A Hierarchical Linear Modeling of the Effects of School characteristics on Students' Academic Achievement in Busia County, Kenya

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ABSTRACT

Studies on school effectiveness have dominated educational research over the past decade, but still there is much that needs to be done. In an attempt to contribute to knowledge on school effectiveness, this study examined the effects of school characteristics namely; school size, location and school type (day, boarding and coeducational) on students' academic achievement in the Kenya Certificate of Secondary Education (KCSE) examination in Busia County, Kenya. A two level hierarchical linear modeling (HLM) technique was employed with student predictors at level 1 and school characteristics at level 2. A sample of 755 students who were drawn from 100 secondary schools participated in the study. Findings of the study demonstrated that school type, location and size of the school had no statistically significant effects on students' academic achievement in Kenya Certificate of Secondary Education examination. The findings of the study give implication that parents should not have the perception that school characteristics influence their children's academic achievement.

Keywords: Hierarchical Linear Modeling, School characteristics, Academic achievement

1. INTRODUCTION

Over the past decade, most countries have increased the national budget for education with a view to expand access, promote retention and improve learning outcomes. A survey of studies across the world revealed that significant gains have been made in regard to access and retention but less has been achieved in relation to learning outcomes. Abreh (2015) noted that in most countries learning outcomes remain unsatisfactory but even then the problem may not be limited to third world countries. For instance, even in highly developed countries such as Canada and Finland where education system are hailed to be more efficient and equitable, there are still concerns of quality of education (OECD, 2010; UNESCO, 2014). Since there is enough evidence showing that most countries have almost achieved universal access, the focus for most of the countries now shifts to ensuring that learners access quality education and attain desirable outcomes that meet their needs.

The Coleman study on the Equality of Educational Opportunity in the sixties is probably among the most significant attempts to explore the causes of inequity in educational outcomes (Coleman, 1966). The study demonstrated that school type, school location and school size had statistically significant effects on learning outcomes. Sugden (2012); Joan (2009); Anditi, Okere and Muchiri (2014) reckoned that there was a positive relationship between type of school and students' academic achievement. Saidin and Brahim (2013) reported that presence of boys in a classroom had negative effect on girls' academic achievement. Kang, Lee and Niederle (2014) instead reported that type of school had no significant effect on student academic achievement in South Korea. In Turkey, Brock (2016) employed a multilevel analysis to investigate the causes of inequalities among seventh and eighth grade students' academic achievement. The multilevel approach enabled the researcher to estimate apportion variation in student academic achievement to various independent variables. The study predicted that 17 % of the variation in student test scores was explained by differences between schools while the remaining variation was accounted by the within-school factors. The type of school attended explained approximately 5% of the variation in students' academic achievement. Dambudzo (2013) found that students in boarding schools had a higher self concept that made them perform better than their colleagues in non boarding schools.

In Rwanda, Zhahibimana (2010) found that there was a statistically significant difference in academic achievement among students attending public schools and their counterparts in private schools. In Uganda, Nyamongo (2014) reported that there was a statistically significant difference in academic achievement of students attending rural and urban schools. In Kenya, Mburu (2013) reported that single-sex secondary schools recorded a higher number of students enrolling in university and other tertiary institutions. Epari, Othuon and Khasenye (2016) demonstrated that type of school had statistically significant effect on students' scores in KCPE examination. Students in boarding schools attained higher scores compared to

their counterparts in day schools. Kang, Lee and Niederle (2014) also reported a significant positive effect of type of school on students' academic achievement.

The question of whether the location of a school influences learning outcomes has continued to dominate debate on school effectiveness. Some studies found a significant relationship between school location and academic achievement while others have reported otherwise. In Malaysia, Gul and Shaheen (2014) while examining the effects of school location found that location of a school accounted for up to 19.6 percent of variation in student academic achievement in mathematics. The works of Koroye (2016) demonstrated that there was a statistically significant difference in students' academic achievement among rural and urban secondary schools in senior school certificate examinations in Nigeria. Meanwhile, Omotade and Olusola (2014) also reported similar results but Mersch (2012) reported contrary findings. The study indicated that location of a school had no statistically significant effect on students' academic achievement in the USA. However, findings of this study were consistent with Adeoye and Tayo (2010). In Kenya a study by Odumbe, Simatwa and Ayodo (2014) also revealed that school location had significant effect on academic achievement.

