

## Effects of School Type on Students' Performance in Biology and Geography Taught Using their Preferred Learning Styles in Secondary Schools in Nairobi County

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**Abstract:** The purpose of this was to establish the effects of school type on students' performance in Biology and Geography taught using their preferred learning styles in secondary schools in Nairobi County. The study was based on Felder Learning Style Theory, and Grasha Teaching Style Theory. A purposive sample of 1,322 students from 18,536 Form Two Students in private and public schools randomly selected for the study. The study employed quasi-experimental research design, which utilised a pre-test, treatment of experimental group and a post-test to estimate impact of an intervention of mismatch due to traditional teaching styles to preferred leaning styles on target population of 69,634 in 146 secondary schools in Nairobi County. Questionnaires and pre-test and post-test were used to collect quantitative data. A full disclosure of the nature of the study was given to subjects with an extended opportunity to ask questions and get their free consent to participate. The collected data was analysed with the aid of the Statistical Package for Social Sciences (SPSS) version 22. On school type in geography,  $F(1, 657) = 3.046$ ,  $p = .081$  and in biology,  $F(1, 657) = .000$ ,  $p = .991$ . The study concluded that teachers should be sensitised on the need to identify and teach their learners according to their preferred learning styles in order to enhance their performance in sciences. The study recommends the ministry of education science and technology in Kenya to in-service, and train teachers to acquire the skills of detecting learning style preferences of students.

**Keywords:** Learning Styles, Teaching Styles, Gender, Performance.

### INTRODUCTION

In Kenya, a study by Mutua [1] in Machakos - Kathiani Sub-County was done on the relationship between learning styles and academic achievement among secondary school students in Kenya. Mutua found that there was positive and statistically significant relationship between learning styles and academic achievement for the tri-modal learners, and among male and female students. However, analysis of specific learning styles and the effect of mismatch of teaching styles to preferred learners' styles have not been done in Kenya. The traditional way of teaching sciences in Kenyan secondary schools is the use of ASEI-PDSI (Activity-focused Student-centred learning Experiment Improvisation - Plan, Do, See, Improve) approach which continues to yield unsatisfactory performance [2]. In the recent past, the Kenyan government has been concerned on how to improve secondary school students' performance in sciences. However, literature review indicate, regardless of the effort of the government in the Strengthening of Mathematics and Science in Secondary School Education, In-Service Training (SMASSE INSET), the Sciences that include biology and geography had no significant improvement year after year. The prescribed traditional ASEI-PDSI

(Activity-focused Student-centred learning Experiment Improvisation - Plan, Do, See, Improve) approach in teaching has not yielded the expected high performance. The students in private and public secondary schools in Nairobi County have been performing unsatisfactorily in sciences in the last seven years. No study has satisfactorily analysed the contribution of mismatching teaching styles with preferred learning styles to the unsatisfactorily performance in sciences. This study was aimed at filling this gap.

### LITERATURE REVIEW

#### Effects of School Type on Students' Performance in Biology and Geography

A number of studies have been carried to determine differences in performance in sciences in public and private schools. In Pakistan Barrera-Osorio, Blakeslee, Hoover, Linden, Raju and Ryan [11] in their study, found out that private schools produce higher test scores than government schools. The high-test scores in sciences were attributed to more consistency in provision learning resources, high cost-effectiveness, and teaching effectiveness. In Kenya, Mwangi, Muriithi, Mwaniki and Wambugu [3] suggested that different type of schools private and public support

academic resilience of their students, which make them perform higher in biology and other sciences.

Academic resilience is students' ability to successfully deal with academic drawbacks, challenges and academic pressure (grades, exam pressure), stress and difficulties in the academic or school life. Academically resilient students are intrinsically motivated, are optimistic, self-regulated, and flexible, show agency toward being solution-focused, exercise reciprocity, have determination, are assertive, and possess good communication skills [4]. Ferguson and Wolkow, [5] assert that type of school may affect academic resilience, and the consequent academic achievement.

Yang [6] observed that in Uganda, government-aided schools are finding it rough maintaining the high level of academic race. Studies show that the effect of Universal Primary Education (UPE) weighs down most of the public schools. Implementation of UPE has seen public schools enrol high number of pupils leading to large classes that have overwhelmed the teaching force. Consequently, performance has continued to drop. On the other hand, private schools have an edge over their counterparts as they are more organized in terms of pupil enrolment and teaching/learning facilities. Yang further noted that teachers in private schools work tirelessly from early in the morning to late in the evening in order to produce attractive academic results as a prerequisite for retaining the job. Those in public schools work with some laxity, as there is no strict supervision or punishment against non-performers.

