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Library Resources as Predictor of Students' Learning Outcomes in Physics at Secondary Schools in Trans Nzoia County, Kenya

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Library Resources, Learning Outcomes, Physics, Secondary Schools.

Science, Technology, Engineering and Mathematics (STEM) subjects play a critical role in a country's socio-economic development. Low learning outcomes in Physics mean that students cannot participate positively towards the economic development of the country. Teaching and learning resources including library resources, can help improve students' learning outcomes. The purpose of this study was to investigate the relationship between the management of library resources and students' academic achievement in Physics at the Kenya Certificate of Secondary Education (KCSE) examination in Trans Nzoia County, Kenya. The study utilised quantitative methods, specifically descriptive research design, where questionnaires and documentary analysis served as instruments of data collection. The respondents of the study were 268 students, 24 teachers and 24 library assistants. Data was analysed with the help of the Statistical Package for Social Sciences (SPSS). The findings were presented using tables, figures, and thematic discussions. The findings of the study indicated that the management of library resources had a statically significant effect on student's academic achievement in Physics. The number of students who sat in the library at once had a statistically significant effect on students' academic performance at KCSE examinations ($\beta=0.616, p<0.05$), and the number of reference books a student was able to access in the school library also had a positive effect on students' academic performance ($\beta=0.203, p<0.05$). The number of times a student went to the school library in the past week to study Physics without the assistance of the librarian had a significant effect on students' academic performance. ($\beta=0.029, p<0.05$) while the number of different Physics textbooks that a student was able to access in the library revealed a positive effect on students' academic achievement ($\beta=0.203, p=0.05$). Based on the findings of the study, it was concluded that library resources were a significant predictor of student's academic achievement in Physics at the KCSE examination. From the foregoing conclusion, the study recommended that school boards of management and other stakeholders should focus on improving the management of library resources for enhanced students' academic achievement in Physics at the KCSE examination.

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INTRODUCTION

Library resources include a collection of books, journals, manuscripts, creative works such as novels and short stories, maps, and other forms of print material. These resources also include audio resources such as CD-ROMS, audio and video tapes, as well as other forms of media resources. Library resources help both teachers and students acquire valuable information that facilitates research and learning activities (Gbemi-Ogunleye, 2016). Thus, the role of library resources in learning institutions is surmountable and is often considered very critical for achieving quality learning outcomes. Whereas the availability of adequate and relevant library resources is important, their management is key to quality learning outcomes.

Research has demonstrated the positive impact of library resources on students' learning outcomes (Soria et al., 2013; Onuoha, 2000). It has also been argued that students who frequently visit the library can access more information compared to their counterparts who do not have the opportunity to visit the library (Bresciani et al., 2012)

In a related study on the association of library resources and students' academic achievement, Rodrigues and Mandrekar (2020) found that there was a significant and remarkable relationship between library usage and students' learning outcomes. Thus, there is a need to create awareness among students about resources and facilities that are available in the library so that

students can take maximum advantage of the benefits provided by the library.

Providing support to students to access resources in the library could play a significant role in helping students find useful and relevant resources within the library. A couple of factors contribute towards the productive usage of the library. These factors include; proper guidance by library staff on the use of the library resources, a conducive library environment and the opportunity to access the library resources when required (Rodrigues and Mandrekar, 2020).

Sterner (2021) contends that school library resources must be accessible to all those who wish to use the resources. But still, there is a need to ensure that a library is managed by well-trained and skilled staff. Library staff can help the reader find relevant resources and may be able to point out additional resources one had not thought about.

However, there are concerns about obstacles to efficient use of library resources. Some of these obstacles include poor management and lack of support to access relevant resources within the library, and inadequate library resources. In addition, some students may not benefit enough from the library because of limited time for the use of the library, and difficulty in accessing the library are among some of the major challenges. Poor management of library resources can potentially affect the effective use of library resources, thus leading to low student learning outcomes. Bimenyimana (2021) suggested that

there is a need to develop cooperation between the school management, librarians, and parents so as to acquire adequate library resources.