There is no agreement as to what constitutes a large or small school. However, most commentators think that an optimal school should enroll between 400 and 500 student (Ndiritu, 2012). As to whether school size influences educational outcomes, Sun, et.al, (2012) demonstrated that small classes improved learning outcomes. Menge (2014) on the other hand demonstrated that overcrowded classrooms made it difficult for teachers to move around the classroom and the teacher was therefore unable to provide individualized student instruction. This is supported by Akabogu and Ajiwoju (2014) who reported that large class had a statistically significant but negative effect on students' academic achievement. Waita (2012) too found that there was a statistically significant negative correlation between class size and academic achievement. The current study adopted hierarchical linear modeling to analyze school effects on school effects on learning outcomes in secondary education in Busia County, Kenya.

Secondary education in Kenya is critical in preparing learners for further training and the job market. It is worrying that despite the many studies on school effectiveness it is still not clear why secondary students in Busia County continue to perform poorly in national examinations. In the past years, less than 10% of the students who sit for the Kenya Certificate of Secondary Education examination normally attain grades that allow admission to university. In 2017, 7550 students registered for the KCSE examination. During that year only 849 students scored C+ (Plus) the mandatory grade for admission into university. No student scored an A (plain) and only 15 students scored A- (Minus). Majority of the students who sat for that year's examination were in the lower quartile, 860 scored C (plain), 1264 scored C-(minus) and the rest below D+ (plus). The probable cause of the decimal achievement has continued to dominate public debate. Even then some studies have suggested that school variables are to blame for the unsatisfactory

achievement while others have blamed student characteristics. This study recons that the controversy surrounding the unsatisfactory academic achievement was probably a product of the statistical approaches employed. For most of the reviewed studies, the hierarchical nature of educational data was ignored and as a result the findings could have been inaccurate. The current study adopted hierarchical linear modeling to analyze the school effects on students' academic achievement in secondary education in Busia County, Kenya.

1.1 Objective of the Study

The study sought to establish the effect of school characteristics on students' academic achievement in KCSE examination in Busia County, Kenya

1.2 Hypothesis of the Study

School characteristics have no statistically significant effect on students' academic achievement in KCSE examination in Busia, County Kenya

1.3 Conceptual Framework

The conceptual framework adopted by the study is as shown in Figure 1. Figure 1 demonstrates that student learning outcomes were a function of level 1 variable (student characteristics) and level 2 variables (school characteristics, teacher inputs and non teacher inputs). The study employed Hierarchical Linear Modeling (HLM) technique to isolate the school effects on students' academic achievement in KCSE examination.

Figure 1: Hierarchical Linear Modeling of the effects of school characteristics on students' academic achievement in Busia County, Kenya.

2. RESEARCH DESIGN AND PROCEDURE

The study was carried out in Busia County, Kenya. Busia County is located in the Western part of Kenya and it comprises of seven Sub Counties namely; Nambale, Teso North, Teso South, Butula, Funyula, Budalangi, and Matayos. The County touches the Republic of Uganda on the West lying between latitude 0° and $0^{\circ} 45'$ North and longitude $34^{\circ} 25'$ east. It is approximately 1694.5 km^2 . The study employed a descriptive survey research design. The County had a total of 152 registered secondary schools with total enrolment of 9480 students. The study employed a descriptive survey design. This design was preferred because the study merely sought to establish facts as they are without manipulating any variable. Simple random sampling was employed to draw the sample of teachers and students while purposive sampling was used to draw the sample of principals. A sample of 855 students, 344 teachers and 100 principals was used. Teachers and the principals were used to provide information on level 2 variables (school based variables) such as availability of physical facilities and text books while students provided information on the student level variables such as student age, gender and level of parental involvement.