A study in Ghana by Harry [7] revealed that private schools had better resourced, had parents of pupils whose socioeconomic status was higher, and were more involved in their children's education. Public

schools had more professionally qualified teachers than the private schools and recommended teachers to improvise the teaching and learning resources, which were not available in the schools to enhance the quality of education in the country. These studies revealed that the teacher and parent interaction with the learner influenced significantly the performance of students in sciences rather than the institutions.

According to Etxeberria, Intxausti and Azpillaga [8] school climate is linked to teachers' commitment to educational work, involvement, teamwork, and participatory management. The private but public funded schools (often-religious schools) are more effective than comparable public owned and funded schools with the same students, parents, and social composition in terms of reading, mathematics, and science abilities. The main explanation of this higher effectiveness is the better school climate in the former, in comparison to the latter. However, private owned and funded schools are less effective than public schools with the same students, parents, and social composition because of limitation of funding. The main explanation of their initially higher effectiveness is the better social compositions of these schools. This created the need to find the effect of teaching according to preferred learning styles on their performance in biology and geography.

## RESULTS

### Differences in Performance of Students in Private and Public schools in Baseline Tests

The researcher sought first to know the differences in performance of students in Private and Public schools in baseline tests. The descriptive (Table 1) showed that mean differences were small in geography 49.4% and 49.5% in public and private groups respectively, biology 49.6% and 49.3% public and private groups respectively.

**Table-1: Means of Geography and Biology in Private and Public Schools**

Test	School	N	Mean	Std. Deviation	Std. Error Mean
Geography	Public	694	49.3790	10.20690	.38745
	Private	623	49.4992	9.35575	.37483
Biology	Public	694	49.6282	8.66834	.32905
	Private	623	49.3804	8.02737	.32161

The Levene's Test for Equality of Variances (Table 1) indicated that that there was homogeneity of variance in geography between the private and public schools' means in geography and biology' given observed significant value  $> .05$  were  $F(1, 1315) = 3.43$ ,  $p = .064$  and  $F(1, 1315) = 2.90$ ,  $p = .089$  respectively.

### The Differences in Performance Biology and Geography Between in Private and Public Secondary Schools Students Taught Using their Preferred Learning Styles in Nairobi County.

The data used to compare, main effect of type of school on performance in biology and geography of students taught using their preferred learning styles in secondary schools in Nairobi County was arranged in stacked format. Multivariate analysis of variance (MANOVA) of stacked data in SPSS windows was analysed using the command 'Analyse' > 'General Linear Model' > 'Multivariate' > 'Model' > 'Custom' >

'Main effect' > 'Option' > 'Descriptive statistics', > 'Estimate of effects' > 'Observe power' > Ok . Descriptive statistics of performance in sciences in private and public secondary schools of students taught according to preferred learning styles (Table 3) indicated that public schools had slightly higher mean

scores in geography ( $M = 74.3, SD = 6.09$ ) compared to private schools ( $M = 73.6, SD = 5.29$ ). However, in biology the schools registered similar mean scores Public ( $M = 73.6, SD = 5.33$ ) Private ( $M = 73.6, SD = 5.26$ ).

**Table-2: Levene's Test for Equality of Variances in Geography and Biology in Private and Public Schools**

Independent Samples Test										
Test		Levene's Test for Equality of Variances		test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper	
Geog	Equal variances assumed	3.434	.064	-.222	1315	.824	-.12023	.54162	-1.18277	.94230
	Equal variances not assumed			-.223	1314.424	.824	-.12023	.53909	-1.17780	.93733
Biol	Equal variances assumed	2.904	.089	.536	1315	.592	.24782	.46202	-.65855	1.15420
	Equal variances not assumed			.539	1313.722	.590	.24782	.46011	-.65481	1.15046

\*The mean difference is significant at the 0.05 level

The mean scores were not significantly different in geography, in Public schools ( $M = 49.4, SD = 10.2$ ) and Private schools ( $M = 49.5, SD = 9.36; t(1315) = -.222, p = .824$ ). In biology, Public schools ( $M = 49.6, SD = 8.67$ ) and Private schools ( $M = 49.4, SD = 8.03; t$

(1315) = .536,  $p = .592$ ). The results described above (Table 17) suggested the two types schools were on the same level of performance at the beginning of the experiment [9].