Statement of the Problem

According to Mogaka (2020), teaching and learning can be more effective with the use of adequate and relevant instructional materials. He emphasises that students who have the opportunity to actively manipulate the available teaching and learning resources have better chances of performing better than their counterparts who have no access to learning resources. Students have consistently performed poorly in Physics at the Kenya Certificate of Secondary Education (KCSE) in Trans Nzoia County. This study sought to examine the effects of library resources as a predictor of students' learning outcomes in Physics at the KCSE examination in Trans Nzoia County, Kenya.

Objectives of the Study

The study was guided by the following specific objectives

- Establish the factors that hinder the effective use of library resources in Secondary schools in Trans Nzoia County
- To determine the effect of management of library resources on students' academic achievement in Trans Nzoia County

LITERATURE REVIEW

Libraries play an important role in the teaching and learning process. From the library, both teachers and learners can access useful resources in the form of books, journals, manuscripts, newspapers and magazines. Libraries can also provide audio visual resources that can go a long way in enhancing learning (Ukim, 2012). According to Verma (2015), the role of the academic library is to achieve academic excellence. Verma proceeds to note that an academic institution cannot effectively achieve its mandate if it does not have a functional library. Todd and Carol (2010) stated that library resources enable learners to critically analyse and

organise information, problem-solving, and communicate their understanding.

Studies have effectively shown that students who have access to library resources have the potential to achieve better learning outcomes than those who have little or no access to library resources. Other studies established that students' satisfaction with the physical facilities in the libraries was an important predictor of learning outcomes (Kaushamalika, (2023). Carvalho et al. (2020) also showed a positive and significant relationship between the library usage and the students' academic performance and success. Aernyi and Odeh (2017) conducted a study on library services utilisation and students' academic performance in the Philippines. The study established students' satisfaction with library usage had a positive but moderate correlation with students' academic performance.

Ekong and Ogunode (2022), in a study of the usage of library resources among university students in Nigeria, found that library usage played a significant role in postgraduate students' research work. In Uganda, Kabanda (2020) found a weak positive correlation between the organisation of school libraries and student academic performance. However, in Rwanda, Bimenyimana (2021) reported that the availability of library services and their utilisation significantly enhanced the level of academic performance. A study carried out in Nigeria to establish the effect of academic library usage on pre-service teachers' academic achievement found that effective library usage improved pre-service teachers' academic achievement irrespective of gender (Eze et al., 2022).

In related studies seeking to establish the association between library resources and students' academic achievement, some studies have shown the factors that hinder library usage, thus impacting negatively on students' academic performance. For instance, Kayode (2017) noted that the low use of library resources was due to a lack of students' awareness. The study alluded that for a learner to acquire good and quality education, it is necessary for him or her to have

free access to the materials that can help widen their horizon. These materials should not just be sourced by the individual user, but it is the obligation of the school management to provide auxiliary services, including trained and qualified school library personnel.

In Kenya, Nganga (2020) sought to establish the relationship between library services and students' academic performance. They revealed that there was a positive correlation between library service and students' academic performance. Thurania et al. (2022), in a study on the influence of teaching and learning resources on academic performance among public primary schools in Laikipia West Sub County, revealed that teaching and learning resources had a positive and significant influence on pupil's performance in public primary schools.

