Framework for Nomadic Education in Kenya*. Government Printer.

Republic of Kenya. (2012). *SESSIONAL PAPER NO. 14 2012. A Policy Framework For Education And Training: Reforming Education and Training in Kenya.* Government of Kenya.

Republic of Kenya. (2013). *County of Tharaka Nithi*. Government Printer.

Republic of Kenya. (2015a). *Fees Guidelines for Public Secondary Schools in Kenya* (p. 6) [Taskforce]. Ministry of Education Science and Technology.

Republic of Kenya. (2015b). *National Education Sector Plan (NESP): Basic Education Programme Rationale and Approach 2013—2018*. Government of Kenya.

Republic of Kenya. (2016). *School Nutrition and Meals Strategy for Kenya*. Government Printer.

Republic of Kenya. (2017). *Education Sector Report for the Medium Term Expenditure Framework 2018/19—2020/21*. Government Printer.

Roemer, J., & Unveren, B. (2016). Dynamic Equality of Opprtunity. *Yale University Press*.

Scheerens, J., Luyten, H., & Ravens, V. (2011). Measuring Educational Quality by means of Indicators. *Springer*, *2*(3), 35–49.

Sebastian, B., & Ricarda, S. (2018). *Journal of Intelligence*, *6*(27), 1–18. https://doi.org/10.3390/jintelligence6020027

Shone, J. (2015). *Introduction to Quantitative Research Methods*. Graduate School, The University of Hong Kong.

Sisungo, Z., Kaberia, L., & Buhere, P. (2014). An investigation on the relationship between the school level of funding and performance at K.C.S.E. in Mumias District, Western Province, Kenya. *International Journal of*

Educational Administration and Policy Studies, *6*(2), 15–22. https://doi.org/10.5897/IJEAPS11.018

Spengler, M., Damian, R., & Roberts, B. (2018). How you Behave in School Predicts Life Success above and beyond Family Background, Broad Traits, and Cognitive Ability. *Journal of Personality and Social Psychology*. http://dx.doi.org/10.1037/pspp0000185

Spruit, M. (2015). Quantifying Education Quality in Secondary Schools. *Research Gate*, 1–42. https://doi.org/10.4018/IJKSR.2015010104

Stine, S., & Guro, F. (2017). *The Effects of Technology on Students' Academic Performance*. NHH.

Tabachnick, B., & Fidell, L. (2013a). *Using Multivariate Statistics* (6th ed.). Pearson Education, Inc. http://reliefwatch.com/Download-Using-Multivariate-Statistics-6th-Edition-Pdf.pdf

Tabachnick, B., & Fidell, L. (2013b). *Using Multivariate Statistics* (6th ed.). Pearson Education, Inc. http://reliefwatch.com/Download-Using-Multivariate-Statistics-6th-Edition-Pdf.pdf

Taherdoost, H. (2016). Validity and Reliability of the Research Instrument; How to Test the Validation of a Questionnaire/Survey in a Research. *International Journal of Academic Research in Management (IJARM)*, *5*(3), 28–36. https://doi.org/10.2139/ssrn.3205040

Tastan, S., Davoudi, S., Masalimova, A., Bersanov, A., Kurbanov, R., Boiarchuk, A., & Pavlushin, A. (2018). The Impacts of Teacher's Efficacy and Motivation on Student's Academic Achievement in Science Education among Secondary and High School Students. *EURASIA Journal of Mathematics, Science and Technology Education*, *14*(6), 2353–2366.

Thompson, R. (2013). A Rawlsian Instrument for the Evaluation of Justice in Educational Policy Documents. *All Dissertations. Paper 1131*, 280.

Thuba, E. (2018). *Effect of Parental Involvement on Quality of Education in Public Day Secondary Schools in Igembe Central Sub-County, Meru County Kenya*. Kenya Methodist University.

UIS. (2018). *Handbook on Measuring Equity in Education*. UNESCO Institute for Statistics.

UNESCO. (2016). *Global Education Monitoring Report Education for people and planet: Creating Sustainable Future for All* (p. 620).

UNESCO. (2017). *A guide for ensuring inclusion and equity in education.* United Nations Educational, Scientific and Cultural Organization.

UNICEF. (2018). *Education Budget Brief 2018*. UNICEF.

Wakwabubi, S., Achoka, J., Shiundu, J., & Ejakait, E. (2016). Students' Socio-Economic Status and Enrolment in Public Secondary Schools in Kenya. *International Journal Advances in Social Science and Humanities*, *4*(04), 70–80.

Wodtke, G. (2016). *Neighborhoods, Schools, and Academic Achievement: A Formal Mediation Analysis of Contextual Effects on Reading and Mathematics* (No. 16–864; Population Studies Center, p. 71). University of Michigan Institute for Social Research.

World Bank. (2005). *Expanding Opportunities and Building Competencies for Young People A New Agenda for Secondary Education*. The International Bank for Reconstruction and Development.

World Data Atlas. (2018). *Uganda—Public spending on education as a share of gross domestic product*. https://knoema.com/atlas/Uganda/ topics/ Education/Expenditures-on-Education/Public-spending-on-education-as-a-share-of-GDP

APPENDICES

Appendix I: Student Questionnaire on Predictors of Variations in Learning Outcomes

Hallo, I am a student at Kenyatta University, School of Education, Department of Educational Management, Policy and Curriculum Studies. I am currently undertaking research on '*Predictors of Variations in Students' Learning Outcomes in Public Day Secondary Schools, Tharaka Nithi County, Kenya*' in fulfilment of the requirements of the degree of Doctor of Philosophy in educational planning. You are kindly requested to participate in this research by giving your responses to the questions asked to the best of your knowledge. The researcher would like to assure you that the information given will strictly be confidential and only meant for this research purposes. No reference will be made to individuals or schools. Kindly omit your name and of your school.

