

Learner Characteristics and Educational Attainment among High School Students in Kenya

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ABSTRACT

This study examined the contribution of learner characteristics being gender, age, prior attainment, family size and parental involvement to educational attainment in among high school students in Busia County, Kenya. The study adopted descriptive survey design. The study hypothesized that gender, family size, age, prior attainment and parental involvement had no statistically significant effects on academic attainment in high school education. A sample of 755 high school students and 344 teachers was used. Self administered questionnaires and document analysis schedule were used to collect data. Using multilevel linear modeling of the Kenya Certificate of Secondary Education (KCSE) examination of 2016, the study demonstrated that gender, family size, age, prior attainment and parental involvement accounted for 43.13% of the variance in educational attainment among high school students. Based on the findings of study, it was concluded that educational planners should take into consideration the characteristics of individual learners in planning education.

Key words: Gender, Age, Family size, Prior Attainment, Parental Involvement

1. INTRODUCTION

One of the primary concerns of educationists and other stakeholders is that learners under similar educational context; for instance sitting in the same classroom, instructed by the same teachers and sharing a given set of physical facilities and textbooks can still score differently in a test. Furthermore, wide disparities in learning outcomes are observed within schools. Elsewhere, studies have demonstrated the effects of student level variables on educational attainment. However there is no consensus on which student variables really matter. Adigun, Onihunwa, Irunokhai, Sada and Adesina (2015) studied the relationship between gender and students' academic attainment while Lu (2005) examined the effects of family size on educational attainment. Narirro, Rubio and Olivares (2015) sought to determine the effects of learner's age on academic attainment. Nonetheless, all the above studies fail to report the extent to which specific student characteristics account for the variation in educational outcomes. In a related study, Cervini (2009) found that student prior academic attainment and socioeconomic backgrounds accounted for a larger variation in academic attainment between school, municipality, and state levels but the study did not disaggregate the effects of the characteristics under investigation. The study also found that prior academic attainment did not account for significant inter-class differences within the same school. Although the study was useful, the study focused on only two characteristics (but important) namely; prior attainment and socioeconomic background.

In Kenya, Mbugua, Kibet, Muthaa and Nkonke (2012) examined the relationship between primary school academic attainment and high school learning outcomes. The study demonstrated that there was no significant relationship between scores in primary and high school but Kinyua (2014) found that there was a statistically significant relationship between a student's score in primary and that of high school. Some studies have reported that gender has a significant effect on quality of educational outcomes. Demis (2010) defined gender as

physical, mental or biological characteristic pertaining to or differentiating between masculinity and femininity. However, depending on the context, gender could mean social structure including social roles. Concerns about gender and academic attainment remain a matter of concern for educational planners and policy makers. In most African communities, the girl child has been socialized to perform domestic chores at the expense of school work. A review of studies on gender and academic attainment revealed mixed findings. For instance, whereas Othman and Abdullah (2015) found that student's gender had a statistically significant effect on educational attainment among high school students, Ebunuwa-Okoh (2015), Akabogu and Ajiwoju (2014) found that there was no significant effect. According to Sudha (1997) and Lloyd (1994) gender may also mediate the effect of family size. This implied that the effect of family size on educational attainment of females should be stronger than the effect males.

Some studies have shown that age is an important determinant of educational attainment. From decades of practice, educationists and psychologists have argued that a child is ready to join standard one at the age of six. At age six the child enters the stage of concrete operation, the point where they can synthesize information. Controversy has existed as to whether students' age influences academic attainment. Ezenafwor and Obi (2015) found that there was no significant relationship between age and academic attainment. But Munamu (2016) and Voyles (2011) demonstrated that students' age had statistically significantly effect on academic attainment. Thuku (2010) demonstrated that student's age and sex were the major student level predictors of academic attainment in reading and mathematics. The results of variance partitioning suggested that student level variables explained for up to 61.1 % and 44.0 % of the variation in students' academic attainment in reading and mathematics respectively. In a separate study, Motari, Too and Simiyu (2015) also reported that students' age had statistically significant effect on the student's academic attainment.