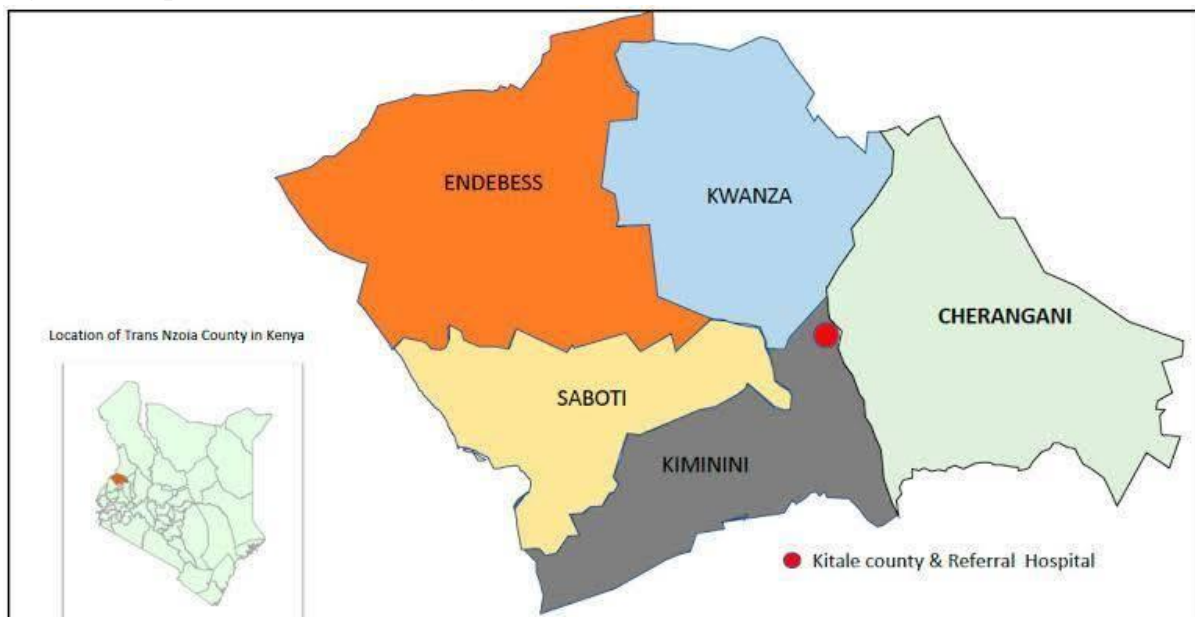
Naisiano et al. (2020) sought to establish how the availability of instructional resources affects students' academic achievement in Gilgil, Kenya.

The study showed that lack of access to teaching and learning resources had a significant negative effect on students' academic achievement. Naisiano et al. (2020) also established that access to teaching materials was very important in determining students' learning outcomes.

RESEARCH METHODOLOGY

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 kilometres (Km²). Trans-Nzoia County 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 Northwest. *Figure 1* presents the Map of Trans Nzoia County.

Figure 1: Map of Trans -Nzoia County



Source: Trans-Nzoia County Integrated Development Program

The study adopted a correlational research design. A correlational research design investigates relationships between variables without the researcher controlling or manipulating any of them. This design was appropriate since it could establish the strength and/or direction of the

relationship between the variables of interest. The target population was 24 public secondary schools, 24 Physics teachers, 24 laboratory technicians and 24 library assistants, and 5460 form three students in Trans Nzoia County. A simple random sampling technique was used to

pick the schools and respondents that participated in the study. The respondents included 268 students, 24 teachers and 24 library assistants.

Questionnaires and document analysis schedules were used for data collection. Before the actual study, piloting of the research instruments was conducted in two secondary schools in Uasin Gishu County involving 45 respondents; 2 Physics teachers, 38 students, 2 library assistants and 2 laboratory technicians. The questionnaires were used to collect data regarding the size of the library (How many students would sit in the library at once, the number of times students visited the library in a week, the number of Physics reference books available in the library, number of hours in a week student allocated for private study, whether student found going to the library was helpful and whether student enjoyed going to the library to study physics subject.

Validity of the instruments was carried out by Experts in the Department of Educational Planning and Management at Kibabii University. The reliability of the instruments was ascertained by the test-retest technique. The test-retest of the questionnaires yielded a Cronbach's alpha coefficient of 0.784 and was considered

appropriate for the collection of data during the actual study.

Quantitative data obtained was analysed using Statistical Package for Social Sciences (SPSS). The SPSS was used to generate a data array that was used for subsequent analysis of the data. Both descriptive and inferential statistics were used to analyse quantitative data. Descriptive statistics was used to summarise data in the form of charts, tables, and graphs. Inferential statistics were used to test for the relationship between the dependent and independent variables.