Gatwiri Winniejoy Nkonge

Department of Educational Management,

Policy and Curriculum Studies.

School of Education

Kenyatta University.

PART 1: Conduct Characteristics

S/N	Characteristic Category		Respond by ticking, that is writing a tick [√] where applicable.
1.	Gender	Male	
		Female	
2.	Which category of school did you attend for your primary education	Public Day Primary School	
		Private Day Primary School	
		Public Boarding Primary school	
		Private Boarding Primary school	
		Other, Specify_____	
3.	Which year did you do your KCPE?	_____	
4.	How many marks did you score in your KCPE?	KCPE Marks _____	

Respond by ticking, that is writing a tick [√] where applicable

	Description Statement	Strongly Disagree	Disagree	Do not Know	Agree	Strongly Agree
5.	I can do anything to stay in school					
6.	I desire to be the best in my class					
7.	I spend 2 hours or more outside school doing my personal study					
8.	I have never missed school without a good reason					
9.	During the holiday I read other academic books on my own besides doing assignment					
10.	I desire to join college/university					
11.	I believe I am brighter than average					
12.	I expect to have a professional career					
13.	My academic achievement will determine my career					
14.	I desire to attain highest education level possible					

PART 2: End of year examination scores

15. Kindly, indicate your **mean grade** for the end of year examination scores (end of third term exam results) while you were in **Form one (1)** and **Form two (2)**.

End of year examination mean grade	
2018	**2019**
Form 1	Form 2

PART 3: Student's Household Characteristics

16 What is **your** family size**?**

Respond by ticking, that is writing a tick [√] where applicable			
	1 to 3 persons	Between 4 to 8 persons	More than 8 persons
How many are you in your family NB: Including your parents or guardians, brothers, sisters and yourself?			

17. In the last 7 days (a week), how often has your family had to do the following?

1. Rely on less preferred and less expensive foods?
2. Borrow food, or rely on help from a friend or relative?
3. Serve small amount of food at mealtimes?
4. Serve only small children with food and older children remain with no food?
5. Eat only once or twice a day?

Respond by ticking, that is writing a tick **[√]** where applicable in the table below **only once** where it applies **on the number of days your family takes each of the actions listed above within a week, seven (7) days.**

If your family does not take the actions described above, tick, or write a tick **[√]** where it is written **'it did not happen'** on the action. ***See first two examples, and respond accordingly.***

		1 day	**2 days**	**3 days**	**4 days**	**5 days**	**6 days**	**7 days**	**It did not happen**
	Example 1, ***Rely on less preferred and less expensive foods?***					√			
	Example 2, ***Borrow food, or rely on help from a friend or relative?***								√
a	Rely on less preferred and less expensive foods?								
b	Borrow food, or rely on help from a friend or relative?								
c	Serve small amount of food at mealtimes?								
d	Serve only children with food and adults/teenagers remain with no food?								
e	When at home whole day eat only once or twice a day?								

18. Which of the following items are found in your home? Please respond by ticking, that is writing a tick **[√]** on all the items that are found in your home.

Items **If you have any or all of the items listed below in your home**		Please write a tick **[√]** where applicable	Items **If you have any or all of the items listed below in your home**		Please write a tick **[√]** where applicable
a)	A desk/table to study at		f)	Family vehicle	
b)	Computer for school work		g)	Family television	
c)	Quiet place to study		h)	Tap water	
d)	Internet availability		i)	Electricity lighting	
e)	Touch screen mobile phones		j)	Gas/Electrical cookers	

19. How far is your home from the following places? Respond by ticking, that is writing a tick **[√]** where applicable

Approximate distance from your home to…	Above 2 Km	Between 1 – 2 Km	Below 1 Km
Your school			
Town center			
Permanent tarmacked road			
Medical institution			
Police post/station			

PART 4: School Resources

Please respond by ticking that is writing a tick [√] where applicable on the statements below.

	Description Statements	Strongly Disagree	Disagree	Agree	Strongly Agree
20.	Students use computer in class				
21.	During the lesson, teacher(s) use computer to teach				
22.	During the lesson, at times teacher(s) use their phone to teach				
23.	During the lesson, at times teacher(s) show education videos				
24.	During the lesson, at times teacher(s) use projectors to teach				
25.	During the lesson, teacher(s) use **only** textbook to teach				
26.	During the lesson, teacher(s) at times use charts to teach				
27.	Students use charts in class to draw something for learning purposes.				
28.	You have exercise books in all the subjects you are taking.				
29.	You have a textbook **in at least one of** the following subjects: Mathematics, English, Biology, Chemistry, Physics or Kiswahili				
30.	School provides textbooks				
31.	School has central library				
32.	The school has a laboratory				
33.	School laboratory fully equipped				
34.	Students fit well in the laboratory during practical lessons				
35.	In case you face a problem in your studies or problems at home you feel free to report to any teacher				
36.	Any teacher teaching you helps you to solve study and some home problems				
37.	All the teachers teaching you encourage you to work hard				
38.	All the teachers teaching you can be approached easily				

END

THANK YOU!

