KABARAK UNIVERSITY

TOPIC: LATENT INDICATORS OF STUDENT'S PERFORMANCE IN UASING GISHU COUNTY: CASE OF SELECTED SCHOOLS

By

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Background of the study

The study examined the determinants of students performance in secondary schools in Uasin Gishu county. The study focused on selected schools in the county. In particular, two homogeneous and one heterogeneous schools were selected. The first school was a girls school, second school being a boys school and the third one was a mixed school. A total sample of 300 students was selected for the study. Secondary data from these schools was used in the study with the previous year's KCSE results taken as the replications of the study. The KCSE results for the years 2014, 2013 and 2012 was taken as replication to enhance consistency and unravel latent factors contributing to student performance in high school. Data analysis was done using Statistical Packages for Social Sciences (SPSS Version 21.0) and results was presented using factorial ANOVA tables. Multiple Hypotheses were formulated to test the main effects and interaction effects between factors. F-tests were used as a basis of rejecting or accepting null hypothesis at 5% level of significance. Where significant difference was found, Post Hoc analysis such as Tukey's HSD and LSD were employed as further tests to establish difference in factors(variables) levels.

Statement of the problem

The 21st high school students are faced with many challenges both in school and the society. In the Kenya, students from different backgrounds have experienced varying levels of academic achievement in schools. This research identified factors that might account for the variance in student performance in high school. Variables associated with each of these factors influence the academic achievement of all student populations either positively or negatively. However, their combined effect may results in a significant disparity in the level of achievement amongst the different student population groups. This disparity probably may exists because of a variety of factors, which are presented in this paper. While these factors are not exhaustive, six of the most common factors believed to affect student performance was used in the research.

It has always been believed that the variables(factors) such as student discipline, Entry/Exit behaviour, peer influence, school tradition/culture, nature of school population and type of primary school one attended have a significant effect on the performance of the student. However, no endeavors have been done to show whether these factors are statistically significance or not. This paper established whether these factors have statistical significant effect on student performance at 5% level of significance.

Objectives

i) To establish whether student discipline plays a role in his/her performance level in high school.

ii) To determine whether peer influence amongst students has effect on performance level

iii) To find out if a particular school's tradition contribute to student's performance achievement.

iv) To find out whether KCPE marks for form one entry behaviour contributes to student's performance achievement(exit behaviour).

v) To find if the nature of a school's population(Unisex or Mixed school) has direct impact on the student's performance level in high school.

vi) To find out if the elementary school attended by a student (Public versus private/academy) contributes to student's performance level in high school.

Research Hypotheses

The factor treatment is represented as **factor A** and the factor performance is represented as factor B. The experimenter investigated if the six treatments, performance or the interaction between treatments and performance affects the student' grade. In other words, the following hypotheses was tested.

1. H0: A= 0 (No main effect of factor A, treatment)
   H1: A ≠ 0 (There is some difference in main effect A)

2. H0: B= 0 (No main effect of factor B, Performance level)
   H1: B≠ 0 (There is some difference in main effect B)

3. H0: AB=0 (There is no significance in interaction effect AB)
   H1: AB≠ 0 (There is some significance in interaction effect AB)

Justification of the Study

The justification of the study lies in the fact that high school examination performance in Uasin Gishu county has declined drastically despite introduction and implementation of various academic practices such as holiday tuition, remedials and others. The socio-economic and political changes that have occurred in the country over the last decade have impacted on the stability of schools in Kenya and more so in Uasin Gishu county. There are emerging issues in education sector such as new technology which has changed the societal setup and student's social fabric. This therefore calls for serious policy action not only from school managers but also from education actors to salvage the hitherto unseen effects of students' performance in high schools in Uasin Gishu county. This study is therefore significant in that it has highlighted the pertinent emerging issues that could be determinants of students performance in Uasin Gishu county.

Research Design and Methodology

Factorial experiment design was employed in this study. A factorial design allows the effect of several factors and even interactions between them to be determined with the same number of trials as necessary to determine any one of the effects by itself with the same degree of accuracy. This paper investigated the effect of the six treatments student's discipline, entry behaviour versus exit behaviour, peer influence, school tradition, student population nature and elementary schooling background. Two levels performance and two levels of above treatments were investigated in a 2x2 factorial design experiment. Each of the treatment combinations are replicated three times. The secondary data collected were tabulated as shown below:

2X2 factorial design table

	Treament	
Performance	**Level 1**	**Level 2**
Pass	r_1, r_2, r_3	r_1, r_2, r_3
Fail	r_1, r_2, r_3	r_1, r_2, r_3

Where r_1, r_2 and r_3 are replication one, two and three respectively for the years 2014, 2013 and 2012 KCSE results.

Model explained

The mathematical model for the analysis of factorial experiments was formulated as shown below. The factorial experiment has the effect of two factors, Aand B, on the response being investigated.

Let there be $\mathbf{n_a}$levels of factor A and $\mathbf{n_b}$ levels of factor B. The **mathematical model** for this experiment can be stated as:

$$y_{ijk}=\mu_i+a_i+b_j+a_ib_j+\varepsilon_{ijk}$$

Where

$\mathbf{a_i}$ is the i^{th} of the effect level of factor **A** $(i=1,2,\ldots,n_a)$

$\mathbf{b_j}$ is the j^{th} of the effect level of factor **B** $((j=1,2,\ldots,n_b)$

$\boldsymbol{\mu_i}$ is the general constant(Overall effect)

$\mathbf{a_ib_j}$ is the interaction effect between **A** and **B**

$\boldsymbol{\varepsilon_{ijk}}\sim N(0,\delta 2)$ i.e represents the random error terms(which are assumend to be normally distributed with a mean of zero and variance of $\boldsymbol{\delta^2}$.