This study sought to establish the extent of the differences in average KCSE examination results

between schools that were accounted for by variables such as student prior achievement, age, gender, student's parent involvement, average class size, school types (day, boarding, co-educational) and location of schools. Students were considered as level 1 unit while schools were level 2 units. The level 1 predictors were student prior achievement, age, gender and student's parent involvement. The level 2 predictors were average class size, school types (day, boarding, co-educational) and location of schools. In this case, students were nested within schools hence creating hierarchical data structure. According to Raudenbush and Bryk (2002), the problem of nested data sets as was the case in this study, could best be dealt with using hierarchical linear modeling technique.

3. RESULTS

3.1 Variables Used in the Study

Table 1 shows the description of the variables used to carry out hierarchical linear modeling of effects of school characteristics on students' academic achievement in KCSE in Busia County, Kenya.

Table 1: Description Variables used in Modeling School Effect on Learning Outcomes

Var.	Variable Label	Variable scale	Variable values
a1z	Student's KCSE z-score	Ratio	-2.04 - 2.59
a1a	Female student	Nominal	0=Male; 1=Female
a1c	Student's prior academic achievement	Interval	150 – 410
a2a	Student's parent involved in discussing academic	Interval	0= Nonexistent 4=Fully existent
a2b	Student's parent's provision of school requirements	Interval	0= Nonexistent 4=Fully existent
a2c	Student's parent involved in attendance of meetings	Interval	0= Nonexistent 4=Fully existent
s0e	Rural school	Nominal	0=Urban school; 1=Rural school
s2a	Boys secondary schools	Dummy	0=Other classification;1=Boys secondary schools
s2b	School is boarding	Nominal	0= Not Boarding; 1= Boarding School
s2f	Number of streams	Interval	1 – 6
s2g	School enrolment	Interval	144 – 845
s2h	School mean score 2015	Interval	2 - 8.931
s2i	School mean score 2016	Interval	2 - 5.992
s2j	Average school mean score 2015/16	Interval	2.31 - 7.308
s3p	Students participation in co-curricular	Interval	0=Very poor;4=Excellent
s2c	Number of TSC teachers	Interval	0 -28
s2d	Number of BoM teachers	Interval	4 – 16
s2e	Total number of teachers	Interval	8 – 40
s3a	Teacher's lessons missed	Interval	2 -5
s3b	Teachers cover missed lessons	Interval	0=Not at all; 4=Yes, Fully
s3c	Teachers assist weak students	Interval	0=Not at all; 4=Yes, Fully
s3d	Teachers adhere to code of conduct	Interval	0=Not at all; 4=Yes, Fully
s3f	Teacher teamwork	Interval	0=Very poor; 4=Excellent
s3g	Teacher relationships	Interval	0=Very poor; 4=Excellent
s3h	Teacher-parent relationships	Interval	0=Very poor;4=Excellent
s3i	Teacher-student relationship	Interval	0=Very poor;4=Excellent
s3j	Teachers duty reporting time	Interval	0=Very late;4=Excellent
s3k	Teachers commitment to duty	Interval	0=Very poor;4=Excellent
s3l	Availability of text books	Interval	0=Very poor;4=Excellent
s3n	Availability of physical facilities	Interval	0=Not available;4=Excellent

Note. Student Level-1 variables are prefixed with letter "a" and School Level-2 with letter "s"

Table 1 depicts the dependent variable (a1z) or the students' academic achievement in KCSE examination. The variable was based on the student's average score in the five compulsory subjects tested in the KCSE examination. The maximum score in any of the five subjects is 12 points making a total of 60 points for all the five compulsory subjects. To arrive at the average raw scores, the total scores are divided by the number of

subjects. The results also indicate that the average raw (untransformed) scores ranged from 2.31 to 7.308. These scores were then standardized by subtracting the raw scores from the mean and dividing by the standard deviation. Meanwhile the transformed scores ranged from 2.04 to 2.59.

3.2 Descriptive Statistics of Variables used in HLM Analysis

The study sought to estimate effects of school characteristics on students' academic achievement in

Kenya Certificate of Secondary Education examination. Table 2 presents the descriptive statistics of the variables used in the hierarchical linear modeling analysis.