Appendix II: Students Group Interview on Predictors of Variations in Learning Outcomes

Hallo, I am a student at Kenyatta University, School of Education, Department of Educational Management, Policy and Curriculum Studies. I am currently undertaking research on '*Predictors of Variations in Students' Learning Outcomes in Public Day Secondary Schools, Tharaka Nithi County, Kenya*' in fulfilment of the requirements of the degree of Doctor of Philosophy in educational planning. You are kindly requested to participate in this research by giving your responses to the questions asked to the best of your knowledge. The researcher would like to assure you that the information given will strictly be confidential and only meant for this research purposes. No reference will be made to individuals or schools. Kindly omit your name and of your school.

Gatwiri Winniejoy Nkonge

Department of Educational Management,

Policy and Curriculum Studies.

School of Education

Kenyatta University.

Bio Data: Briefly tell me about yourself?
Probe for school liking, vision for the future, any challenges encountered at home and in school while attaining secondary education in the PDSS?

	Objective	General Question	Probing Questions
1.	To model the relationship between student's household characteristics and variations in examination scores	What do you think is the association of student's household characteristics and their differences in academic achievements in this school?	a) Do you think there is any association between students' average family size and differences in their examination scores? If YES, what is it, If No why do you think so? b) Do you think there is an association between students' food availability at home and differences in their examination scores? If YES, what is it, If No why do you think so? c) Do you think there is an association between students' distance covered from home to school and differences in their examination scores? If YES, what is it, If No why do you think so? d) Do you think there is an association between students' home accessibility to the social amenities and differences in their examination scores? If YES, what is it, If No why do you think so?
2.	To model the relationship between student's parental/guardian characteristics and variations in examination	Could you kindly explain the association of the parent's/guardian's characteristics of the students in this school and the students' differences in academic	a) In your own opinion is there an association between parent's/guardian's education level and differences in students' examination scores? If YES, what is it, If No what would you say about it?

	Objective	General Question	Probing Questions
	scores	achievements.	b) In your own opinion is there an association between parent's/guardian's income level and differences in students' examination scores? If YES, what is it, If No what would you say about it? c) In your own opinion is there an association between parent's/guardian's occupation and differences in students' examination scores? If YES, what is it, If No what would you say about it?
3.	To model the relationship between student's conduct characteristics and variations in examination scores	How do the student's conduct characteristics and variations in examination scores relate in this school?	a) According your knowledge and experience as a student in this school, what do you think is the relation between students' KCPE score and the differences in students' examination scores? b) What is the association between students' time spent in learning and the differences in students' examination scores?
4.	To model the relationship between PDSS resources and student's variations in examination scores	1. Comment on the school resources in this school and how they relate to variations in students' examination scores compared to other PDSS in this County?	In your own opinion is there an association between the availability of school resources such as the • Teaching and learning materials, e.g. textbooks • Technology e.g. computers • Laboratory facilities • Instruction time in school

END

THANK YOU!

Appendix III: Parent/Guardian Questionnaire on Predictors of Variations in Students' Learning Outcomes

Hallo, I am a student at Kenyatta University, School of Education, Department of Educational Management, Policy and Curriculum Studies. I am currently undertaking research on '*Predictors of Variations in Students' Learning Outcomes in Public Day Secondary Schools, Tharaka Nithi County, Kenya*' in fulfilment of the requirements of the degree of Doctor of Philosophy in educational planning. You are kindly requested to participate in this research by giving your responses to the questions asked to the best of your knowledge. The researcher would like to assure you that the information given will strictly be confidential and only meant for this research purposes. No reference will be made to individuals or schools. Kindly omit your name and that of your school.

Gatwiri Winniejoy Nkonge

Department of Educational Management,

Policy and Curriculum Studies.

School of Education

Kenyatta University.

NB: TO BE COMPLETED BY THE CARE GIVER OF THE STUDENT WHO STAYS WITH THE STUDENT MOST OF THE TIME AT HOME.

PART 1: Parent/Guardian Support

S/N	**Characteristic Category**		**Respond by ticking, that is writing a tick [√] where applicable.**
1.	Gender	Male	
		Female	
2.	What is your relation to this student? ***NOTE:*** ***Parent,*** *(mother or father and the student is the biological child)* ***Guardian,*** *(takes care of the student as a mother or a father but is not the biological parent)* ***Care giver,*** *can be* ***a parent*** *or a* ***guardian***	Mother	
		Father	
		Guardian Mother	
		Guardian Father	
		Other, Specify _____	

PART 2: Parent/Guardian Education

Please tick, that is write a tick **[√]** on your response to the following statements.

	Description Statement	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
3.	I can do anything to keep this student in school				
4.	I fully support this student in school				
5.	I expect the best performance for this student				
6.	I attend school meetings for this student				
7.	I discuss school progress with this student				
8.	I am ready to support this student to continue with education after secondary education				
9.	I will support this student to attain highest level of education				
10.	This student will do well in the final examinations in secondary school				
11.	I visit school to check with the teachers how this student is doing in school				
12.	I advise this student to work hard in school				

Where applicable please tick, that is write a tick **[√]** on the **Highest Education level** of the student's?

Characteristic Category		University or Degree	College or Diploma	Secondary	Primary	Did not attend school
13.	Mother					
14.	Father					
15.	Guardian Father					
16.	Guardian Mother					
17.	Caregiver (**Your education level**)					

PART 3: Parent/Guardian Occupation

Where applicable please tick, that is write a tick **[√]** on the **Occupation** (source of income) of the student's?

Characteristic Category		Employed by government	Employed in a private company	Self-employed e.g. Business person, Farmer	Employed in a Person's home	Not employed
18.	Mother					
19.	Father					
20.	Guardian Father					
21.	Guardian Mother					
22.	Caregiver (**Your occupation**)					

PART 4: Parent/Guardian Income

Where applicable please tick, that is write a tick **[√]** on the **approximate** monthly Income level of the student's?