The subscript **k** =1,2,….,m, where m= number of replications

Target Population

The population of the study was drawn from selected schools in Uasin Gishu county that have experienced fluctuations in student performance. The targeted schools were Kerotet girls school, Kipsangui boys school and U.G high school. .

Sample size and procedure

To obtain the subjects for the sample, a stratified sampling method was used. The subjects were grouped into various strata according to gender, type of school and population size. Thus to achieve the proportional allocation, a school was taken as a stratum.

$$n_i = \frac{N_i \; n}{N}$$

Proportional allocation was achieved by using the formula shown below:
Where N_i =stratum(school) population size

n= Total sample size

N= Total strata(All schools) population size.

One hundred students(100) from Kerotet Girls, eighty(80) from Kipsangui boys and another one hundred (120) from U.G High school was chosen using the KCSE results Datasheet for the years 2014, 2013 and 2012. Therefore, a total of three hundred (300) students was selected as the sample size of the study.

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Data Collection Instrument(s)

The researcher used secondary data from the three strata (schools). The KCSE results for the last three years used as replicates (*see appendix A for KCSE results*) and student admission book(*see appendix B*) to derive the KCPE marks for the subjects as well their former primary school nature (whether public or private).

Analysis , interpretation and Presentation of findings

In this section, the factorial ANOVA was employed. This inferential statistical test which allows the researcher to test if each of the independent variables have an effect on the dependent variable (hereby called the *main effects*). It also allows the researcher to determine if the main effects are independent of each other (that is, to determine if two or more independent variables interact with each other.) The data collected for the six treatments were tabulated in two formats of factorial design. The two factorial experiment design formats used were either the **2x2 Symmetrical factorial** experiment design(**2^2=4 treatments**) or **2x3 Asymmetrical factorial** experiment design(**2^3=8 treatments**). (*See appendix C for the tabulation of data using the above designs for the three schools*). In the subsequent sections, the six treatment effects were computed against performance using a factorial ANOVA. Decisions were made based on two scenarios. These decisions were to stop if H_0 is accepted or carry Tukey's HSD and LSD Post Hoc analysis if H_0 is rejected.

Student Discipline

Test of Hypothesis

Let **A** be the treatment 'student discipline and let **B** be the treatment 'Performance'

This leads to multiple hypotheses (to be tested with ANOVA):

- There is no difference between the levels of factor A (no main effect A)
- There is no difference between the levels of factor B (no main effect B)
- There is no significant interaction of factors A and B

Which can summarily be tabulated as shown below:

Main Effect of student discipline(A)	Main Effect of performance(B)	Interaction Effect of Type of performance and student discipline (A and B)
H_0: $\mu_{Disciplined} = \mu_{Indiscipline}$ Vs H_1: $\mu_{Disciplined} \neq \mu_{Indiscipline}$	H_0: $\mu_{Pass} = \mu_{Fail}$ Vs H_1: $\mu_{Pass} \neq \mu_{Fail}$	H_0: $\mu_{Disciplined,Pass} - \mu_{Disciplined,Fail} = \mu_{Indisciplined,Pass} - \mu_{Indisciplined,Fail}$ Vs H_1: $\mu_{Disciplined,Pass} - \mu_{Disciplined,Fail} \neq \mu_{Indisciplined,Pass} - \mu_{Indisciplined,Fail}$

Source: Author

Student Discipline..Ctd 1

Table 2(b): Between-Subjects factors levels

Between-Subjects Factors			
		Value Label	N
Performance level	1	Pass	6
	2	Fail	6
Discipline level	1	Disciplined	6
	2	Indisciplined	6

Source: Author

Table 3 (c): ANOVA for student discipline versus performance level

Tests of Between-Subjects Effects					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3993.000(a)	3	1331.000	44.992	.000
Intercept	63656.333	1	63656.333	2151.763	.000
PERFOMANCE	176.333	1	176.333	5.961	.040
DISCIPLINE	280.333	1	280.333	9.476	.015
PERFOMANCE * DISCIPLINE	3536.333	1	3536.333	119.538	.000
Error	236.667	8	29.583		
Total	67886.000	12			
Corrected Total	4229.667	11			

a R Squared = .944 (Adjusted R Squared = .923)

Source: Author

Student Discipline..Ctd 2

Initial Interpretation:

(a) The Performance effect is significant, F=5.961, p = .040

(b) The Discipline effect is significant, F=9.476, p = .015.

(c) The Performance * Discipline-the interaction effect is significant, F=119.538, p = .000.

