

Management Of Laboratory Resources As Predictor Of Students' Academic Achievement In Physics At KCSE Examinations In Trans-Nzoia County, Kenya

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Abstract

The purpose of this study was to investigate the relationship between management of science laboratory resources and students' academic achievement in Physics at the Kenya Certificate of Secondary Education Examination. The study was conducted in Trans Nzoia County, Kenya. The study utilized quantitative methods, specifically descriptive research design where questionnaires and documentary analysis served as instruments of data collection. The respondents of the study were 368 students, 24 teachers and 24 laboratory technicians. Data was analyzed with the help of Statistical Package for Social Sciences (SPSS). The findings were presented using tables and texts. The study revealed that there was a strong positive correlation between the number of times students went to learn in the school laboratory and students' academic achievement in Physics at the KCSE Examination ($r=0.843$, $p<0.05$). Otherwise the study established a negative correlation between students' academic achievement in Physics at the KCSE Examination and number of students who shared a laboratory equipment during a Physics lesson ($r=-0.784$, $p<0.05$), and students being denied entry into the laboratory ($r=-0.755$, $p<0.05$). The number of times students went to learn physics in the laboratory had a positive effect on students' performance in Physics ($\beta=0.170$, $p<0.05$) while the number of students who shared a laboratory equipment had a negative effect on Students' academic achievement in Physics ($\beta = -0.208$, $p=<0.05$). Also, denying students entry into the school laboratory had a negative effect on students' academic achievement in Physics at KCSE Examinations ($\beta=-0.048$, $p<0.05$). From the findings of the study, it was concluded that management of school laboratory was a significant predictor of students' academic achievement in Physics at the KCSE Examination. Based on the findings and conclusion made thereof, the study recommended that schools should improve the management of laboratories by allowing students to access the facilities more frequently and increasing the quantity of science equipment.

Keywords: Laboratory Resources, Students Engagement, Science Learning

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I. INTRODUCTION

In many countries worldwide including Kenya, an indicator of the quality of the education system is learners' achievement in terms of quality grades in national examinations. The percentage of quality grades attained by learners depends on the level of efficiency and effectiveness of management of teaching and learning resources, (Usman, 2016)

Some of the resources that can be used for teaching and learning of Sciences are; physical resources such as laboratories, human resources example laboratory technicians and material resources example laboratory equipment. According to Maera, (2016) meaningful teaching approach makes proper utilization of well managed instructional resources to explain concepts to achieve educational objectives.

Tekalign, (2016) emphasizes that Students learn better when they are given opportunity to actively manipulate the available teaching and learning resources. However, research findings indicate that Teachers do not effectively utilize teaching and learning resources and hence, students' academic achievement is poor Asige et al (2017). This is a clear indicator of poor management of teaching and learning resources. Consequently, compromises the quality of education.

Okoth et al (2018) asserts that many countries are experiencing a gradual dropdown on students' participation and performance in science subjects especially physics. The decline in enrolment and rates of

graduation in Physics at various levels of education systems has been reported in many countries such as the UK, Netherlands and the USA Osborne et al (2003). The decline raises questions about the future of technological expertise.

The National Centre for Education and Statistics USA report 2018, asserts that though the number of students studying science courses was increasing, Physics bachelor's degree represents only one third of one percent of all bachelor's degree and only about 2% of all bachelor's degree in the natural sciences, mathematics and engineering (USA report, 2018). This concurs with Akarsu, B. & Kariper, A. (2013), which asserts that students shun sciences and especially physics in favor of other sciences when given an option.

In Kenya, the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA), conducted a study in 2015 in One County to understand the process of selection of Science subjects at KCSE and factors influencing the selection. Their findings showed that, all Students who participated in the study had enrolled: 100% in Chemistry, 85% in Biology and only 38% in Physics. These findings are consistent with statistics available from the Kenya National Examinations Council (KNEC) on the candidature in these subjects as depicted in table 1.1

Table 1.1
KCSE Examination Candidates Trends for the last 5 year

Year	Total Entry	Chemistry Entry	Biology Entry	Physics Entry	% Physics Entry
2021	699,479	691 802	618 654	184 559	26.4
2020	664,479	656 163	589 900	172 676	26.0
2019	615,591	606 515	545 663	160 182	26.1
2018	577,249	549 647	488 208	154 080	26.70
2017	525,787	501 955	250.191	135 423	25.90

Source: KNEC 2022

Low enrolment in a subject and poor academic achievement implies that teaching and learning resources are not well managed.