Characteristic Category		Kshs. 50,000 and above	Between Kshs. 20,000 and 49,999	Between Kshs. 10,001 and 19,999	Between Kshs. 10,000 and 0
23.	Mother				
24.	Father				
25.	Guardian Father				
26.	Guardian Mother				
27.	Caregiver (**Your income level**)				

END

THANK YOU!

Appendix IV: Principal Interview Schedule on Predictors of Variations in Students' Learning Outcomes

Hallo, I am a student at Kenyatta University, School of Education, Department of Educational Management, Policy and Curriculum Studies. I am currently undertaking research on '*Predictors of Variations in Students' Learning Outcomes in Public Day Secondary Schools, Tharaka Nithi County, Kenya*' in fulfilment of the requirements of the degree of Doctor of Philosophy in educational planning. You are kindly requested to participate in this research by giving your responses to the questions asked to the best of your knowledge. The researcher would like to assure you that the information given will strictly be confidential and only meant for this research purposes. No reference will be made to individuals or schools. Kindly omit your name and that of your school.

Gatwiri Winniejoy Nkonge

Department of Educational Management,

Policy and Curriculum Studies.

School of Education

Kenyatta University.

Bio Data: Briefly tell me about yourself?
Probe for number of years as a teacher, as a principal, served in the school as a principal, highest academic qualifications, professional qualifications, vision for the school?

	Objective	General Question	Probing Questions
1.	To model the relationship between student's household characteristics and variations in examination scores	What do you think is the association of student's household characteristics and their differences in academic achievements in this school?	a) Do you think there is any association between students' average family size and differences in their examination scores? If YES, what is it, If No why do you think so? b) Do you think there is an association between students' food availability at home and differences in their examination scores? If YES, what is it, If No why do you think so? c) Do you think there is an association between students' distance covered from home to school and differences in their examination scores? If YES, what is it, If No why do you think so? d) Do you think there is an association between students' home accessibility to the social amenities and differences in their examination scores? If YES, what is it, If No why do you think so?
2.	To model the relationship between student's parental/guardian characteristics and variations in	Could you kindly explain the association of the parent's/guardian's characteristics of the students in this school and the students'	a) In your own opinion is there an association between parent's/guardian's education level and differences in students' examination scores? If YES, what is it, If No what would

	Objective	General Question	Probing Questions
	examination scores	differences in academic achievements.	you say about it? b) In your own opinion is there an association between parent's/guardian's income level and differences in students' examination scores? If YES, what is it, If No what would you say about it? c) In your own opinion is there an association between parent's/guardian's occupation and differences in students' examination scores? If YES, what is it, If No what would you say about it?
3.	To model the relationship between student's conduct characteristics and variations in examination scores	How do the student's conduct characteristics and variations in examination scores relate in this school?	a) According your knowledge and experience as a school manager, what do you think is the relation between students' KCPE score and the differences in students' examination scores? b) What is the association between students' time spent in learning and the differences in students' examination scores?
4.	To model the relationship between PDSS resources and student's variations in examination scores	2. Comment on the school resources in this school and how they relate to variations in students' examination scores compared to other PDSS in this County?	a) In your own opinion is there an association between the availability of school laboratories in this school and the differences in students' examination scores compared to other PDSS in this County? If YES, what is it, If No what would you say about it? b) As the school principal what would you say about the association between the

	Objective	General Question	Probing Questions
			availability of teaching and learning materials in this school and the differences in students' examination scores compared to other PDSS in this County c) What is your opinion on association between the use of technology in this school and the differences in students' examination scores compared to other PDSS in this County?
		3. What is the association between instruction time in this school and the variations in students' examination scores compared to other PDSS in this County?	d) In your own opinion is there an association between number of hours spent by students in this school in class during the week-days and the differences in students' examination scores compared to other PDSS in this County? If YES, what is it, If No what would you say about it? e) From your experience as the school principal in this school what would you say about the association between number of hours spent by students in this school in class during the week-ends and the differences in students' examination scores compared to other PDSS in this County?
		4. Describe the association of your school size and the variations in students' examination scores compared to other	f) In your own opinion is there an association between the number of students enrolled in your school and the differences in students' examination scores compared to other PDSS in

	Objective	General Question	Probing Questions
		PDSS in this County?	this County? If YES, what is it, If No what would you say about it?
		5. Kindly share with me the teaching experience of most of the teachers in this school and its association with the variations in students' examination scores?	g) What is the experience of your teachers? h) In your own opinion is there an association between teachers' number of years spent in teaching students in this school and the differences in students' examination scores? If YES, what is it, If No what would you say about it? i) In your own opinion is there an association between teachers' motivation in teaching in this school and the differences in students' examination scores in this school? If YES, what is it, If No what would you say about it?
		6. Kindly briefly explain the working of teachers under different terms of employment such as those employed by the TSC, BOM and volunteers in this school and its association with the variations in students' examination scores?	j) Is there an association between teachers' terms of employment in this school and the differences in students' examination scores? If YES, what is it, If No what would you say about it?

END

THANK YOU!