Decision: A **post-hoc** analysis needed

A post hoc analysis for interaction effects needs to be performed since significance was found in the Performance* discipline factor interaction. Thus a *manual calculation was performed* using **Tukey HSD** formula given as:

(q,N,N-k)* MSE/n

where **q**=table value

n =average sample size and

N=from Table 3(b) Between-subject factors

From Table 3 (c) we obtain the q value: q.05,3,8 = 4.04

MSE from the ANOVA results = 29.583

N = 6 representing the average group size

K=3

Student Discipline..Ctd 3

Therefore, the minimum difference which must exist between a pair wise group comparison is:

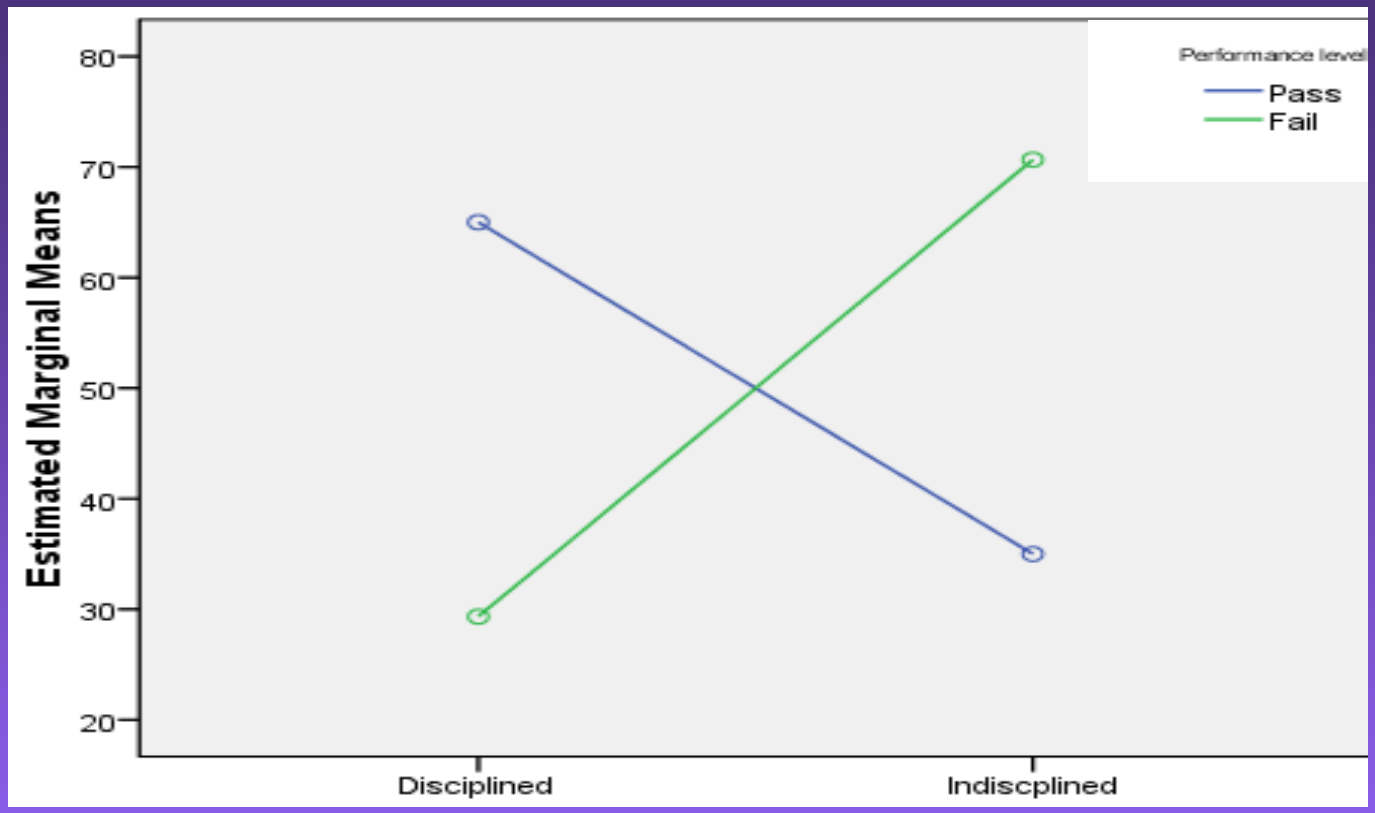
(4.04)* 29.583/6 = 8.97

Comparison of Discipline and Indiscipline:

76.98 – 68 = 8.98 is greater than 8.97; significantly different.

Since the P-values for main effects Performance and discipline are p=0.04 and p=0.015 respectively, we reject H_0 and conclude that there is some difference between the levels of factor A (main effect Performance) as well as difference between the levels of factor B (main effect discipline). Moreover, there is significant interaction effect between of factors A and B (performance and discipline) with p-value=.000.

Student Discipline..Ctd 4



The graph clearly depicts that interaction effect is highly significant between the two factors since the lines intersect. Disciplined students have high tendency of passing than their indisciplined counterparts

Entry Behaviour vs Exit Behaviour

The hypotheses that was tested for this variable is tabulated in the summary of multiple hypotheses shown below:

Main Effect of Entry-Exit Behaviour (A)	Main Effect of performance(B)	Interaction Effect of Type of performance and Entry-Exit Behaviour(A and B)
$H_0: \mu_{<=30} = \mu_{>350}$ Vs $H_1: \mu_{<=30} \neq \mu_{>350}$	$H_0: \mu_{Pass} = \mu_{Fail}$ Vs $H_1: \mu_{Pass} \neq \mu_{Fail}$	$H_0: \mu_{<=30,Pass} - \mu_{<=30,Fail} = \mu_{>350,Pass} - \mu_{>350,Fail}$ Vs $H_1: \mu_{<=30,Pass} - \mu_{<=30,Fail} \neq \mu_{>350,Pass} - \mu_{>350,Fail}$