Table 2: Descriptive Statistics of Variables Used in HLM Analysis						
Var.	Variable Label	Mean	SE(Mean)	SD	Min	Max
a1z	Student's KCSE z-score	0.00	0.03	1	2.04	2.59
a1c	Student's prior academic achievement	274.89	1.29	37.81	150	410
a2a	Student's parent involved in discussing academic	2.77	0.04	1.06	0	4
a2b	Student's parent's provision of school requirements	2.77	0.04	1.03	0	4
a2c	Student's parent involved in attendance of meetings	2.69	0.04	1.05	0	4
s2f	Number of streams	2.28	0.04	1.27	1	6
s2g	School enrolment	374.69	5.78	168.90	144	845
s2h	School mean score 2015	4.80	0.05	1.58	2	8.931
s2i	School mean score 2016	3.42	0.03	0.92	2	5.992
s2j	Average school mean score 2015/16	4.08	0.04	1.08	2.31	7.308
s3p	Students participation in co-curricular	2.17	0.04	1.08	0	4
s2c	Number of TSC teachers	10.37	0.19	5.69	0	28
s2d	Number of BOM teachers	6.96	0.10	2.80	4	16
s2e	Total number of teachers	17.34	0.27	7.78	8	40
s3a	Teacher's miss lessons	3.43	0.03	0.93	2	4
s3b	Teachers cover missed lessons	2.31	0.03	0.85	0	4
s3c	Teachers assist weak students	2.31	0.03	0.88	0	4
s3d	Teachers adhere to code of conduct	2.70	0.03	0.86	0	4
s3f	Teacher teamwork	2.49	0.03	0.89	1	4
s3g	Teacher relationships	2.44	0.03	0.80	0	4
s3h	Teacher-parent relationships	2.55	0.03	0.90	0	4
s3i	Teacher-student relationship	2.58	0.03	0.91	0	4
s3j	Teachers duty reporting time	2.33	0.03	0.84	0	4
s3k	Teachers commitment to duty	2.31	0.03	0.87	0	4
s3l	Availability of text books	2.83	0.04	1.16	0	4
s3n	Availability of physical facilities	2.34	0.04	1.06	0	4
	Nominal and Dummy Variables [Frequencies preceding percent in ()]					
s0e	Rural school: 0=Student is in urban school, 312 (36.49); 1=Student is in rural school, 543 (63.51)					
a1a	Female student: 0=Male, 413(60.00); 1=Female, 342 (40.00)					
s2a3	Boys secondary schools: 0=Other classification, 672 (90.29); 1=Boys secondary schools 83 (9.71)					
s2b	School is boarding: 0=School is not boarding 438 (51.23); 1=School is boarding 417 (48.77)					
Note. SE=Standard Error; SD=Standard Deviation; Min=Minimum; Max=Maximum; Var. =Variable						

The results of the study displayed in Table 2 indicate that the KCSE z-score was 0.00 with standard error of the mean of 0.03, standard deviation of 1. Student prior achievement ranged between 150 and 410. The results also indicate that the largest secondary school in the County had eight streams. In addition, school enrolment ranged from 144-845 students.

3.3 Bivariate Analysis of Relationship between the Dependent and Independent Variables

Pair wise correlation was carried out to analyze the relationship between students' academic achievement in KCSE examination and selected school characteristics. The correlation results are presented in Table 3.

Table 3: Pair-Wise Correlation between Student KCSE z Score and Selected School Level Variables

Var.	Variable		a1z	s0e	s2a3	s2b	s2f	s2g	s2h
a1z	Student's KCSE z-score	^a	1						
s0e	Rural school	^a	-0.219	1					
		^b	<.001						
s2a	Boys secondary schools	^a	0.072	-0.301	1				
		^b	0.035	<.001					
s2b	School is boarding	^a	0.175	-0.412	0.336	1			
		^b	<.001	<.001	<.001				
s2f	Number of streams	^a	0.296	-0.340	0.301	0.463	1		
		^b	<.001	<.001	<.001	<.001			
s2g	School enrolment	^a	0.304	-0.351	0.350	0.404	0.952	1	
		^b	<.001	<.001	<.001	<.001	<.001		
s2h	School mean score 2015	^a	0.232	-0.208	0.129	0.392	0.652	0.597	1
		^b	<.001	<.001	<.001	<.001	<.001	<.001	
s2i	School mean score 2016	^a	0.143	-0.205	0.227	0.414	0.492	0.508	0.493
		^b	<.001	<.001	<.001	<.001	<.001	<.001	<.001
s2j	Average school mean score 2015/16	^a	0.208	-0.223	0.203	0.446	0.652	0.609	0.894
		^b	<.001	<.001	<.001	<.001	<.001	<.001	<.001
s3p	Students participation in co-curricular	^a	0.082	-0.053	0.007	0.052	0.008	0.046	0.022
		^b	0.017	0.123	0.829	0.132	0.818	0.176	0.515