Appendix V : Document Analysis Guide on Predictors of Variations in Students' Academic Achievement

1. School mean scores for the end of year examination scores: **Form one (1) and Form two (2).**

End of year school examination mean scores		
School	**2018**	**2019**
	Form 1	Form 2
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

2. School size in **Student Enrolment in Form 1 – 4 in the year 2019**.

Students' Enrolment in the class register								
School	**Form 1**		**Form 2**		**Form 3**		**Form 4**	
	Boys	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

3. Number of teachers in each school, terms of employment and their qualifications

School	Total Number of Teachers		Employment status			Highest academic qualification							
	Male	Female	TSC	BOM	Volunteers	PhD Edu	M. Edu	P. Grad Dip. Edu	B. Edu	D. Edu	C. Edu	Degree Not Edu	Cert Not Edu
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

ENDTHANK YOU!

Appendix VI : Tested Assumptions of Hierarchical multiple regression Analysis

Assumption 1: The relationship between the independent variables and the Dependent variable is linear

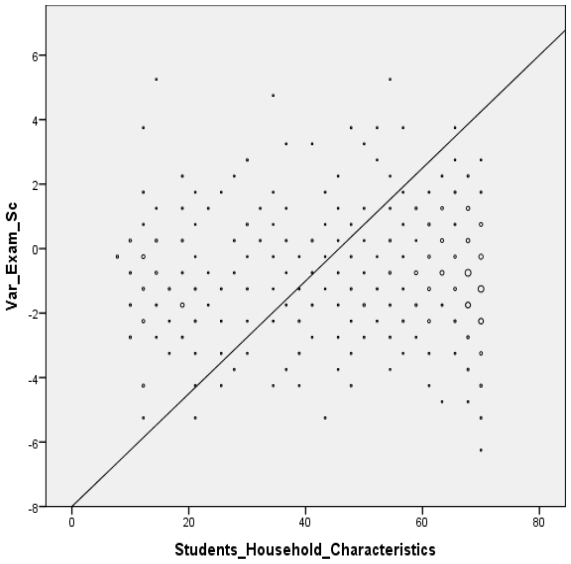


Figure 4.1. Scatterplot showing the relationship between Students houshold characteristics and their Variations in examination score is linear.

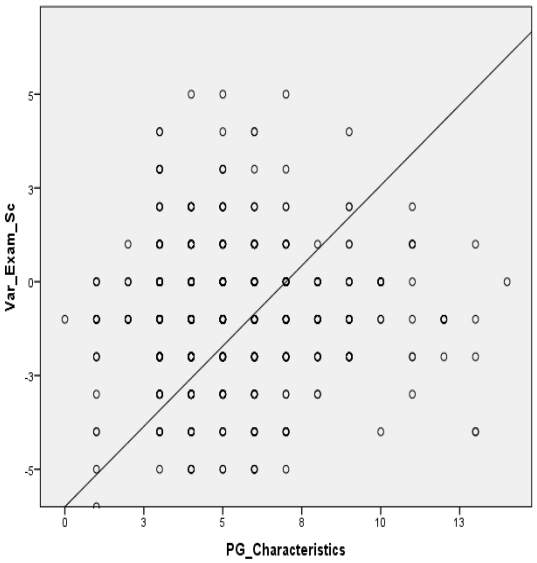


Figure 4.2. Scatterplot showing the relationship between Parental/Guardian characteristics and Variations in students examination score is linear.

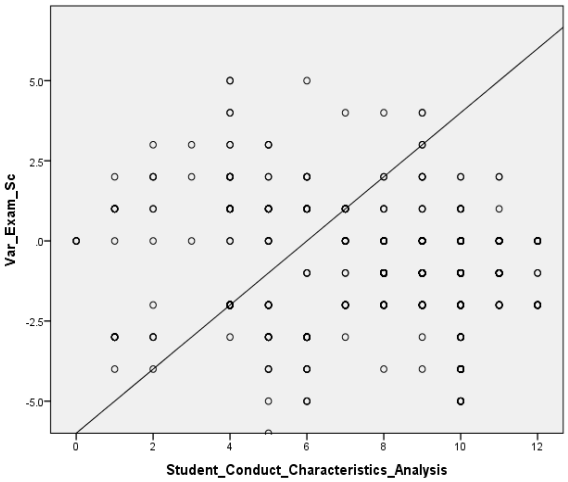


Figure 4.3. Scatterplot showing the relationship between Student conduct characteristics and their Variations in examination score is linear.

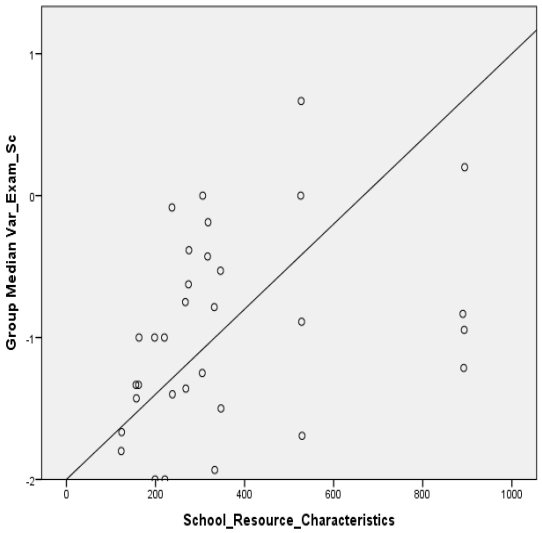


Figure 4.4. Scatterplot showing the relationship between students School resource characteristics and their Variations in examination score is linear.

Assumption 2: There was no multicollinearity

In checking for the multicollinearity, predictors correlations and collinearity statistics were assessed. Table on correlations of predictors illustrate findings.

