

African Journal of Education and Practice (AJEP)

**Influence of Teaching and Learning Resources on Quality Education in Public Primary
Schools in Machakos County, Kenya**

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Article History

Received 11th August 2026

Received in Revised Form 15th September 2026

Accepted 12th October 2026



How to cite in APA format:

Mutie, J., Kahigi, C., Ngesu, L., & Muriuki, E. (2026). Influence of Teaching and Learning Resources on Quality Education in Public Primary Schools in Machakos County, Kenya. *African Journal of Education and Practice*, 12(5), 1–13. <https://doi.org/10.47604/ajep.4007>

Abstract

Purpose: The purpose of this study was to examine the influence of teaching and learning resources on quality education in public primary schools in Machakos County, Kenya.

Methodology: The study adopted a descriptive research design that combined quantitative and qualitative approaches. The target population comprised 403 head teachers, 2,015 Standard Eight teachers and 756 Standard Eight pupils in rural public primary schools ($N = 3,174$). A sample of 343 respondents was determined using the Krejcie and Morgan formula and selected through purposive and simple random sampling. Data were collected using structured questionnaires administered to teachers who taught Standard Eight, Focus Group Discussions (FGDs) with Standard Eight pupils, and document analysis of school records provided by head teachers. Quantitative data were analyzed in SPSS version 26.0 using descriptive statistics, Pearson's correlation and simple linear regression, while qualitative data were analyzed thematically.

Findings: The findings revealed that teachers disagreed that teaching and learning resources were adequate (overall mean = 2.31), with digital learning resources (mean = 1.66) and classrooms and laboratories (mean = 1.92) rated lowest. Pupils' accounts and school records corroborated these shortages. Teaching and learning resources had a strong, positive and statistically significant relationship with quality education ($r = .858$, $p < .05$) and explained 73.7% of its variation ($R^2 = .737$; $\beta = 45.526$, $p < .05$).

Unique Contribution to Theory, Practice and Policy:

The study provides empirical support for the education production function in rural Kenyan primary schools. For policy, it recommends targeted and equitable resource allocation, especially for digital resources, classrooms, textbooks, sanitation facilities and staffing. For practice, it recommends that teachers move beyond sole reliance on textbooks and incorporate a variety of instructional materials such as visual aids, manipulatives, locally available resources and digital content to address diverse learning styles and improve learning outcomes.

Keywords: *Teaching and Learning Resources, Quality Education, Public Primary Schools, Machakos County*

JEL Classification Codes: I21, I22, I28

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INTRODUCTION

Quality education has been a central global agenda since the UNESCO Dakar Framework for Action (UNESCO, 2000) affirmed it as a fundamental right of every child. Sustainable Development Goal 4 (SDG 4) later shifted the focus from access under the Education for All (EFA) initiative to inclusive and equitable quality education that ensures meaningful learning outcomes for all. However, increased enrolment alone does not guarantee improved learning outcomes (Ferguson, 2017). Attention has therefore turned to structural inputs, such as textbooks, teaching aids, classroom facilities, furniture, technological tools and adequate staffing, as determinants of learning outcomes. Lyons (2012) notes that schools endowed with sufficient instructional materials, facilities and learning tools tend to perform better than those with limited resources, because adequate resources improve comprehension, engagement and retention, while inadequate resources constrain instruction and reduce learner motivation. Schinder (2013) similarly observes that, even in developed countries, available data on efforts to address the challenges affecting quality education in state schools remain inconclusive.

The gap between structural inputs and learning outcomes is wider in developing regions. The Global Partnership for Education (2013) reported that approximately 250 million children in developing countries either drop out of school or fail to acquire basic literacy and numeracy skills by Grade Four, despite the presence of teachers in schools. Similarly, the World Bank (2016) Africa Learning Barometer revealed that children in Sub-Saharan Africa have only a 10 percent chance of completing the primary learning cycle with the requisite competencies. Although reforms in basic education, such as improving teachers' competencies and expanding access to instructional materials, have brought modest progress, concerns about learning outcomes persist. For teaching and learning to be effective, resources must be not only available but also adequate, relevant and properly utilized (Lyons, 2012).