**Table-3: Descriptive Statistics of Performance in Biology and Geography in Private and Public Secondary Schools of Students Taught According to Preferred Learning Styles**

Dependent Variable	School	N	Mean	Std. Deviation
Post-test Geography	Public	347	74.3343	6.09065
	Private	312	73.5545	5.29244
	Total	659	73.9651	5.73559
Post-test Biology	Public	347	73.6427	5.33548
	Private	312	73.6474	5.26995
	Total	659	73.6449	5.30053

The researcher did multivariate analysis of variance (MANOVA) using general linear model (GLM) to determine the main effect of type of school on performance in biology and geography of students taught using their preferred learning styles (Table 4).

The results (Table 4) indicated that there were no statistically significant differences, in performance in geography  $F(1, 657) = 3.046, p = .081$  and biology  $F(1, 657) = .000, p = .991$  in private and public secondary schools' students taught according to preferred learning styles.

**Table-4: Multivariate Analysis of Variance (MANOVA) of Main Effect of Type of School on Performance in biology and geography of Students Taught Using their Preferred Learning Styles.**

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>c</sup>
Corrected Model	Post-test Geog.	99.902 <sup>a</sup>	1	99.902	3.046	.081	.005	3.046	.414
	Post-test Biology	.004 <sup>b</sup>	1	.004	.000	.991	.000	.000	.050
Intercept	Post-test Geog.	3593098.421	1	3593098.421	109562.484	.000	.994	109562.484	1.000
	Post-test Biology	3564065.630	1	3564065.630	126662.137	.000	.995	126662.137	1.000
School	Post-test Geog.	99.902	1	99.902	3.046	.081	.005	3.046	.414
	Post-test Biology	.004	1	.004	.000	.991	.000	.000	.050
Error	Post-test Geog.	21546.296	657	32.795					
	Post-test Biology	18486.907	657	28.138					
Total	Post-test Geog.	3626927.000	659						
	Post-test Biology	3592622.000	659						
Corrected Total	Post-test Geog.	21646.197	658						
	Post-test Biology	18486.910	658						

a. R Squared = .005 (Adjusted R Squared = .003)  
 b. R Squared = .000 (Adjusted R Squared = -.002)

In addition linear regression analysis (Table 5) to establish the differences in performance in biology between private and public secondary schools students

taught using their preferred learning styles showed that-

**Table-5: Linear Regression Model Summary for Effect of School Type on Performance in Biology of Students Taught Using their Preferred Learning Styles.**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.000 <sup>a</sup>	.000	-.002	5.30456

a. Predictors: (Constant), School Type

The adjusted r square ( $r^2 = .000$ ) revealed that 0% of variation in performance in biology is determined by differences in type of school of students taught using

preferred learning styles. The ANOVA results (Table 6) showed that;

**Table-6: Of Significance Effect of School Type on Performance in Biology of Students Taught Using their Preferred Learning Styles**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.004	1	.004	.000	.991 <sup>b</sup>
	Residual	18486.907	657	28.138		
	Total	18486.910	658			

a. Dependent Variable: Post-test Biology  
 b. Predictors: (Constant), School Type

There were no statistically significant contributions of school type on performance in biology

of students taught using their preferred learning styles  $F(1, 657) = .000, p = .991$ .

**Table-7: Coefficients of Determination of Effect School Type on Performance in Biology of Students Taught Using their Preferred Learning Styles**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	73.638	.644		114.370	.000
	School Type	.005	.414	.000		

a. Dependent Variable: Post-test Biology

The B coefficient (Table 7) was .005, which indicated there was a positive association of school type and performance of students taught using preferred learning style in biology. One-unit increase in school type (i.e. moving from private to public) there is increase in performance in biology by 0.005 units. The results of the regression indicated that the model explained 0% of the variance and that the model was not a significant predictor of performance in biology,  $F(1, 657) = .000, p = .991$

While school type did not contributed significantly to the model ( $\beta = .005, p = .991$ ).The final

predictive model was biology score =  $73.638 + (.005 * \text{school type})$ .This indicated the difference in performance in biology of students in private and public secondary schools taught according their preferred learning style were statistically non-significant.