Correlations of Predictors

	Predictors	Correlations				N
Pearson Correlation	Students household characteristics	1.000				705
	Parental/Guardian characteristics	.543	1.000			705
	Student conduct characteristics	.434	.467	1.000		705
	School resource characteristics	-.424	.531	.348	1.000	705
Sig. (1-tailed)	Students household characteristics	.				
	Parental/Guardian characteristics	.127	.			
	Student conduct characteristics	.000	.038	.		
	School resource characteristics	.000	.000	.102	.	

Source: Study Data, 2020

Table on correlations of predictors illustrates that the study predictors were not too highly correlated since the highest correlation was r = 0.543 below r = 0.8. Table on collinearity statistics depicts the findings.

Collinearity Statistics

Predictors	Collinearity Statistics	
	Tolerance	**VIF**
Students household characteristics	.921	1.086
Parental/Guardian characteristics	.936	1.069
Student conduct characteristics	.974	1.027
School resource characteristics	.888	1.126

Source: Study Data, 2020

Table on collinearity statistics depicts that the Variance Inflation Factor (VIF) scores were below 10, and tolerance scores above 0.2. According to Tabachnick and Fidell (2013) there is no multicollinearity in the data when the correlations of the predictors are below r = 0.8, the (VIF) scores are below 10, and tolerance scores above 0.2.

Assumption 3: The values of the residuals are independent

Durbin-Watson statistic was used to test the assumption that the residuals are independent or uncorrelated. Table on model summary illustrates the findings.

Model Summary

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.662[a]	.404	.352	16.698	1.886

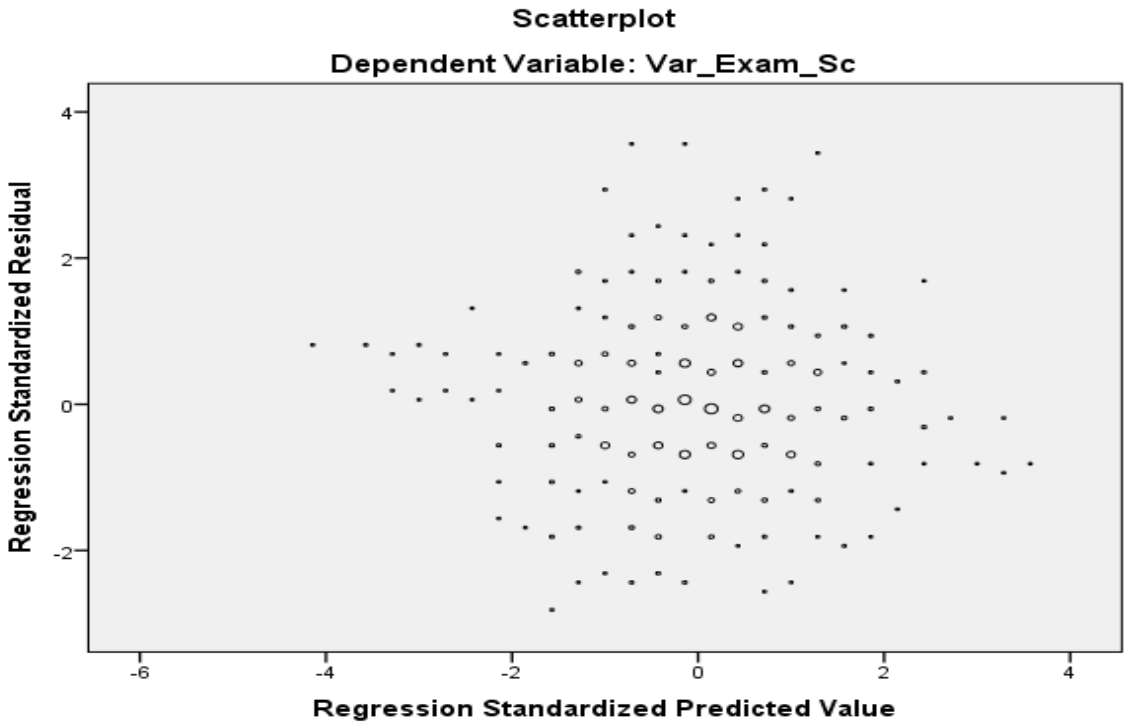
a. Predictors: (Constant), School resource characteristics, Student conduct characteristics, Parental/Guardian characteristics, Students household characteristics

b. Dependent Variable: Variation Examination Score

Table on model summary shows that the value for the Durbin-Watson statistic was 1.886. Rawlings et al. (1998) notes that the statistic can vary from 0 to 4 but the assumption on independence of the residuals is met when it is close to 2. Thus, in this case the assumption was met since Durbin-Watson statistic value was 1.886, close to