As for family background and students' educational attainment, studies have reported that family background characteristics such as parental education, parental input and parents' occupation had significant effects on students' academic attainment. Ella, Odok and Ella (2015) while investigating examined the relationship between family size and student academic attainment in Nigeria found that there was a significant effect of family size on students' academic attainment in high school. The controversy surrounding the causes of commonly observed disparities in educational attainment can only be resolved by empirical research. That is why this study sought to analyze the relationship between gender, family size, age, prior attainment, parental involvement and educational attainment among high school students in Kenya.

2. OBJECTIVES OF THE STUDY

The broad objective of the study was to examine the influence of learner characteristics on educational attainment among high school students.

The specific objectives of the study were;

- 1) To examine the effect of gender on educational attainment among high school students in Busia County, Kenya
- 2) To establish the relationship between age and educational attainment among high school students in Busia County, Kenya
- 3) To investigate the effect of family size on educational attainment among high school students in Busia County, Kenya

- 4) To determine the effect of parental involvement on educational attainment among high school students in Busia County, Kenya

3. RESEARCH HYPOTHESES

The study was guided by the following research hypotheses

- H01:** Gender has no statistically significant effect on educational attainment among high school students in Busia County, Kenya
- H02:** Age has no statistically significant effect on educational attainment among high school students in Busia County, Kenya
- H03:** Family size has no statistically significant effect on educational attainment among high school students in Busia County, Kenya
- H04:** Parental involvement has no statistically significant effect on educational attainment among high school students in Busia County, Kenya

4. DATA AND METHODS

The study was conducted in high schools in Busia County based on the 2016 Kenya Certificate of High Education (KCSE) examination results. The study targeted 152 schools involving 7550 students and 2640 teachers. A total of 264 teachers and 755 students were sampled. The dependent variable of interest was the KCSE examination results of 2016. For ease of analysis and comparison across schools, the mean scores of five compulsory subjects namely; English, Kiswahili, Mathematics, Biology and Chemistry. The outcome variable was transformed into a standardized score. The primary student level variables were gender, age, family size, and prior attainment, type of primary school attended and level of parental involvement. All student level variables were measured on an interval scale. The school level variables included the teacher input and non teacher inputs. The variables were measured on an interval scale.

5. RESULTS

5.1 Description of Omitted Variables

All variables that were not significant at $\alpha=0.05$ were omitted. Table 1 presents the description of the variables that were omitted.

Table 1: Description of Omitted Variables

Var.	Variable Label	Variable scale	Variable values
a0b	Student's age	Interval	16-21
a0f	Student attended private school	Nominal	0=Public; 1=Private
a0g	Number of siblings	Interval	0 – 10
a2e	Student's parent involved in guidance and counseling	Interval	0=Non existent 4=Fully existent
a2f	Student's parent's offers moral support to teachers	Interval	0=Non existent 4=Fully existent
a2g	Student's parent involved in student discipline	Interval	0=Non existent 4=Fully existent
a2h	Student's parent pays school fee	Interval	0=Very poor 1=Excellent

Table 1: Description of Omitted Variables

a2i	Student's parent creates a conducive environment at home	Interval	0=Non existent; 1=Fully existent
a2j	Student's parent visits student at school	Interval	0=Non existent; 1=Fully existent
a2k	Student's interest in education	Interval	0=Very poor 1=Excellent
a2l	Student's understanding of importance of education	Interval	0=Very Excellent
a2m	Student's conduct at school	Interval	0=Very poor 1=Excellent
a2n	Student completes homework	Interval	0=Very poor 1=Excellent
s3e	Syllabus coverage	Interval	0=Very poor 1=Excellent
s3o	Availability of ICT facilities	Interval	0=Non existent; 1=Fully existent