Entry Behaviour vs Exit Behaviour..Ctd 1

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3105.667(a)	3	1035.222	19.471	.000
Intercept	54675.000	1	54675.000	1028.370	.000
PERFORMANCE	2028.000	1	2028.000	38.144	.000
ENTRY_EXIT	341.333	1	341.333	6.420	.035
PERFORMA NCE* ENTRY_EXIT	736.333	1	736.333	13.850	.006
Error	425.333	8	53.167		
Total	58206.000	12			
Corrected Total	3531.000	11			

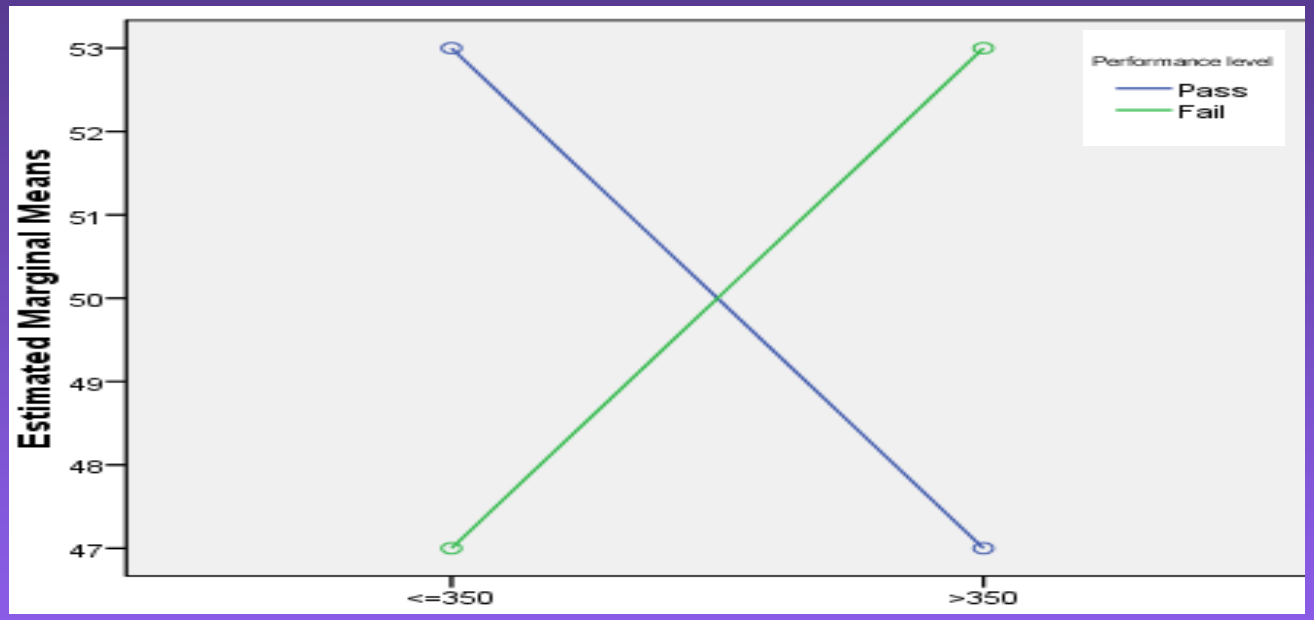
a R Squared = .880 (Adjusted R Squared = .834)

Source:Author

A final conclusion was arrive that since the P-values for Performance and Entry_Exit are p=0.000 and p=0.035 respectively, we reject H0 and conclude that there is some difference between the levels of factor A (Performance) as well difference between the levels of factor B (Entry_Exit behaviour). Furthermore entry behaviour seem to indicate Exit_behaviour since their p=0.006 implies that there is significant interaction effect between of factors A and B(performance and Entry_Exit behaviour). But practically, this is subject to other factors not mentioned in this research.

Entry Behaviour vs Exit Behaviour..Ctd 2

The Figure below depicts that there is an interaction effect between Entry_Exit behaviour and performance. Students with higher KCPE marks are less likely to fail than their counterparts of lower KCPE marks.



Elementary School Background

Multiple hypotheses summary

Main Effect of Type of primary school (A)	Main Effect of performance(B)	Interaction Effect between performance and Type of primary school (A and B)
$H_0: \mu_{Public} = \mu_{Academy}$ Vs $H_1: \mu_{Public} \neq \mu_{Academy}$	$H_0: \mu_{Pass} = \mu_{Fail}$ Vs $H_1: \mu_{Pass} \neq \mu_{Fail}$	$H_0: \mu_{Public,Pass} - \mu_{Public,Fail} = \mu_{Academy,Pass} - \mu_{Academy,Fail}$ Vs $H_1: \mu_{Public,Pass} - \mu_{Public,Fail} \neq \mu_{Academy,Pass} - \mu_{Academy,Fail}$