The Government of Kenya has since 2016 initiated a number of comprehensive reforms in the education sector with the aim of making Kenya globally competitive. For instance, in 2018, the President launched the national distribution of text books for schools in a new government initiative to ensure that each Student has a text book for each of the core subjects. Other initiatives geared towards quality learning by the GOK include: Disbursement of repair and improvement funds (R and I) of Ksh 22,444 as capitation per student per year, hiring of teachers on contract, internship and on relief basis to alleviate shortage and the introduction of teacher professional development (TPD) modules for serving teachers to enhance their management and service delivery skills.

However, in spite of the various initiatives implemented by the Kenya Government and the availability of resources, students' academic achievement in physics in Trans- Nzoia County has remained low as shown in table 1.2, below

Table 1.2
Trans-Nzoia County Physics performance in KCSE for the last 5 years (2017 – 2021)

Year	Total Entry in sciences subjects	Physics	% Entry in Physics	KCSE Mean Grade
2017	14,098	3 449	24.5	4.96 D+ (plus)
2018	14 534	3 989	27.4	4.47 D+ (plus)
2019	15 034	4 179	27.8	3.82 D (plain)
2020	15 974	4 269	26.7	4.72 D+(plus)
2021	17 320	5 060	29.2	4.48 D+ (plus)

Source: CDE office Trans-Nzoia County

The persistent poor achievement in Physics by students at KCSE is a big challenge to education planners, policy makers and teachers amongst other education stakeholders in the County. This poor academic achievement in physics has made many students to be locked out of major careers like Medicine, Pharmacy, laboratory Science and engineering among others. While available literature suggested that the use of resources is significant for the effective teaching and learning process in Physics, the question is whether or not and what extent are laboratory resources well managed. Previous studies carried out found a positive relationship between some aspects of school resources management and students' academic achievement (Mwikaria *et al*, 2019, Hendrawijaja, 2020, Bada and Jita, 2021, Laxman *et al*, 2022)

It was on the Basis of this persistent poor academic achievement in Physics in Trans-Nzoia County in spite of the adequacy and availability of teaching and learning resources that this study sought to examine the

efficiency of management strategies concerning laboratory teaching and learning resources as a correlate of students' academic achievement in Physics at KCSE examinations in Trans –Nzoia County.

Purpose of the study

The purpose of the study was to establish the extent to which management of laboratory resources affect students' academic achievement at KCSE examinations in Physics in Trans-Nzoia County, Kenya

Hypothesis of the study

There is no statistically significant relationship between management of laboratory resources and students' academic achievement in Physics at KCSE examinations in Trans-Nzoia County, Kenya

II. METHODOLOGY

Research Design

The study adopted a descriptive research design. The design was preferred because the study primarily sought to establish facts from the collected data concerning management of laboratory resources and students' academic achievement in Physics at KCSE examinations

Study area

The study was carried out in Trans-Nzoia County, Kenya. Trans-Nzoia County is located in the western part of Kenya. The county comprises five (5) sub-counties namely; Kiminini, Saboti, Endebess, Kwanza and Cherangany(Trans-Nzoia East). The county covers approximately 2470 square kilometers (Km²). Trans-Nzoia covesunty borders, Bungoma County to the West, Uasin Gishu and Kakamega counties to the South, Elgeyo Marakwet county to the East, West Pokot County to the North and the Republic of Uganda to the North west

Target Population

Trans Nzoia County had 240 secondary schools with an estimated population of 5460 Form IV Physics students in the year 2021. The county was stratified according to the five counties. 24 schools participated in the study. A non proportionate sampling was used to determine the number of schools per Sub County that participated in the study as shown in Table 2.1

Table2.1
Sampling of Schools

Sub – County	Target School	Sampling Unit Size
Kiminini	57	6
Trans – Nzoia West	43	4
Trans – Nzoia East	73	7
Kwanza	47	5
Endebess	20	2
Total	240	24
Percentage	100%	10%

The subjects of the study were drawn from the 24 schools. The respondents included Form IV Physics students, Physics teachers and laboratory technicians.