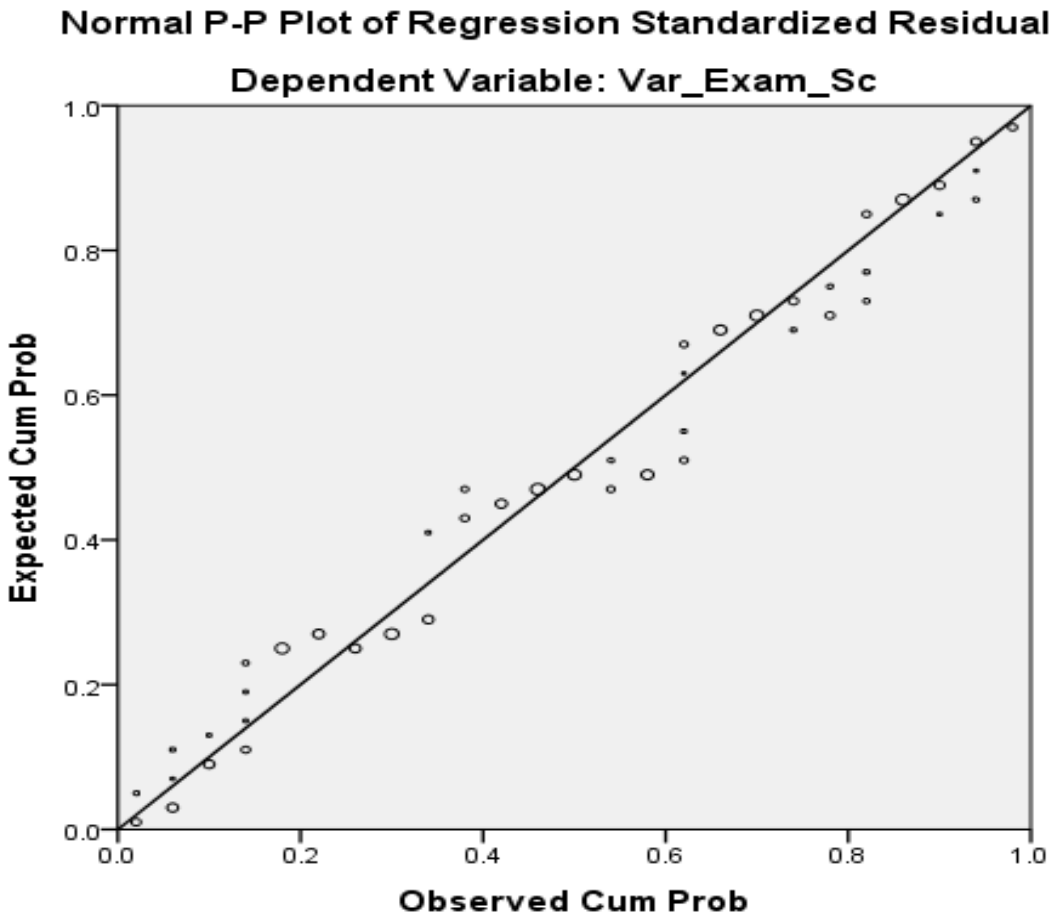
Assumption 4: The variance of the residuals is constant showing homoscedasticity

In establishing if the study data met this assumption, a scatter plot showing the standardised values predicted by model against standardised residuals was obtained.



Scatterplot showing random data points with no signs of funnelling suggesting that assumption of homoscedasticity was met.

Assumption 5: The values of the residuals are normally distributed



Normal P-P plot for the School resource characteristics, Student conduct characteristics, Parental/Guardian characteristics and Students household characteristics prediction model. It shows that the data points lie close to the diagonal line thus indicating normal distribution of the residuals.

Assumption 6: There are no influential outliers

Cook's Distance statistic for each participant was examined. All the Cook's Distance values were under 1. Therefore, individual cases did not unduly influence the model.

Appendix VII: Approval of Research Proposal from Graduate School

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 57530

Internal Memo

FROM: Dean, Graduate School **DATE:** 14th August, 2019

TO: **Ms. Winniejoy Gatwiri Nkonge**
C/o Ed. Mgt. Pol & Curr Studies Department.
Kenyatta University

REF: E83/CTY/33817/15

SUBJECT: **APPROVAL OF RESEARCH PROPOSAL**

This is to inform you that Graduate School Board, at its meeting of 7th August, 2019, approved your Ph.D Research Proposal **Entitled, "Predictors of Variations in Students' Academic Achievement in Public Day Secondary Schools, Tharaka Nithi County, Kenya".**

You may now proceed with data collection, subject to clearance with the Director General, National Commission for Science, Technology and Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking forms per semester. The form has been developed to replace the progress report forms. The supervision Tracking Forms are available at the University's website under Graduate School webpage downloads.

By a copy of this letter, The Registrar (Academic) is hereby requested to grant you substantive registration for your Ph.D studies.

Thank you.

EDWIN OBUNGU
FOR: DEAN, GRADUATE SCHOOL

c.c. Chairman, Department of Ed. Mgt. Pol and Curriculum Studies
Registrar (Academic)

Supervisors:

1. Dr. Mukirae Njihia
C/o Department of Ed. Mgt. Pol and Curr. Studies
Kenyatta University

2. Dr. John Ndiritu
C/o Department of Ed. Mgt. Pol and Curr. Studies
Kenyatta University

EO/nn

Appendix VIII: Research Authorization from Graduate School

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 020-8704150

Our Ref: E83/CTY/33817/15

DATE: 14th August, 2019

Director General,
National Commission for Science, Technology
& Innovation
P.O. Box 30623-00100,
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR GATWIRI WINNIEJOY NKONGE– REG. NO. E83/CTY/33817/15

I write to introduce Ms. Gatwiri Winniejoy Nkonge who is a Postgraduate Student of this University. She is registered for Ph.D Degree programme in the **Department of Educational Management Policy and Curriculum Studies.**

Ms. Gatwiri intends to conduct research for Ph.D. Proposal entitled, **"Predictors of Variations in Students' Academic Achievement in Public Day Secondary School, Tharaka Nithi County, Kenya".**

Any assistance given will be highly appreciated.