Source:Author

Elementary School Background..Ctd 1

ANOVA of Elementary school background

Tests of Between-Subjects Effects

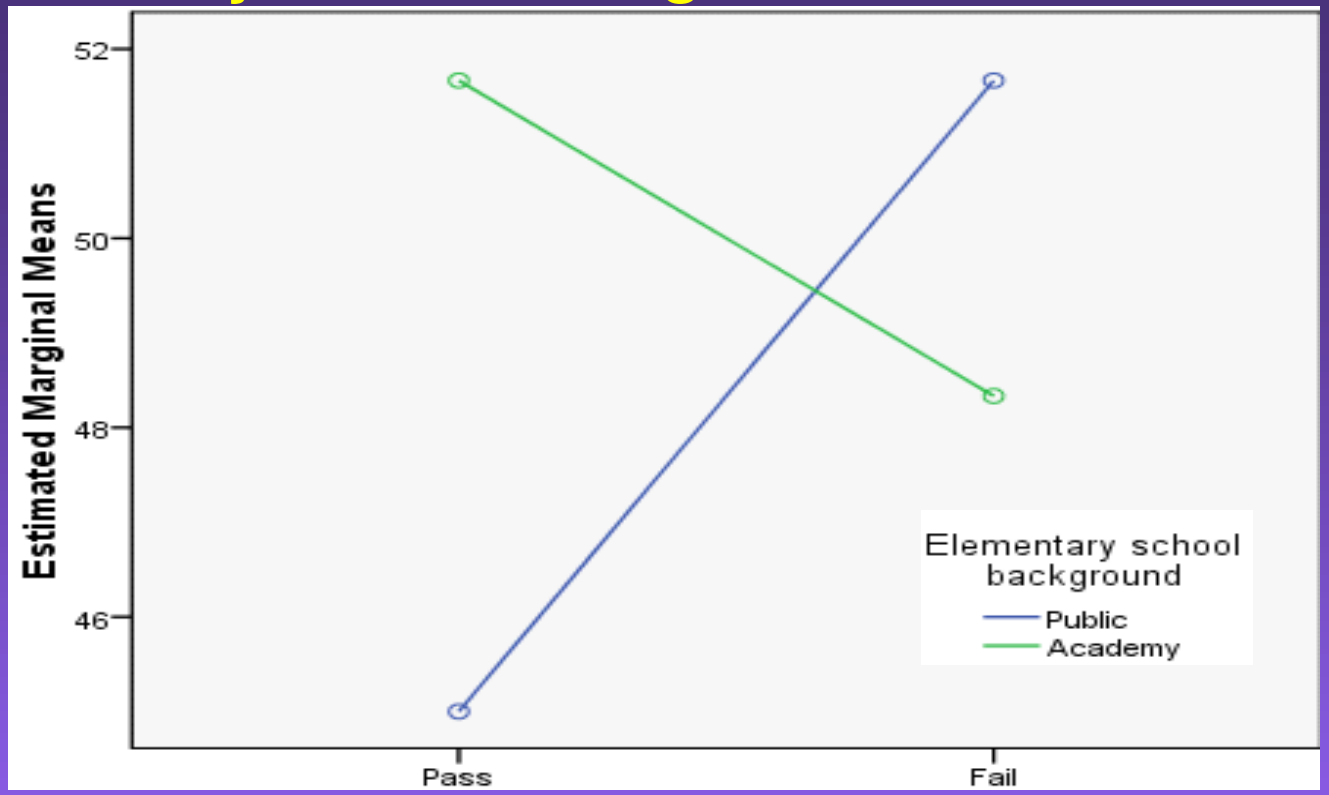
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4299.583(a)	3	1433.194	37.551	.000
Intercept	55624.083	1	55624.083	1457.400	.000
PERFOMANNCE	2976.750	1	2976.750	77.993	.000
PRIMARYSCHOOL	602.083	1	602.083	15.775	.004
PERFOMANCE* PRIMARYSCHOOL	720.750	1	720.750	18.884	.002
Error	305.333	8	38.167		
Total	60229.000	12			
Corrected Total	4604.917	11			

a R Squared = .934 (Adjusted R Squared = .909)

Source:Author

Since the P-values for Performance and Primary_school type are both p=0.000 and p=0.004 respectively, we reject H_0 and conclude that there is some significance difference between the levels of factor A (Performance) as well as levels of factor B (Primary_school type).

Elementary School Background..Ctd 2



The Figure above depicts that there is interaction effect between Primary_school type and performance. Students from public primary school depicts a positive linear correlation of passing than their counterparts of academies.

Peer Influence

Multiple Hypotheses summary on peer Influence

Main Effect of Type of Peer Influence (A)	Main Effect of performance(B)	Interaction Effect between performance and Type of Peer Influence (A and B)
$H_0: \mu_{+ve\_Influence} = \mu_{-Ve\_Influence}$ Vs $H_1: \mu_{+ve\_Influence} \neq \mu_{-Ve\_Influence}$	$H_0: \mu_{Pass} = \mu_{Fail}$ Vs $H_1: \mu_{Pass} \neq \mu_{Fail}$	$H_0: \mu_{+ve\_Influence,Pass} - \mu_{+ve\_Influence,Fail} = \mu_{-Ve\_Influence,Pass} - \mu_{-Ve\_Influence,Fail}$ Vs $H_1: \mu_{+ve\_Influence,Pass} - \mu_{+ve\_Influence,Fail} \neq \mu_{-Ve\_Influence,Pass} - \mu_{-Ve\_Influence,Fail}$