Linear regression analysis (Table 8) to establish the differences in performance in geography between private and public secondary schools students taught using their preferred learning styles showed that-

**Table-8: Linear Regression Model Summary for Effect of School Type on Performance in Geography of Students Taught Using their Preferred Learning Styles.**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.068 <sup>a</sup>	.005	.003	5.72669

a. Predictors: (Constant), School Type

The adjusted r square ( $r^2 = .005$ ) revealed that 0.5% of variation in performance in geography is determined by differences in type of school of students

taught using preferred learning styles. The ANOVA results (Table 9) showed that

**Table-9: ANOVA of Significance Effect of School Type on Performance in Geography of Students Taught Using their Preferred Learning Styles.**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	99.902	1	99.902	3.046	.081 <sup>b</sup>
	Residual	21546.296	657	32.795		
	Total	21646.197	658			

a. Dependent Variable: Post-test Geography  
b. Predictors: (Constant), School

There were no statistically significant contributions of school type on performance in

geography of students taught using their preferred learning styles  $F(1, 657) = 3.046, p = .081$

**Table-1: Coefficients of Determination of Effect School Type on Performance in Biology of Students Taught Using their Preferred Learning Styles**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	75.114	.695		108.064	.000
	School type	-.780	.447	-.068		

a. Dependent Variable: Post-test Geography

The  $\beta$  coefficient (Table 10) was -.780, which indicated there was a negative association of school type and performance of students taught using preferred learning style in geography. One-unit increase in school

type (i.e. moving from private to public) there is decrease in performance in geography by .780 units. The results of the regression indicated that the model explained 0.5% of the variance and that the model was



not a significant predictor of performance in geography,  $F(1, 657) = 3.046, p = .081$ . While school type did not contribute significantly to the model ( $\beta = -.780, p = .081$ ). The final predictive model was geography score =  $75.114 + (-.780 * \text{School type})$ . This indicated the differences in performance of students in private and public secondary schools taught according to their preferred learning style were statistically non-significant.

In conclusion, the multivariate analysis of variance and linear regression analysis showed that school type (private or public) differences had no statistically significant effect on performance of students taught using preferred learning styles in geography and biology. Given multivariate analysis of variance in geography  $F(1, 657) = 3.046, p = .081$  and biology  $F(1, 657) = .000, p = .991$  and linear regression in geography,  $F(1, 657) = 3.046, p = .081$  and in biology,  $F(1, 657) = .000, p = .991$ . This shows that teaching students according to their preferred learning styles makes students perform equally well in both private and public secondary schools in biology and geography. Therefore, the null hypothesis was accepted that there are no statistically significant differences in performance in biology and geography between private and public secondary students taught using their preferred learning styles in secondary schools in Nairobi County.

The researcher observed that type of school has insignificant effect on performance of students in biology and geography taught according to their preferred learning style. The study supports Ndaji, Little, and Coe [10] study in England, similar to those carried in Australia and the United States that found little or no significant differences between the educational outcomes of independent and state schools in science, mathematics and reading tests. After controlling factors such as gender, ethnicity, disability status, English language learner status, school size and location the differences in public and private students in Sciences, Mathematics and Reading tests were not statistically significant. However, the findings of this study differ with Bonsu [11] observation that in the academic performance of pupils in the public and private basic schools in Ghana, private basic schools were performing better than public basic schools academically. However, Bonsu further observed that the use of teaching and learning materials indicated that teachers did not use laboratories and equipment for practical because they were not available and adequate in the public schools and a few were available and adequate in the private schools. This still indicates that mismatch due to inadequate equipment for practical explains the difference in academic performance between private and public schools.

## CONCLUSION

Descriptive statistics of performance in biology and geography in private and public secondary schools of students taught according to preferred learning styles indicated that public schools had slightly higher mean scores in geography ( $M = 74.3, SD = 6.09$ ) compared to private schools ( $M = 73.6, SD = 5.29$ ). However, in biology the schools registered similar mean scores Public ( $M = 73.6, SD = 5.33$ ) Private ( $M = 73.6, SD = 5.26$ ). Multivariate analysis of variance (MANOVA) using general linear model (GLM) indicated that there were no statistically significant differences, in performance in geography  $F(1, 657) = 3.046, p = .081$  and biology  $F(1, 657) < .001, p = .991$  in private and public secondary schools' students taught according to preferred learning styles. The results of the linear regression indicated that the model explained 0% of the variance and that the model was not a significant predictor of performance in biology,  $F(1, 657) = .000, p = .991$ . In addition, the results of the linear regression indicated that the model explained 0.5% of the variance and that the model was not a significant predictor of performance in geography,  $F(1, 657) = 3.046, p = .081$ . While school type did not contribute significantly to the model ( $\beta = -.780, p = .081$ ). The final predictive model was geography score =  $75.114 + (-.780 * \text{School type})$ . This indicated the differences in performance of students in private and public secondary schools taught according to their preferred learning style were statistically non-significant.

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