Sampling Procedure and Sample Size

The study employed the use of purposive and simple random sampling to select respondents. A sample size of 373 students, 24 teachers and 24 laboratory technicians was used to provide information on how management of laboratory resources affects students' academic achievement in Physics at KCSE
The study sought to establish the extent to which laboratory resources' management related variables influence students' academic achievement at KCSE in Physics

Data Collection Instruments

Questionnaires and document analysis were used to collect data. The questionnaires were used to collect data from physics teachers, physics students and laboratory technicians on the effects of laboratory resources management and students' academic achievement at KCSE in physics. While, document analysis was used to gather information on the schools mean scores performance in physics at KCSE examinations in the five year period 2017-2021

Data analysis methods

Data was analyzed by mean, mode, range, standard deviation, Pearson correlation and multiple linear regression

III. FINDINGS AND DISCUSSION

Description of the Independent Variables Used to Address the Objective

The independent variables used are described under Table 3.1

Table 3.1

Description of the independent variables used to address the first objective

Var.	Variable	Measure Scale
Var3a	Number of student who attend a Physics lesson in Laboratory at one go	Interval
Var3b	Number of times student went to the school laboratory in the past week to learn Physics in the presence of a teacher	Interval
Var3c	Number of times students went to the school laboratory in the past week to learn Physics without a teacher	Interval
Var3d	Number of times students went to the school laboratory in the past week to learn Physics without assistance of a laboratory assistant	Interval
Var3e	Number of times students went to the school laboratory in the past week to learn Physics with assistance of a laboratory assistant	Interval
Var3f	Hours in a week student spent in the school laboratory learning Physics.,	Interval
Var3g	Students who share a laboratory equipment during a Physics lesson	Interval
Var3h	Number of times a student broke a laboratory equipment during the term	Interval
Var3i	Number of times in the term student was denied entry in the school laboratory	Interval
Var3j	Lessons student attended during the last three years on use of the laboratory	Interval
Var3k	I find it hard to go to lab	Interval
Var3l	I find going to the lab as a waste of time	Interval
Var3m	I enjoy going to the school lab	Interval
Var3n	Physics practical's help me to understand concepts of physics	Interval

Note: Var=Variable

Source: Researcher (2022)

Table 3.1 describes the fourteen (14) independent variables that were used to address the first objective of the study. These variables were related to how management of laboratory resources affects students' academic achievement in physics at KCSE in Trans Nzoia County, Kenya. All variables were measured on an Interval scale.

Correlation between Management of Laboratory Resources and Students Academic Achievement in Physics at KCSE Examination in Trans-Nzoia County

Pearson correlation coefficients were computed to determine the linear relationship between the variables of interest. The findings are presented in Table 3.2

Table 3.2

Means, Standard Deviations and Correlations for variables in the first Objective

Var.	M	SD	Phy_Avg	A	B	C	D	E	F	G	H
Phy_Avg			1								
3a	38.71	8.568	-.941*	1							
			.002								
3b	1.21	0.384	.843*	-.742	1						
			.045	.011							
3c	1.43	0.484	.472	-.742	.234	1					
			.061	.031	.002						
3d	1.64	0.784	.254	-.742	.665	.354	1				
			.058	.051	.065	.871					
3e	1.80	0.884	.674*	-.742	.768	.321	.345	1			
			.054	.011	.001	.011	.009				
3f	1.00	0.684	.688	-.742	.457	.562	.876	.971	1		
			.021	.000	.051	.442	.093	.000			
3g	6.24	2.923	-.784*	.869	-.627	-.627	-.627	-.627	-.627	1	
			.011	.056	0.021	.000	.031	.014	.098		
3h	5.64	2.774	-.719	.736	-.542	-.500	-.449	-.571	-.652	.886	1
			.066	.000	.076	.972	.324	.753	.421	.792	
3i	3.02	1.991	-.755*	.744	-.547	-.347	-.747	-.621	-.547	.786	.772
			.003	.002	.045	.983	.004	.112	.034	.768	.431
3j	1.44	1.266	.442*	-.772	.702	.338	.653	.440	.763	-.706	-.591
			.031	.078	.432	.762	.227	.563	.722	.071	.042