ANOVA table on peer Influence

Tests of Between-Subjects Effects

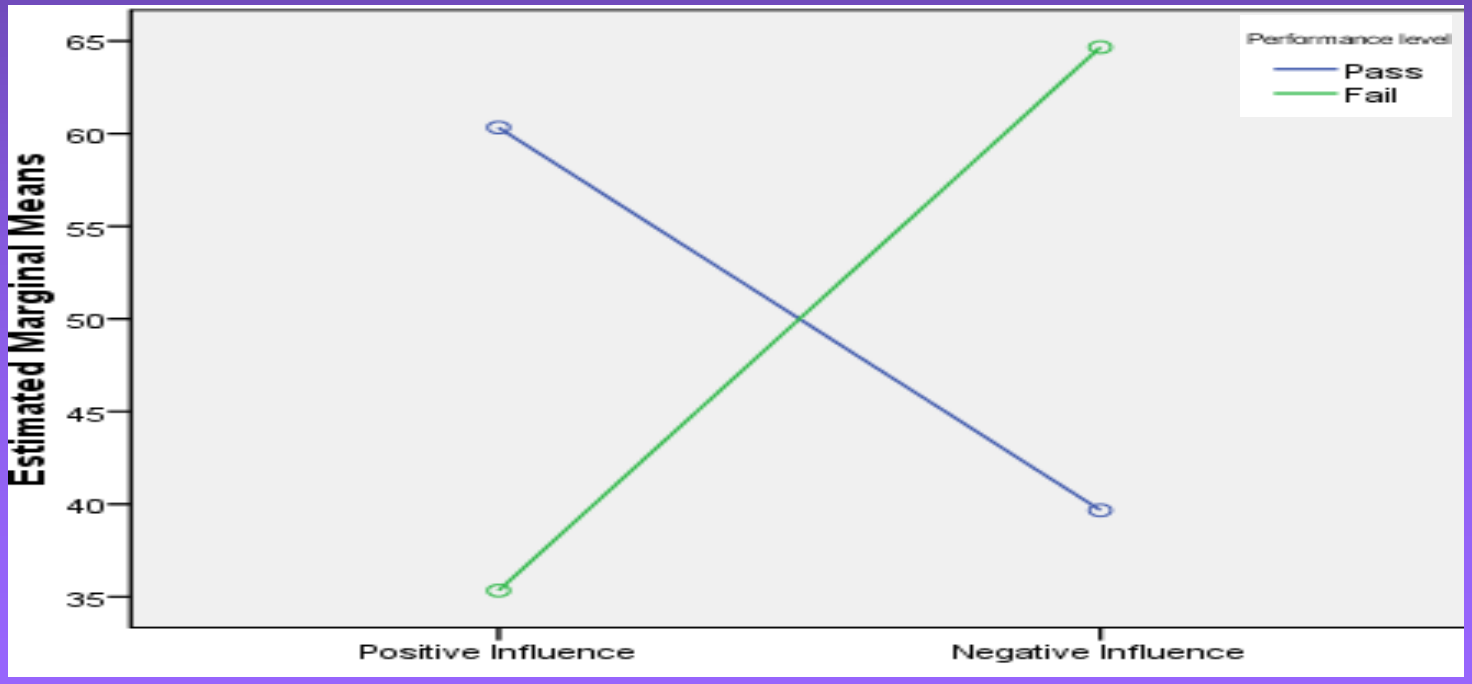
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4656.667(a)	3	1552.222	18.589	.001
Intercept	59925.333	1	59925.333	717.669	.000
PERFOMANCE	1160.333	1	1160.333	13.896	.006
PEERINFLUNCE	1200.000	1	1200.000	14.371	.005
PERFOMANCE * PEER INFLUENCE	2296.333	1	2296.333	27.501	.001
Error	668.000	8	83.500		
Total	65250.000	12			
Corrected Total	5324.667	11			

a R Squared = .875 (Adjusted R Squared = .828)

Source:Author

Peer Influence…Ctd 1

We conclude that, since the P-values for Performance and peer influence are **p=0.006** and **p=0.005** respectively, we reject H0 and deduce that there is some difference between the levels of factor A (Performance) as well as difference between the levels of factor B (discipline). Furthermore, there is significant interaction effect between of factors A and B(performance and peer influence). Positive peer influence indicates high chances of student performance well. Figure 5 below depicts a sharp decline in performance when there is negative peer influence.



Student population nature

This treatment used a 2x3 factorial experiment design to investigate whether there is any latent determinant in student performance when a school is single or mixed. These hypotheses can be tabulated as shown below:

Main Effect of Type of student population (A)	Main Effect of performance(B)	Interaction Effect between performance and Type of student population (A and B)
$H_0: \mu_{SingleSchool} = \mu_{Mixedschool}$ $H_1: \mu_{SingleSchool} \neq \mu_{Mixed\ school}$	$H_0: \mu_{Pass} = \mu_{Fail}$ Vs $H_1: \mu_{Pass} \neq \mu_{Fail}$	$H_0: \mu_{SingleSchool,Pass} - \mu_{SingleSchool,Fail} = \mu_{MixedSchool,Pass} - \mu_{MixedSchool,Fail}$ Vs $H_1: \mu_{SingleSchoo,Pass} - \mu_{SingleSchoo,Fail} \neq \mu_{MixedSchool,Pass} - \mu_{MixedSchool,Fail}$