3.4 Unconditional (Intercept-only) Model

The first step in fitting hierarchical linear models is to run an unconditional (intercept-only, null or empty) model. The unconditional model forms the basis for developing the regression models. An unconditional model is ideally a one-way ANOVA model. As the name suggests, the model excludes all predictor (independent) variables. A model with only an intercept as a predictor was therefore formulated at level 1, student level or within-school level. The results of the unconditional model are presented in Table 4. In this model, 755 students were nested within

100 schools. The outcome variable was transformed to a standard normal score with a mean of zero (0); standard deviation and variance of one (1). This transformation was necessary so that the residuals at each level could better approximate the normality assumptions of the models. According to Leckie (2013) and Raudenbush and Bryk (2002) such transformation would also allow interpretation of the effects of covariates in hierarchical linear models in terms of standard deviation units of the outcome variable. Table 4 presents the results of the unconditional model

Table 4: Two Level Unconditional (Empty) Model				
Fixed Effect				
Variable	Variable label	Null Model		
		Est. (Std. Err.)	<i>P</i>	
	Intercept, β_{0j}	0.012 (0.078)	0.874	
Random Effect		Variance Component		
Student (Level-1), e_{ij}		0.4116 (0.02)		
School (Level-2), u_j		0.5426 (0.08)		
Variance Partition Coefficient (VPC)				
Student (Level-1), σ^2_e		0.4314		
School (Level-2), σ^2_u		0.5686		
Model Fit Statistics				
Deviance		1913		
Akaike Information Criterion (AIC)		1919		
Bayesian Information Criterion (BIC)		1933		
Likelihood Ratio test vs. OLS Regression		chibar2(01) = 513	<.001	
<i>Note.</i> N= 755; Est. = Estimate; Std. Err. = Standard Error (in parentheses); AIC and BIC statistics = smaller-is-better fit; OLS=Ordinary Least Squares				

From this study, Table 4 depicts that the overall student mean academic achievement in the 2017 KCSE examination across all schools in Busia County was 0.012, standard error (SE) = 0.078, $p = .874$ (random intercept, β_{0j}). Since the outcome variable was approximately normalized, an estimated random intercept of zero, total variance of approximately one and a non-significant intercept were expected.

The Variance Partition Component (VPC) was used to estimate variation in students' academic achievement that lay at student and school levels of the model hierarchy. The VPC was therefore used to establish the relative importance of school level predictors and students characteristics as sources of variation in academic achievement. Ordinarily, in hierarchical linear modeling, the general implication of the VPC is that when the VPC is high there are large systematic differences in student achievement scores across schools. In a conditional model, VPC is based on the residual rather than the observed responses. Table 4 depicts that the between school and within school variance in academic achievement were 0.5426 and 0.4116 respectively.

According to Hox (2010), deviance statistics estimate the lack of model adjustment and should be compared to subsequent models. For instance, with the addition of explanatory variables, model adjustment is expected to improve and the deviance is expected to decrease. Kreft and De Leeuw (1998) argue that when comparing models, a reduction in the estimates of deviance statistic in a subsequent model when predictor variables are introduced suggests that the subsequent model is a better fit of the data compared with the preceding model(s). The results provided in Table 4 depicts that the deviance, Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) estimates for the unconditional model were 1913, 1919 and 1933 respectively.

3.5 The Random Intercept Model for School Effects

Table 5 presents the random intercept model for the effects of school characteristics with selected student level variables, and non teacher school inputs. By adding the predictors into the model step by step, it was possible to estimate the effects of school characteristics on students' academic achievement.