3k	2.72	1.342	-.785*	.769	-.511	-.485	-.286	-.578	-.982	.417	.769
			.002	.034	.023	.044	.098	.043	.342	.034	.111
3l	2.63	1.273	-.690*	.706	-.511	-.443	-.547	-.343	-.542	.736	.632
			.051	.029	.341	.432	.543	.561	.442	.332	.531
3m	3.17	1.287	.772*	-.679	.221	.429	.521	.321	.521	-.700	-.644
			.048	.002	.031	.350	.260	.980	.011	.043	.254
3n	3.26	1.22	.661*	-.643	.577	.594	.512	.340	.566	-.663	-.639
			.025	.012	.234	.112	.076	.118	.042	.842	.542

Note: *= correlations are significant at 0.05, Var= Variables, M= Mean, SD= Standard Deviations, Phy_Avg=Students achievement in Physics at KCSE Examination.
Source: Field Data (2022)

The findings presented in Table 3.2 reveal that there was a strong negative relationship between variable 3a (Number of student who attend a Physics lesson in Laboratory at one go) and students' academic achievement in Physics at the KCSE Examination. ($r=-0.941$, $p<0.05$). On average, the schools that participated in the study had Physics Laboratories with a capacity of 39 students ($M=38.71$, $SD=8.568$). These results suggest large class size had a negative relationship with students' academic achievement. Previous studies have shown have shown that large class sizes had a negative relationship with students' performance (Ahebha & Adeyinka, 2022; Etim, et.al, 2020; Istifanus, 2022).

The relationship between variable 3b (Number of times students went to the school laboratory in the past week to learn Physics in the presence of the teacher) and students' academic achievement in Physics at the KSCE Examination was also found to be strong ($r=0.843$, $p<0.05$). On average students who participated in study reported that they learned Physics in the laboratory in the presence of their physics teachers twice a week ($M=1.8$, $SD=0.888$). These results probably suggest that an increase in teacher-student interactive hours in the laboratory could enhance the understanding of Physics concepts.

The study also found that there was a moderate positive relationship between variable 3e (Number of times in the past week students went to the school laboratory to learn physics and were assisted by the laboratory technician) [$r=0.674$, $p<0.05$] with students' academic achievement in Physics at KCSE examinations. This was interpreted to mean that laboratory technicians play an important role in enhancing students' understanding of concepts in Physics.

In addition, the results presented in Table 3.2 indicate that relationship between var3g (Number of students who share laboratory equipment during a Physics lesion) and students' academic achievement in Physics at the KCSE Examination was statistically significant. However, the relationship was shown to be negative ($r=-0.784$, $p<0.05$). On average, across the schools that participated in the study, six (6) students shared an equipment in the laboratory during a physics practical ($M=6.24$, $SD=2.932$). The negative correlation between the var3g and students' academic achievement in Physics at KCSE signifies that an increase in number of students sharing equipment in the Laboratory was likely to lead to a decrease in students' academic achievement in the subject.

The study also found a strong negative relationship between 3i (Number of times in the term a student was denied entry into the school laboratory and students' academic achievement in Physics at KCSE examinations ($r=-0.755$, $p<0.05$). These results suggested that if students were denied entry to the school laboratory many times, their performance in Physics exam is decreases. Additionally, on average, students who participated in the study were denied entry to the school lab about three times in a term. Previous studies have shown that exposure to adequate physics laboratory equipment improved students' performance (Bajon et al 2021, Tamunoyowara and Omeodu, 2022)

Regarding students' academic achievement in Physics and variable 3j (lessons students attended in the last three years on the use of the lab), the study established a moderate positive correlation ($r=0.442$, $p<0.05$). On average, students who participated in the study attended approximately two lessons on the use of the lab in the last three years ($M=1.44$, $SD=1.266$). The results suggest that as the number of lessons attended increased, students' academic achievement was likely to improve. These findings are similar to the findings by (Laxman, et. al., 2022).

Other variables that were found to have a statistically significant relationship with the dependent variable were; variable 3k (I find it had hard to go to the school lab) [$r=-0.785$, $p<0.05$], var3l (I find going to the lab as a waste of time) [$r=-0.690$, $p<0.05$], var3m (I enjoy going to the school laboratory to learn Physics) [$r=0.722$, $p<0.05$]. From the findings of the study, it was clear those students who enjoyed going to the school laboratory to learn Physics tended to perform better than their counterparts who did not. The results suggest that a student's attitude towards physics determines his/her academic performance in physics. The findings of the study agree with Assem et. al. (2023), Mboniyirivaze et .al, (2021) and Malala et al 2021).