Note. Student characteristics variables are prefixed with letter "a" and School predictors with letter "s"

The rationale for omitting the variables was informed by the need to achieve parsimony in a model (popularly known as the Occam's razor). A parsimonious model requires a balance between fitting very few variables on one hand and fitting too many variables than necessary in the final model fit. Technically speaking, parsimony is based on the premise that fitting too many variables in a model introduces unnecessary "noise" hence the variances of the estimated parameters will likely be larger than those of a simpler model. In addition, if too many variables are introduced in a model, multi-co linearity between predictors can easily arise. However, if a model has just too few predictors, it may create aggregation bias (omitting important ones).

5.2 Description of Variables used in Fitting Regression Models

Only variables that were statistically significant at $\alpha = 0.05$ were used in fitting the regression models. Table 2 presents the description of the variables that were statistically significant.

Table 2 Descriptive Statistics for the Variables Used in Analysis

Var.	Variable Label	Mean	SE	SD	Min	Max
a1z	Student's KCSE z-score	0.00	0.03	1	2.04	2.59
a1c	Student's prior academic attainment	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 high schools: 0=Other classification, 672 (90.29); 1=Boys high 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

5.3 Descriptive Statistics of Variables used in Analysis

Table 3 presents descriptive statistics of the variables used in the analysis

Table 3 Descriptive Statistics for the Variables Used in Analysis

Var.	Variable Label	Mean	SE	SD	Min	Max
a1z	Student's KCSE z-score	0.00	0.03	1	2.04	2.59
a1c	Student's prior academic attainment	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
s2e	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	Lessons missed	2.31	0.03	0.85	0	4
s3c	Assistance to weak students	2.31	0.03	0.88	0	4
s3d	Adhere to code of conduct	2.70	0.03	0.86	0	4
s3f	Teamwork	2.49	0.03	0.89	1	4

Table 3 Descriptive Statistics for the Variables Used in Analysis

Var.	Variable Label	Mean	SE	SD	Min	Max
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	Time of Reporting on duty	2.33	0.03	0.84	0	4
s3k	Level of 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 % 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 high schools: 0=Other classification, 672 (90.29); 1=Boys high 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

From this study, Table 3 indicates that the average school size was three hundred and seventy four (374) students. This was lower than the optimal school size of five hundred and forty (540) students recommended in Kenya by (MoEST, 2014). The findings gave the impression that majority of schools were under enrolled. This should worry education stakeholders particularly given that Kenya is implementing Free High Education policy.

Table 3 also reveals that the mean of teacher lesson attendance was 3.43. On a scale of 0 to 4, where 0 represented “teachers don’t attend lessons at all” and 4 represented “complete attendance to lessons” with a mean of 3.43, it implies that teacher lesson attendance was quite good. The mean of “teachers covered missed lessons” was 2.31. This gives the impression that teachers rarely covered lessons missed.

5.4 Unconditional Model

The unconditional model formed the basis for fitting the regression models that were used to address the objective of the study. The intercept only model specification is ideally similar to a one-way ANOVA model. This study considered 755 students nested in 100 schools. For ease of interpretation, the outcome variable was transformed to a standard normal score with a mean of zero (0); standard deviation and variance of one (1). Transforming the outcome variable allowed interpretation of the effects of covariates in hierarchical model in terms of standard deviation units of the outcome variable (Leckie, 2013; Raudenbush and Bryk, 2002). Table 3 presents the results of the intercept only model.

Table 4. Two-Level Intercept only Model

Fixed Effect

Variable	Variable label	Null Model	
		Est. (Std. Err.)	P
Intercept, β_{0j}		0.012 (0.078)	0.874
<i>Random Effect</i>			
		<i>Variance Component</i>	
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
<i>Model Fit Statistics</i>	
Deviance	1913
Akaike Information Criterion (AIC)	1919
Bayesian Information Criterion (BIC)	1933
Likelihood Ratio test vs. OLS Regression	chibar2(01) = 513 $<.001$

Note. N= 755; Est. = Estimate; Std. Err. = Standard Error (in parentheses); AIC and BIC statistics = smaller-is-better fit; OLS=Ordinary Least Squares

The results presented in Table 3 suggests that the overall school mean academic attainment in KCSE examination across schools was 0.012, SE= 0.078, p=.874. Thus the variance of the mean for each school around the overall county mean was 0.012 unit scores.