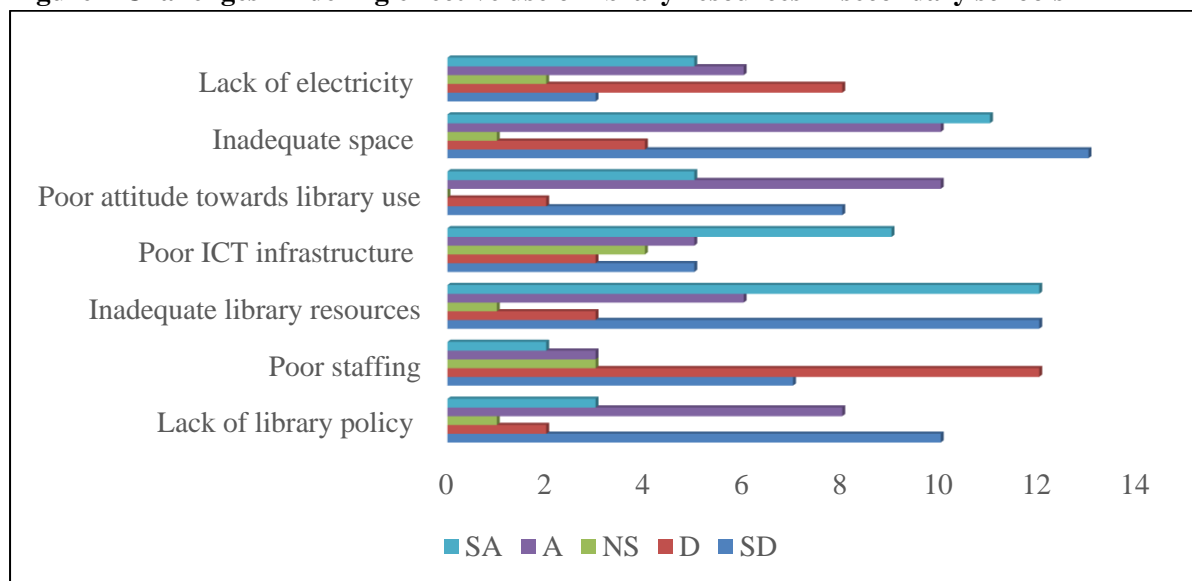
RESULTS AND DISCUSSIONS

This section presents the results and discussions on the challenges hindering the effective use of library resources as well as the effect of management of library resources on students' academic achievement in Physics at the KCSE examination in Transzoia County, Kenya.

Challenges Hindering Effective Use of Library Resources

The first objective sought to establish challenges that hinder the effective use of library resources in Secondary schools in Trans Nzoia County. The findings are shown in *Figure 2*.

Figure 2 Challenges hindering effective use of library resources in secondary schools



The study sought to establish the challenges hindering the effective use of library resources in secondary schools in Trans Nzoia County. Data

collected from school librarians as key respondents and analysed are presented in *Figure 2*. The findings revealed that the majority of the

librarians who were the key respondents under the first objective reported inadequate library space, inadequate library resources, and lack of library policy were the major challenges hindering the effective use of libraries in secondary schools. Other major challenges included a lack of electricity and poor ICT infrastructure.

Management of School Library Resources and Academic Achievement in Physics

Differences in the Performance of Boys' and Girls' Schools

Table 1 shows the variables that were used to address the second objective.