Finally, the results presented in Table 3.2 indicate that there was statistically significant relationship between var3n (Physics practical help me to understand the concepts of Physics) and students' academic

achievement in physics at KCSE Examination ($r=0.661$, $p=0.05$). These results suggest that student belief in the effectiveness of Physics practical in enhancing of understanding concepts increases their achievement in the subject. Other studies have shown that practical work enhanced understanding of concepts in science subjects (Shana et al 2020; Adkins 2020; Adebisi & Osuntuyi, 2021)

Effects of Management of Laboratory Resources on Students' Academic Achievement in Physics at KCSE Examination in Trans-Nzoia County.

The study sought to establish the effects of management of laboratory resources on students' academic achievement in Physics at KCSE Examination of 2017-2021.

The hypothesis being tested was;

H₀1: Management of laboratory resources has no statistically significant effect on Students' academic achievement in Physics at KCSE Examination in Trans-Nzoia County.

To test the null hypothesis, the study used a multiple linear regression (MLR) model to establish the effects of the independent variables on the dependent variable. The results of the MLR model are presented in Table 3.3

Table 3.3
MLR model showing the effects of the independent variables on the dependent variable

Variable	Coefficient	Std. Error	t-Statistic	Prob
Constant (α)	8.614	0.388	22.197	0.000
SchCAT	-0.067	0.058	-2.276	0.024
var3a	-0.505	0.009	-10.512	0.000
var3b	0.170	0.064	5.664	0.000
var3g	-0.208	0.025	-4.862	0.000
var3i	-0.048	0.025	-1.608	0.001
va3j	0.052	0.040	1.737	0.054
var3k	0.009	0.047	0.266	0.790
var3l	0.013	0.026	0.686	0.494
var3m	0.021	0.030	1.096	0.274
var3n	0.043	0.042	-1.492	0.037
R-Squared	0.92	Mean Dep. Var	4.3339	
Adjusted R-Squared	0.916	S.D Dep. Var	1.6814	
S.E of Regression	0.48606	F. Statistic	293.893	
Sum Squared Resid.	60.717	Prob (F. Statistic)	0.0000	
Durbin Watson Stat	0.245			

Note: SchCAT=category of school, 1= boys school, 2= girls school; S.E Standard Error, Mean Dep. Var= Mean of the dependent variable, S.D Dep. Var= Standard Deviation of the dependent variable, Sum Squared Resid. = Sum of Squared Residuals
Source (Field Data, 2022)

The findings presented in Table 4.8 reveal that Var SchCAT (Category of School), whether school was boys or girls only predicted students' performance in Physics. According to the findings of the study, boys' schools were more likely to perform better in Physics Examination than the girls' schools. Number of student who attend a Physics lesson in Laboratory at one go (Var3a) had a negative effect of students' performance ($\beta=-0.505$, $P<0.05$). This meant that an additional student sitting in a Physics lesson conducted in the Laboratory would cause the school mean score in Physics at the KCSE Examination to decrease by 0.505 scores.

The findings presented in Table 3.3 indicate that Var3b had a positive impact on students' performance in Physics ($\beta=0.170$, $p<0.05$). The results suggest that an additional day of students going to the laboratory to learn Physics in a week accompanied by the Physics teacher, would lead to a 0.170 increase in performance in Physics at KCSE Examinations. This improvement in students' academic performance attributed to students going to the laboratory with a teacher probably meant that students benefited more from the teacher's presence. This is supported by earlier studies (Elsio 2022, Nnamdi and Ebele 2020)

The results in Table 3.3, further established that, Var3g had a negative effect on Students' academic achievement in Physics ($\beta =-0.208$, $p=<0.05$). The results give the impression that, one more student sharing laboratory equipment during a Physics lesson, caused the students' academic achievement KCSE Examination to decrease by 0.208 units.

In addition, the study revealed that var3i had a statistically significant negative effect on students' academic achievement in Physics at KCSE Examinations ($\beta=-0.048$, $p<0.05$). The finding was interpreted to mean that students being denied entry into the school Physics laboratory more often increases had a negative effect on students' academic achievement causing a drop of -0.048 scores in the school mean score. These findings agree with Kaupitwa & Amuthenu (2022), Imizuokena (2020) and Abidoye et. al (2022) whose findings showed that students tend to perform better in science subjects when they are exposed more to science facilities.