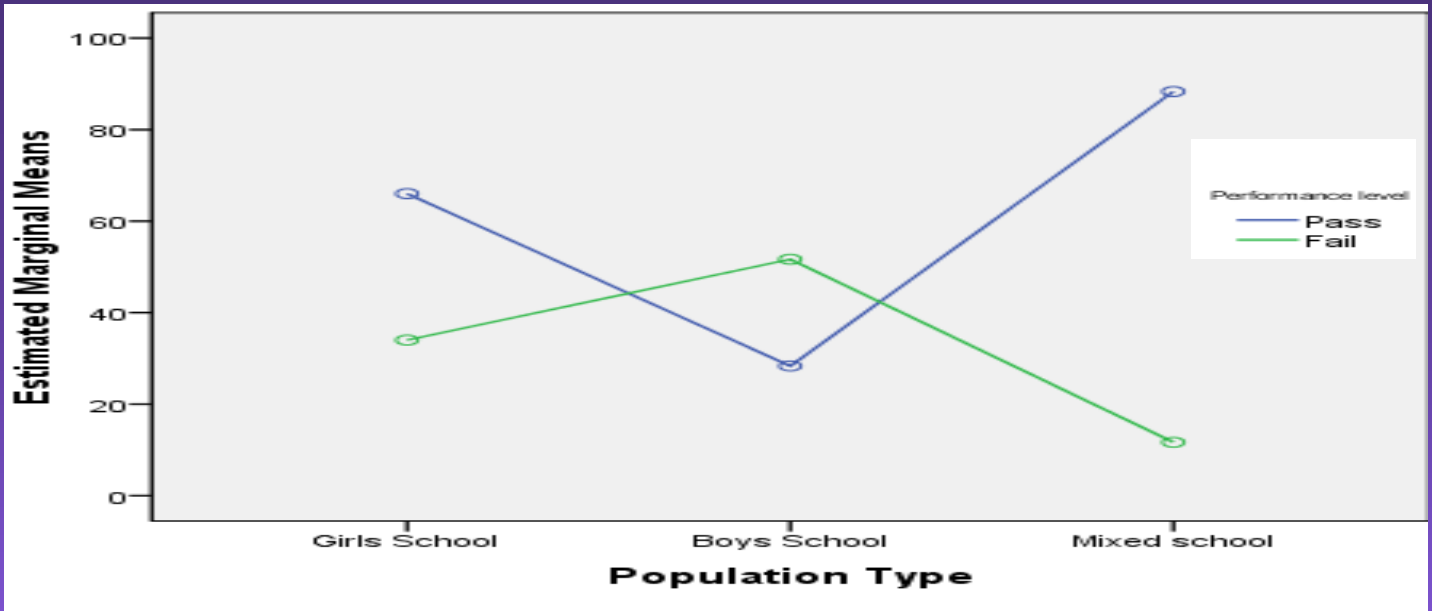
ANOVA table on Student Population nature and performance

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6738.278(a)	5	1347.656	46.650	.000
Intercept	104120.056	1	104120.056	3604.156	.000
PERFORMANCE	6086.722	1	6086.722	210.694	.000
POPNTYPE	243.111	2	121.556	4.208	.041
PERFORMANCE * POPNTYPE	408.444	2	204.222	7.069	.009
Error	346.667	12	28.889		
Total	111205.000	18			
Corrected Total	7084.944	17			

a R Squared = .951 (Adjusted R Squared = .931)

Student population nature..Ctd1



A final conclusion is that, since the P-values for Performance and nature of school population are p=.000 and p=.041 respectively, we reject H0 and conclude that there is difference between the levels of factor A (Performance) but there is no difference between the levels of factor B (Student population nature). From Figure 6, there is significant interaction effect between of factors A and B(performance Student population nature). There is a high chance of a student passing when in a mixed school than a single school. Boys' school seems to perform poorly when they are alone when compared to girls school.