Yours faithfully,

for **PROF. ELISHIBA KIMANI**
FOR: DEAN, GRADUATE SCHOOL

EK/xx

Appendix IX: Research Permit from National Commission for Science, Technology and Innovation (NACOSTI)

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **411597**

Date of Issue: **09/September/2019**

RESEARCH LICENSE

This is to Certify that Miss.. Winniejoy Nkonge of Kenyatta University, has been licensed to conduct research in Tharaka-Nithi on the topic: PREDICTORS OF VARIATIONS IN STUDENTS ACADEMIC ACHIEVEMENT IN PUBLIC DAY SECONDARY SCHOOLS THARAKA NITHI COUNTY KENYA for the period ending : 09/September/2020.

License No: **NACOSTI/P/19/1246**

411597

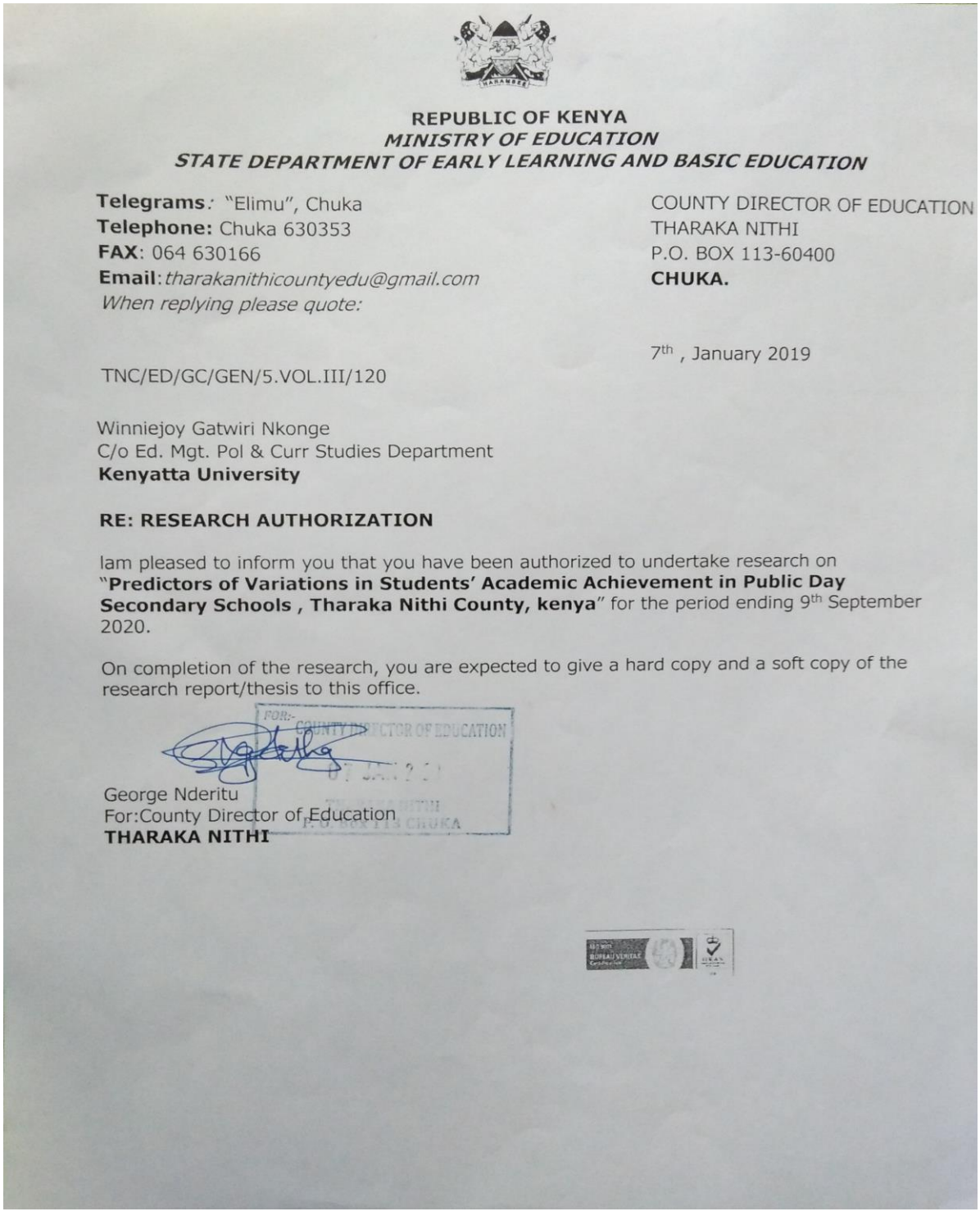
Applicant Identification Number

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.

Appendix X: Research Permit from Tharaka Nithi County



REPUBLIC OF KENYA
MINISTRY OF EDUCATION
STATE DEPARTMENT OF EARLY LEARNING AND BASIC EDUCATION

Telegrams: "Elimu", Chuka
Telephone: Chuka 630353
FAX: 064 630166
Email: *tharakanithicountyedu@gmail.com*
When replying please quote:

COUNTY DIRECTOR OF EDUCATION
THARAKA NITHI
P.O. BOX 113-60400
CHUKA.

7th , January 2019

TNC/ED/GC/GEN/5.VOL.III/120

Winniejoy Gatwiri Nkonge
C/o Ed. Mgt. Pol & Curr Studies Department
Kenyatta University

RE: RESEARCH AUTHORIZATION

Iam pleased to inform you that you have been authorized to undertake research on "**Predictors of Variations in Students' Academic Achievement in Public Day Secondary Schools , Tharaka Nithi County, kenya**" for the period ending 9th September 2020.

On completion of the research, you are expected to give a hard copy and a soft copy of the research report/thesis to this office.

FOR:- COUNTY DIRECTOR OF EDUCATION

George Nderitu
For:County Director of Education
THARAKA NITHI