5.5 Bivariate Analysis

This section presents the correlation results for the relationship between selected student characteristics and the outcome variable (student academic attainment in KCSE). Pearson correlation coefficients were used to establish the strength of the relationship between the variables. Table 5 presents the pair wise correlation matrix showing the extent to which student characteristics affect students' academic attainment in KCSE examination.

Table 5 Bivariate analysis of student characteristics and educational attainment.

Var	Variable Label	a1z	a1a	a1c	a2a	a2b	a2c
a1z	Students' KCSE z-score	a 1					
a1a	Female student	a .127	1				
		b <.001					
a1c	Student prior attainment	a .209	.025	1			
		b <.001	.466				
	Parental involvement in academic issues	a .595	.107	.147	1		
a2a		b <.001	.002	.000			
	Parental involvement in provision of requirements	a .558	.101	.101	.728	1	
a2b		b <.001	.003	.003	.000		
	Parental involvement in meetings	a .439	.070	.048	.543	.449	1
a2c		b <.001	.042	.160	.000	.000	

Note. Pair-wise correlation: ≤ 0.35 = Weak correlation; $0.36-0.67$ = Moderate correlation; $0.68-0.89$ = Strong correlation; ≥ 0.90 = Very strong correlation; Adapted from "Interpretation of Correlation Coefficient," by R. Taylor, 1990, *Journal of Diagnostic Medical Sonography*, 6(1), p. 37^a Pearson correlation coefficient; ^b p-values ($\alpha=.05$)

The results displayed in Table 4 suggest that the five learner characteristics namely gender, prior attainment, parental involvement in academic issues, parental involvement in provision of school requirements and parental involvement in attendance of school meetings had a significant positive correlation with academic attainment. The strongest correlation was between parental involvement in discussing academic issues and students' academic attainment at $r=0.595$, $p=.001$. Parental involvement in provision of school requirements was also strongly correlated with academic attainment ($r=0.558$, $p=0.001$).

Table 6 Random Intercept Model for student characteristics

Fixed Effect

Var	Variable label	Model 1		Model 2		Model 3	
		Est. (SE)	P	Est. (SE)	P	Est. (SE)	P
a1a	Female student	0.12 (0.05)	0.030	0.11 (0.05)	0.034	0.10 (0.05)	0.057
a1c	Student's prior academic attainment	0.00 (0.00)	0.012 <.001	0.00 (0.00)	0.033	0.00 (0.00)	0.036
a2a	Student's parent involved in discussing academic	0.16 (0.03)	<.001	0.16 (0.03)	<.001	0.16 (0.03)	<.001
a2b	Parent provides school requirements	0.15 (0.03)	<.001	0.15 (0.03)	<.001	0.14 (0.03)	<.001
a2c	Parent attends school meetings	0.12 (0.03)	<.001	0.12 (0.03)	<.001	0.12 (0.03)	<.001
s2e	Total number of teachers			-0.06 (0.20)	0.780	-0.08 (0.20)	0.701
s3a	Teacher's lessons missed			-0.08 (0.04)	0.074	-0.08 (0.04)	0.055
s3b	Teachers cover missed lessons			-0.12 (0.12)	0.334	-0.14 (0.12)	0.257
s3c	Teachers assist weak students			-0.01 (0.09)	0.872	-0.02 (0.09)	0.861
s3d	Teachers adhere to code of conduct			0.00 (0.03)	0.868	-0.01 (0.03)	0.815
s3f	Teacher teamwork			0.08 (0.05)	0.066	0.08 (0.05)	0.089
s3g	Teacher relationships			0.01 (0.04)	0.897	0.01 (0.04)	0.834
s3h	Teacher-parent relationships			0.01 (0.03)	0.850	0.00 (0.03)	0.886
s3i	Teacher-student relationship			0.01 (0.03)	0.803	-0.00 (0.03)	0.984
s3j	Teachers duty reporting time			0.12 (0.12)	0.314	0.12 (0.12)	0.302
s3k	Teachers commitment to duty			0.04 (0.09)	0.649	0.04 (0.09)	0.689
s2f	Number of streams					0.18 (0.11)	0.102
s2h	School mean score 2015					0.07 (0.05)	0.128
s3l	Availability of text books					-0.00 (0.02)	0.869
s3n	Availability of physical facilities					0.04 (0.02)	0.048
	Intercept	-1.68 (0.21)	<.001	-2.15 (0.27)	<.001	-2.26 (0.29)	<.001