School Tradition

Summary of Multiple Hypotheses

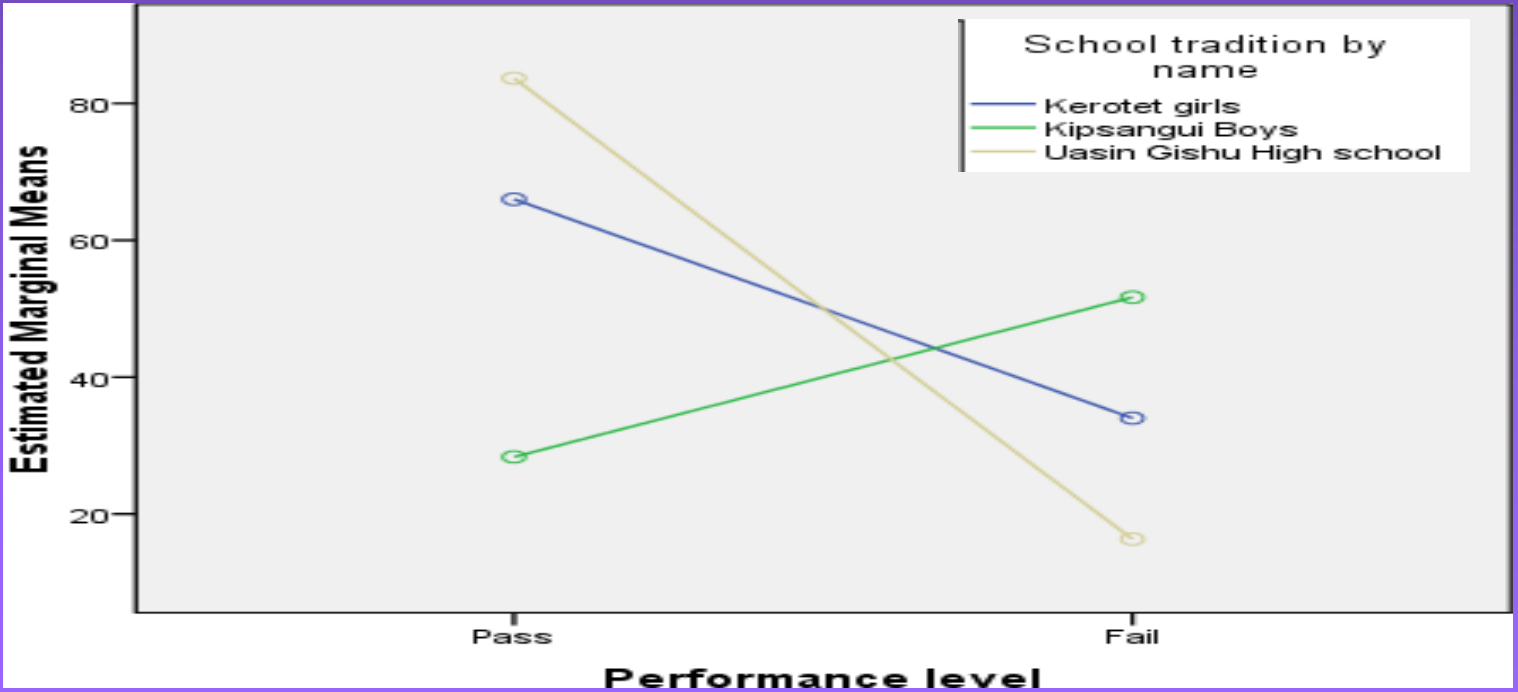
Main Effect of Type of school tradition (A)	Main Effect of performance(B)	Interaction Effect between performance and Type of school tradition (A and B)
$H_0: \mu_{KnownToPass} = \mu_{Fluctuates}$ $H_1: \mu_{KnownToPass} \neq \mu_{Fluctuates}$	$H_0: \mu_{Pass} = \mu_{Fail}$ Vs $H_1: \mu_{Pass} \neq \mu_{Fail}$	$H_0: \mu_{SingleSchool,Pass} - \mu_{KnownToPass,Fail} = \mu_{Fluctuates,Pass} - \mu_{Fluctuates,Fail}$ Vs $H_1: \mu_{SingleSchoo,Pass} - \mu_{SingleSchoo,Fail} \neq \mu_{Fluctuates,Pass} - \mu_{Fluctuates,Fail}$

Post Hoc Analysis- Multiple comparison of School traditions

	(I) School tradition by name	(J) School tradition by name	Mean Difference (I-J)	Std. Error	Sig.
LSD	Kerotet girls	Kipsangui Boys	6.83(*)	3.037	.044
		Uasin Gishu High school	8.83(*)	3.037	.013
	Kipsangui Boys	Kerotet girls	-6.83(*)	3.037	.044
		Uasin Gishu High school	2.00	3.037	.523
	Uasin Gishu High school	Kerotet girls	-8.83(*)	3.037	.013
		Kipsangui Boys	-2.00	3.037	.523

School Tradition…Ctd 1

From the LSD results in the above table, it can be inferred that the tradition of the school or its history matters when it comes to performance. Schools known to perform eitheir maintain or improves their performance status. On the contratry, school known to do poorly makes the students doubt themselves and ultimately affecting the results. This is supported by level of significance from the above table such that the school with smallest p-value, p=.013 (Uasin Gishu high school) has a good culture or its own tradition known over the years. The other two schools almost have the same p-values, p=.044, since they seem not to have developed their tradition.



Observation and Recommendations

1. Performance decline in Uasin Gishu county is real. Conventional measures that have been hitherto taken by ministry of education officials need to be revised owing to the fact that there are changes in lifestyles and emergent of new things such as technology.

2. Good discipline begets good results. Schools should strive to instill discipline by every means to our students in high school if good results are to be expected.

3. Students with almost equal KCPE results should be together. Students with high KCPE results are faster learners while students with low KCPE results are slow learners. Putting the two groups together will have a negative impact on the former cohort.

4. Pedagogical lifestyles used in academic schools need to be checked and revised. Teachers in academic schools seem to 'drill' pupils to pass exams without preparing them for high school curriculum content delivery mode.

5. Sophisticated mechanism must be put in place to curb negative peer influence which has hitherto remained elusive due to changes in societal setup and technological advancement as well as moral decadence.

Observation and Recommendations..Ctd 1

6. The nature of student population (either single or mixed school) need to rechecked. Single schools should be fully implemented but exchange program should be introduced between boys and girls school. This will help develop the students socially and also appreciate the fact that both sexes are the same in capability.

7. Good school tradition should be build and maintained or improved. Posting of principals to a given school should painstakingly be exercised and external forces and influences be shunned.

******END******

Thank you

Q’s & A’s