Table 1: Description of the independent variables used in the second objective

Var.	Variable label	Measure
Var4a	How many students can sit in the school library at ago	Scale
Var4b	The number of times students went to the school library in the past week to study Physics without the assistance of a school librarian assistant.	Scale
Var4c	The number of times students went to the school library in the past week to study Physics with the assistance of a school librarian.	Scale
Var4d	Number of hours in a week student allocated for Physics private study	Scale
Var4e	How many different Physics textbooks students were able to find in your school library	Scale
Var4f	Number of Physics reference books student was able to find in your school library.	Scale
Var4g	I go to the library only if I have to	Scale
Var4h	Going to the library is my favourite hobby	Scale
Var4i	I find it easy to go to the library	Scale
Var4j	For me, going to the library is quite helpful	Scale
Var4k	I enjoy going to the school library	Scale

Note: Var=Variable

Source: Researcher (2022)

Table 1 depicts the description of the eleven variables used to answer the second objective of the study. The eleven variables were measured on an interval scale. The data on the variables were analysed and presented in tables and figures.

Table 2 presents a summary statistic for students' academic achievement in Physics denoted as Phy Avg. Data relating to school mean scores in Physics was collected through document analysis schedules, particularly the analysed school mean scores for Physics from 2017-2021.

Table 2: Descriptive statistics for the School Mean in Physics (2017-2021)

Variable	Range	Min	Max	Mean	Std. Error	Std. Dev.
Phy_Avg	6.2	2.06	8.26	4.3589	0.35105	1.71981

Note. Phy_Avg=School Mean in Physics 2017-2021, Min=Minimum, Max= Maximum, Std. Note: Error=Standard Error of the Mean, Std. Dev. Standard Deviation

Source: Field Data (2022)

Table 2 shows that for the period 2017-2021, the 24 schools that participated in the study had an overall Mean (Phy_Avg) =4.3589, Std. Error, 0.35105. In the KCSE Examinations, Physics has a maximum of 12 points. With the Mean being 4.3589, the results suggest that students' academic achievement in Physics for the 24 schools for 2017-2021 was below average.

An independent samples t-test was computed to compare the performance of students in Physics at the KCSE Examination across boys' and girls' schools for the period 2017-2021. Table 3 shows the group statistics.

Table 3: Group statistics for students' performance in boys' and girls' schools

	Category	Obs.	Mean	Std. Dev.	Std. Error
Overall Mean (Phy_Avg)	Boys Only	89	5.4412	1.42333	0.15087
	Girls Only	70	5.162	1.50802	0.18024

Note: Obs=Observations (Sample), Std. Dev=Standard Deviation, Std. Error=Standard Error Mean

Source: Field Data (2022)

The results of the analysed data portrayed in *Table 3* suggest that the performance of boys' schools in Physics at the KCSE Examination in Tran-Nzoia schools was higher than that of girls; the mean difference was 0.28. Boys' schools had achieved a Mean Score of 5.441, with Std, Dev = 5.4412, while girls had a Mean Score of 5.162, Std. Dev= 5.162. An independent samples t-test was computed to establish whether there was a statically significant difference in the performance of boys' schools and that of girls.

The hypothesis being tested was;

H_0 =There is no statically significant difference in the performance of boys' schools and that of girls' schools in Physics at the KCSE Examination in Trans-Nzoia County schools.

Levene's test was not statistically significant ($F=2.057$, $p>0.04$), displaying homogeneity of the variance on the dependent variable (Phy_Avg). With equal variances assumed, $t = 1.196$ and $p>0.05$, the study rejected the null hypothesis and therefore concluded that there was a statically significant difference in the performance of boys' schools and that of girls' schools with boys exhibiting better performance. Boys' schools had reported a Mean Score of 5.442 ± 1.4233 while girls had a Mean Score of 5.162 ± 1.50802 .

The Utilisation of Library Resources and Academic Performance

Whilst this study is useful and justifies the need to pay attention to female students and provide them with support to enhance their performance in Physics and science-related subjects, there is a need to explore how library resources can be utilised to offer support to students to improve their performance. Taking cognisance of this gap, the study used the Pearson correlation coefficient to determine whether there was any statistically significant relationship between the management

of library resources and students' academic achievement in Physics at KCSE in Trans Nzoia County. The results are presented in *Table 4*.