<i>Random Effect</i>	<i>Variance Component</i>	<i>Variance Component</i>	<i>Variance Component</i>
Student (Level-1), e_{ij}	0.3577 (0.02)	0.3548 (0.02)	0.3524 (0.02)
School (Level-2), u_j	0.2688 (0.05)	0.2231 (0.04)	0.2097 (0.04)
<i>Variance Explained percent (continued)</i>			
Student (Level-1), σ^2_e	0.0565	0.0595	0.0620
School (Level-2), σ^2_u	0.2869	0.3348	0.3489
<i>Model Fit Statistics</i>			
Deviance	1743	1721	1711
Akaike Information Criterion (AIC)	1759	1763	1761
Bayesian Information Criterion (BIC)	1797	1862	1880
Likelihood Ratio test vs. OLS Regression	chibar2(01) = 213	chibar2 (01) = 178	chibar2 (01) = 173
Likelihood Ratio test (Preceding Model vs. Next)	$\chi^2 (5) = 169$	$\chi^2 (13) = 222$	$\chi^2 (4) = 10$
	<.001	0.057	0.035

Note. N= 755; Var. = Variable; Est. = Estimate; Std. Err. = Standard Error (in parentheses); AIC and BIC statistics = smaller-is-better fit; OLS=Ordinary Least Squares

6. DISCUSSIONS

The results presented in Table 5 suggest that parental involvement in discussing academic issues was strongly correlated with the student's academic attainment at $r=0.595$, $p=.001$. This supports the findings of Echaune, Ndiku and Sang (2015) which demonstrated that parental involvement in homework had a strong positive effect on students' academic attainment. Parental involvement in provision of school requirements was also strongly correlated with academic attainment ($r=0.558$, $p=0.001$). The findings gave the impression that if parents were more involved in the provision of school requirements and discussing academic issues, then their children will score highly in high examination. Unlike what was reported by other studies (Adigun, Onihunwa, Irunokhai, Sada and Adesina (2015), the results presented in Table 5 suggested that there was a weak though statistically significant relationship between gender and educational attainment weak ($r= 0.127$, $p=0.001$). This finding suggests that male and female student educational attainment were not significantly different. The Variance Partitioning Component (VPC) reported in Table 3 suggests that the proportion of variation in students' academic attainment in KCSE examination between schools was 0.5426 and the within school- between-student variance in students academic attainment was 0.4116. The total variance in educational attainment among high school students was 0.9542 or 95.42%. In addition, the study found that the proportion of variance in students educational attainment explained by gender, age, prior attainment, family size and parental involvement was $0.4116 / (0.9542) = 0.4313$ or 43.13 %.

7. CONCLUSIONS AND RECOMMENDATIONS

The study established that not all learner characteristics contributed to variation in academic achievement in high education. Thus, educationists should focus on the learner characteristics such as age and prior achievement in order to improve academic achievement in high education.

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