Fixed Effect							
Var.	Variable label	Model 1 (Student)		Model 2 (School characteristics)		Model 3 (School inputs)	
		Est. (SE)	P	Est. (SE)	P	Est. (SE)	P
a1a	Female student	0.12 (0.05)	0.030	0.09 (0.05)	0.080	0.09 (0.05)	0.098
a1c	Student's prior academic achievement	0.00 (0.00)	0.012	0.00 (0.00)	0.027	0.00 (.00)	0.030
a2a	Student's parent involved in discussing academic	0.16 (0.03)	<.001	0.16 (0.03)	<.001	0.16 (0.03)	<.001
a2b	Student's parent's provision of school requirements	0.15 (0.03)	<.001	0.15 (0.03)	<.001	0.15 (0.03)	<.001
a2c	Student's parent involved in attendance of meetings	0.12 (0.03)	<.001	0.12 (0.03)	<.001	0.12 (0.03)	<.001
s0e	Rural school			-0.09 (0.11)	0.412	-0.09 (0.11)	0.431
s2a	Boys secondary schools			-0.21 (0.19)	0.250	-0.22 (0.18)	0.233
s2b	School is boarding			0.01 (0.12)	0.932	0.01 (0.11)	0.964
s2f	Number of streams			-0.03 (0.15)	0.840	-0.03 (0.14)	0.823
s2g	School enrolment			0.00 (0.00)	0.190	0.00 (0.00)	0.162
s2h	School mean score 2015			0.15 (0.15)	0.310	0.15 (0.14)	0.298
s2i	School mean score 2016			0.13 (0.18)	0.474	0.12 (0.18)	0.494
s2j	Average school mean score 2015/16			-0.17 (0.30)	0.561	-0.19 (0.30)	0.530
s3p	Students participation in co-curricular			0.01 (0.02)	0.659	0.00 (0.02)	0.839
s3f	Teacher teamwork					0.02 (0.03)	0.628
s3l	Availability of text books					-0.00 (0.02)	0.845
s3n	Availability of physical facilities					0.04 (0.02)	0.050
	Intercept	-1.68 (0.21)	<.001	-2.41 (0.33)	<.001	-2.48 (0.33)	<.001
Random Effect		Variance Component		Variance Component		Variance Component	
Student (Level-1), e_{ij}		0.3577 (0.02)		0.3575 (0.02)		0.3565 (0.02)	
School (Level-2), u_j		0.2688 (0.05)		0.1937 (0.04)		0.1893 (0.03)	
Variance Explained % (continued)							
Student (Level-1), σ^2_e		0.0565		0.0567		0.0578	
School (Level-2), σ^2_u		0.2869		0.3656		0.3702	
Model Fit Statistics							
Deviance		1743		1715		1711	
Akaike Information Criterion (AIC)		1759		1749		1751	
Bayesian Information Criterion (BIC)		1797		1830		1846	
Likelihood Ratio test vs. OLS Regression		chibar2(01) = 213	<.001	chibar2(1) = 163	<.001	chibar2(01) = 159	<.001
Likelihood Ratio test (Preceding Model vs. Next)		χ^2 (5) =169	<.001	χ^2 (9) =28	<.001	χ^2 (3) = 4	0.253
Note. N= 855; Est. = Estimate; Std. Err. = Standard Error (in parentheses); AIC and BIC statistics = smaller-is-better fit; OLS=Ordinary Least Squares							

Note. N= 855; Est. = Estimate; Std. Err. = Standard Error (in parentheses); AIC and BIC statistics = smaller-is-better fit; OLS=Ordinary Least Squares

The “block” or stepwise approach was used carry out the hierarchical linear modeling meant to establish effects of school characteristics. The process involved entering student level variables into the first block and the school level variables (selected school characteristics) into the second block. From the study, Table 5 indicates that all the five student characteristics were statistically significant; student gender (a1a, $p=0.03$), student’s prior achievement (a1c, $p=0.012$), student’s parent involvement in discussing academic issues (a2a, $p<0.001$) and student’s parents involvement in attendance of school meetings (a2c, $p<0.001$). This gives the implication that student characteristics influenced academic achievement. The findings of the study further suggest that introducing students’ characteristics into the model reduced the random effect from 0.4116 to 0.3577. The proportion of variation in students’ academic achievement and the resulting percent variation explained at the two levels was $0.0565+0.2869 = 0.3434$ or 34.34%. The findings gives the implication that children whose parents were either involved in discussing academic issues (a2a), involved in provision of school requirements (a2b) or involved in attendance of meetings at school (a2c) performed better in KCSE examination than children whose parents were less involved. This probably suggests that there are some school related factors that need to be investigated.