The findings presented in *Table 4* show that, on average, schools that participated in the study had a library sitting capacity of 71 students (Mean =70.15, SD=48.60). The results suggest that there was a strong positive relationship between variable 4a (Number of students who can sit in the school library at ago) and students' academic achievement in Physics at KCSE examinations ($r = 0.866$, $p=0.05$). These findings suggest that having a larger sitting capacity in the school library is associated with better academic performance among students.

The findings of the study are supported by previous studies whose findings indicated a significant remarkable relationship between library usage and students' academic performance (Alhabi and Middleton, 2012; Bimenyimana, 2021). However, the findings departed from Sterner (2021), who found that the number of library visits and library space satisfaction was negatively associated with the student's examination performance.

Table 4: Means, standard deviations and correlations for variables in the second objective

Var	M	SD	Phy_Avg	var4a	var4b	var4c	var4d	var4e	var4f	var4g
Phy_Avg	4.333	1.681	1							
var4a	70.15	48.60	.886*	1						
			0.034							
var4b	2.08	1.183	.549*	.539**	1					
			0.012	0.000						
var4c	2.76	1.157	.342*	.317*	.622**	1				
			0.053	0.024	0.00					
var4d	3.02	1.991	.755*	-.748**	-.484*	-.272**	1			
			0.022	0.000	0.000	0.126				
var4e	1.62	1.276	.620*	.515**	.424**	.291**	-.427**	1		
			0.000	0.340	0.000	0.023	0.349			
var4f	2.85	1.168	.407*	-.446**	-.276**	-.133*	.281**	-.241**	1	
			0.058	0.017	0.025	0.031	0.002	0.230		
var4g	2.96	1.252	-0.113**	-.141*	-0.099	-0.047	.125*	-0.019	.395**	1
			0.011	0.021	0.106	0.445	0.041	0.756	0.054	
var4h	3.11	1.105	0.109	-0.117	-0.067	-0.027	0.069	-0.096	.323**	0.095
			0.075	0.056	0.276	0.658	0.261	0.118	0.043	0.121
var4i	2.82	1.171	.396*	-.441**	-.257**	-.139*	.316**	-.242**	.772**	.291**
			0.000	0.000	0.000	0.023	0.000	0.000	0.000	0.087
var4j	2.87	1.152	.181**	-.209**	-0.05	-0.077	0.066	-0.072	.684**	.297**
			0.003	0.001	0.413	0.211	0.279	0.241	0.00	0.020
var4k	2.99	1.227	.134**	-.168**	-0.09	0.022	.130*	-0.032	.385**	.770**
			0.058	0.006	0.144	0.721	0.033	0.599	0.001	0.203

Note: ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). 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 4* suggested a fairly moderate positive correlation between the number of times a student went to the school library in the past week to study Physics without the assistance of the librarian (Var1 4b) and student academic achievement at KCSE Examination ($r= 0.549, p<0.05$). Otherwise, there was a weak correlation between those who were assisted by the librarian (Var4c) and students' academic achievement at KCSE examinations in Physics ($r= 0.342, p<0.05$). From the findings presented in *Table 4*, it was deduced that students who accessed the school library to study Physics without the assistance of the librarian tended to perform better than those who were assisted by the librarian. However, this finding was unexpected since one would ordinarily have expected that assistance from the school librarian was expected to improve the students' library usage.

As shown in *Table 4*, there was a statistically significant positive relationship between variable 4d (number of hours in a week student allocated for Physics private study) and students' academic achievement at KCSE examinations in Physics ($r=0.755, p<0.05$). It was inferred that the number of hours a student allocated in a week for Physics private study had a positive relationship with academic performance at KCSE examinations. Meanwhile, the study found a moderate positive relationship between variable 4f (Number of Physics reference books a student was able to find in the library) and students' academic performance at KCSE examinations in Physics ($r=0.407, p<0.05$). This was interpreted to mean the availability of a variety of Physics reference books improved students' academic achievement at KCSE examinations in Physics.