The study as depicted in Table 3.3 established that the effect of Var3j on students' academic performance at KCSE in Physics examinations was not significant as depicted in Table 3.3 ($\beta= 0.052$, $p<0.05$) This implied that, a unit increase in the number of lessons students attended in the last three years on use of the laboratory increases students' Physics academic performance at KCSE had no effect on students' academic achievement. These findings contradict previous studies whose findings indicated a positive correlation between a safe laboratory environment and students' 'academic performance in science subjects. (Koc and Caves, 2023; Wu et al., 2020)

Similarly, Var3l as displayed in Table 3,3, had a positive effect on students' performance at KCSE examinations but still the effect was not significant ($\beta=0.013$, $p<0.05$). Just like Var13k, the findings contradict what would be expected as this would mean, a unit increase in the number of students ' who found going to the laboratory as a waste of time rises, students' academic performance in Physics at KCSE examinations would post an improvement index of 0.013.

The findings shown in Table 3.3 revealed Var3m did not have a significant effect on students' academic achievement at KCSE examinations in Physics, ($\beta=0.021$, $p<0.05$). This meant that students positive attitude towards learning in the Physics laboratory had little effect on students' academic achievement in Physics examinations at KCSE. The findings sharply contradict earlier studies whose findings indicated that a positive attitude towards the laboratory environment is positively correlated with good academic performance in science subjects (Elsio, 2022 and Gericke, et .al 2022)

Finally, for Var3n, the study revealed a significant positive effect on students' academic Performance in physics at KCSE examinations. The results suggest that a unitary increase in the number of students' who found Physics practical helpful in understanding concepts of physics, would translate to a 0.043 improvement in students' academic performance in Physics at KCSE examinations. These agrees with other studies that showed hands- on activities help students to internalize concepts in Physics and improve on academic achievement by students (Albarico, et. al 2023; Llanos et. al, 2023 and Amanda et. al, 2023). The study used a Multiple Regression Model (MRM) to predict the change in students' academic achievement at KCSE Examination that would be occasioned by management of laboratory The Model adopted was of the form;

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_n X_n + \dots + \epsilon$$

Where;

- Y= Predicted change in students' academic scores in Physics at KCSE Examination
- α = Constant
- $\beta_1 \dots \beta_n$ = MLR Coefficients
- $X_1, X_2 \dots X_n$ = Independent Variable (var3a, var3b.... var3n)
- ϵ = Error term

Replacing the values shown in Table 3.3 into the equation, the final model for was given as;

$$Y = 8.614 - 0.067 \text{SchCAT} - 0.505 \text{Var3a} + 0.170 \text{Var3b} - 0.208 \text{Var3g} - 0.048 \text{Var3i} + 0.052 \text{Var3j} + 0.043 \text{Var3n} + 0.4845$$

Each regression coefficient in the equation represents the change in students' score in Physics at KCSE Examinations relative to a unit in the independent variable. Otherwise, when all the coefficients are zero, the students' score would be 8.614.

The coefficient of -0.505 for the number of students' who attended a Physics lesson at ago, was interpreted to mean unit increase in the number of students would reduce students' scores by 0.505 units. Likewise, the negative coefficient of 0.067 for the school category implied that a learner attending girls' school would occasion a decrease in the students' scores by 0.067 units. Similarly, students' who shared laboratory equipment had the likelihood of achieving 0.208 lower scores.

IV. Conclusion

The findings of this study revealed that, management of laboratory teaching and learning resources had statistically significant influence on students' academic achievement in Physics at KCSE. The findings gave the impression that management of teaching and learning laboratory influenced students' academic achievement in Physics at KCSE.

V. RECOMMENDATIONS

Based on the findings and conclusion made, the study recommended that;

- i. Education stakeholders should focus on improving the management of school laboratories to enhance students' academic achievement in Physics. This can be done by constructing large laboratories and ensuring that the laboratories are well equipped
- ii. There was need to improve on management of school laboratories by ensuring that schools employ laboratory assistants and stocking the laboratories with adequate equipment

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