To estimate the magnitude of the effects of school characteristics on students’ academic achievement, the researcher adopted criterion set by Hox (1995) where absolute values of standardized coefficients were ranked in terms of their relative degree of influence on the outcome variable within the same sample. In addition, the study was guided by Hungi and Thuku (2010) and Ejakait, et al., (2016) who proposed that a standardized regression coefficient should be considered relatively more important if its magnitude when taken in absolute terms is ≥ 0.10 .

4. DISCUSSIONS

From this study, Table 3 gives the implication that school location has a negative correlation with students’ academic achievement in KCSE examination ($r=-0.219$, $p<0.001$). Thus, students who attended rural schools scored lower grades in KCSE examination compared with their counterparts who attended urban schools. This finding was consistent with Nyamongo (2014). The findings of the study also depicted that there was a positive correlation between school enrolment (class size) and students’ academic achievement in KCSE examination ($r=0.304$, $p<0.001$). The finding gave the implication that large schools perform better in KCSE examinations. This was a classic departure from the findings of Akabogu and Ajiwoju (2014) who reported that large class had a statistically significant but negative effect on students’ academic achievement. Waita (2012) also found that there was a statistically significant negative correlation between class size and academic achievement.

Table 4 depicts that the between school variance in academic achievement was 0.5426 and the within school- between-student variance in students’ academic achievement was 0.4116. These findings suggested that a larger proportion of the variation in students’ academic achievement was accounted for by schools. In addition, the total variance in the students’ academic variable when partitioned into the within group and between group variance components using the unconditional model was $e_{ij} + u_i = 0.4116 + 0.5426 = 0.9542$ or 95.42%. This gives the impression that the model left about 4.58% of the variation unexplained. The probable cause of this was that some variables had been left out of the study. Future studies could therefore consider having more variables being considered.

In addition, from this study, Table 5 suggests that school characteristics particularly school size, type and location were not statistically significant. The results suggest that school characteristics modeled in the study explained for approximately 0.0787 or 7.89% of the variation in students’ academic achievement at school level. These results give the impression that school characteristics had very small influence on the students’ academic achievement. Findings of this study sharply contradict Koroye (2016) and Ejakait, et al., (2016) who reported that there was a statistically significant relationship between type and location of a school and student academic achievement. Based on criteria set by Hox (1995), Ejakait et al., (2016) as well as Hungi and Thuku (2010) findings of this study suggest that location of schools and type of school were not predictors of academic achievement. This study concurs with Othman and Abdullah (2013).

But, when school non -teacher inputs were introduced alongside student level variables and school characteristics variables, school non teacher variables returned statistically significant and then the proportion of variation in students’ academic achievement explained by student characteristics improved from 0.0567 to 0.0578. This implies that school non teacher variables such as text books and physical facilities influenced students academic achievement. In total, student and school characteristics accounted for up to 0.4280 (42.80%) of the variation in academic achievement. In this study, even though the school characteristics modeled had no statistically significant effects on academic achievement, schools still accounted for 0.3702 out of the 0.5686 ($(0.3702/0.5686)*100=65.11\%$) of the variance available for explanation.

5.0 CONCLUSION AND POLICY IMPLICATIONS

Every beginning of the year parents struggle to look for “better” schools for their children based on the school characteristics such as type, location and class size. Many parents in Kenya are very keen on certain characteristics of the school their children are admitted preferring urban and single sex schools. Findings of this

study gave the implication that type of school and location has no significant effect on students' academic achievement. Parents should therefore not have the perception that the type (boarding, day, mixed or coeducational) or location (rural or urban) of a school influences their children's academic achievement. These findings have policy implications for the Kenyan government which is supporting creation of day secondary schools. The study confirmed that day schools which are generally cheap may go a long way to increase access but will not compromise students' academic achievement.

Statement of Competing Interest

The Author has no competing interest

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