The study further established that variable 4i (I find it easy to go to the library) had a moderate positive relationship with students' academic achievement at KCSE examinations in Physics ($r=0.396, p<0.05$). This meant that students who found it easy to go to the library tended to perform better than their counterparts who found difficulty accessing the library. In addition, both variables

4j ((For me going to the library is quite helpful) and 4k (I enjoy going to the library) had a positive relationship with students' academic achievement at KCSE in Physics examinations. However, the relationship was weak ($r=0.181, p=0.001$) and ($r=0.134, p=0.001$) respectively. These findings agree with Okpa et al. (2022), whose findings revealed that positive reading habits correlated positively with test scores.

On the effects of management of school library resources on students' academic achievement in Physics at KCSE Examination of 2017-2021. The study tested the null hypothesis stating;

H_0 : Management of school library resources has no statistically significant effect on Students' academic achievement in Physics at KCSE Examination in Trans-Nzoia County.

The multiple linear regression (MLR) model was then used to establish the effects of the independent variables on the outcome variable. The results of the MLR model are presented in *Table 5*.

According to the MLR results displayed in *Table 5*, the number of students who can sit in the school library at once (var4a) had a statistically significant effect on students' academic performance at KCSE examinations ($\beta=0.616, p<0.05$). This meant that as the number of students who could sit in the library increased by one unit, students' academic performance tended to improve by an index of 0.616. These findings agree with Onuoha (2021), who found that library capacity had a positive effect on student's academic achievement.

Table 5: Multiple linear regression model for the effect of management of school library resources on students' academic achievement in Physics

Variable	Coefficient	Std. Error	t-Statistic	Prob
Constant (α)	2.807	0.267	10.513	0.000
Var4a	0.616	0.001	14.298	0.000
Var4b	0.029	0.052	0.788	0.431
Var4c	0.017	0.047	0.524	0.600
Var4d	-0.019	0.032	-4.954	0.001
Var4e	0.203	0.039	6.808	0.000
Var4g	0.012	0.036	0.459	0.646
Var4i	0.003	0.045	0.101	0.919
Var4j	0.027	0.042	0.946	0.345
R-Squared	0.839	Mean Dep. Var	4.3339	
Adjusted R-Squared	0.834	S.D Dep. Var	1.6814	
S.E of Regression	0.6845	F. Statistic	169.042	
Sum Squared Resid.	121.364	Prob (F. Statistic)	0.0000	
Durbin Watson Stat	0.762			

Note: 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 study found that the number of students who went to the school library in the past week to study Physics without the assistance of the librarian had a positive effect on students' academic performance. However, the effect was not statistically significant ($\beta=0.029$, $p<0.431$). In addition, 4d (Number of hours allocated for Physics private study) had a negative effect on students' academic achievement ($\beta=-0.019$, $p=0.001$). As for variable 4e (The number of different Physics textbooks a student was able to access in the school library), there was a positive effect on students' academic performance ($\beta=0.203$, $p<0.05$). Therefore, there was evidence to suggest that a greater number of different Physics textbooks was associated with improved students' academic performance. This is confirmed by the findings of Rodrigues & Mandrekar (2020). who revealed a positive correlation between the availability and usage of a variety of library resources and students' academic performance.

Other variables that had no statistically significant effects were variables 4i (I find it easy to go to the library) and 4j (For me going to the library is quite helpful) [$\beta=0.003$, $p<0.919$) and ($\beta=0.027$, $p<0.345$)] respectively.

CONCLUSION

Based on the findings of the study, it was concluded that library resources play an important role in enhancing students' academic achievement. Library resources were found to positively predict students' academic achievement in Physics at the KCSE examination. These findings gave the impression that the management of library resources influenced students' academic achievement in Physics at KCSE. Therefore, there is a need to ensure that school library resources are managed well under and that students had access to the library resources.

Recommendations

From the foregoing conclusion, the study recommended that school boards of management and other stakeholders should focus on improving the management of library resources for enhanced students' academic achievement in Physics at KCSE examination.

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