Kenya illustrates this enrolment-versus-retention paradox. Increased funding, infrastructure development and policy reforms, including Free Primary Education (FPE), have expanded access: the Gross Enrolment Rate (GER) in public primary schools rose from 106.4 percent in 2017 to 111.2 percent in 2019, and the Net Enrolment Rate (NER) rose from 81.0 percent to 87.2 percent. Over the same period, however, completion rates declined from 78 percent to 71 percent. This indicates persistent challenges of retention and quality, as evidenced by high dropout rates and inconsistent academic performance, with disparities in educational inputs most evident in rural public primary schools.

Previous studies have highlighted the importance of instructional inputs. Fayemi (2011) and Abe (2014) emphasize that, regardless of funding levels, school environment or curriculum content, the role of teaching and learning resources in promoting effective instruction cannot be overstated. In Machakos County, Muli (2015) established that a relationship exists between teaching and learning resources and the quality of education, although the available evidence remains limited. Kieti (2017) further asserts that failure to evaluate and strengthen educational inputs in Machakos County may compromise children's right to quality education. Against this backdrop, the present study examined the influence of teaching and learning resources on quality education in public primary schools in Machakos County, Kenya, focusing on the adequacy and utilization of instructional resources.

Rationale of the Study

The study responds to a practical and policy need. Although the Government and its partners continue to supply resources to public primary schools, it remains unclear whether these

resources are sufficient, equitably distributed and effectively used, particularly in rural parts of Machakos County, a county with both rural and peri-urban settings. Schools operate under similar policy frameworks, yet differ in instructional materials, infrastructure and learning facilities. Evidence on how far these resources shape educational quality will inform resource allocation, planning and monitoring by policymakers, school administrators and education stakeholders, and will support evidence-based interventions towards SDG 4.

Objective of the Study

The main objective of the study was to examine the influence of teaching and learning resources on quality education in public primary schools in Machakos County, Kenya. The study tested the following null hypothesis:

H01: There is no significant relationship between teaching and learning resources and quality education in public primary schools in Machakos County, Kenya.

Theoretical Framework

The study was guided by the education production function theory (Hanushek, 1979, 1986). The theory views the school as a production process in which inputs, such as textbooks, facilities, teachers and other school resources, are combined with learner and family characteristics to produce outputs, such as academic achievement and retention. In this study, teaching and learning resources (physical facilities, furniture, instructional materials, digital resources and human resources) represent the school inputs, while quality education, measured through learners' academic performance, retention and other learning outcomes, represents the output. Regressing quality education on teaching and learning resources therefore operationalizes the production function. Hanushek's (1986) review found that the relationship between school expenditure and learner performance was not consistently strong, which suggests that the benefit of inputs depends on their adequacy and effective use. This is the reason the present study focuses on both the adequacy and the utilization of resources.

Empirical Review and Research Gap

Studies on teaching and learning resources and learner outcomes have been conducted at different education levels and in different locations. In Kenya, several have focused on secondary schools, including Akungu (2014) in Embakasi District, Mugambi (2016) in Meru South District, Okoth and Onono-Okello (2020) in Kuria West Sub-County and Kieti (2017) in Matungulu Sub-County, Machakos County. Others have focused on preschools, for example Ogata (2012) in Borabu District and Okongo et al. (2015) in Nyamira North Sub-County. Studies of primary schools have largely been located in other counties, such as Ndirangu (2015) in Nyandarua County, Kimondo (2013) in Laikipia North District and Murunga (2017) in Kiminini Sub-County, Trans-Nzoia County, or have taken a national perspective (Njoroge et al., 2020; Orodho, 2014). Beyond Kenya, Modi (2013) studied secondary schools in South Sudan, Owoeye (2011) studied secondary schools in Ekiti State, Nigeria, and Bennell et al. (2013) synthesized evidence from Sub-Saharan Africa. In Machakos County, Wambua (2019) examined the effect of teaching and learning resources on student performance in public schools, and Muli (2015) reported a relationship between resources and quality of education.

Two gaps emerge from this body of work. First, to the best of the authors' knowledge, little evidence exists on the combined influence of the different dimensions of teaching and learning resources on quality education in rural public primary schools in Machakos County. Second, few of the studies reviewed triangulate teachers' ratings, pupils' views from FGDs and head teachers' school records to establish the adequacy of resources, and then quantify the

relationship between resources and quality education using correlation and regression analysis. This study addresses these gaps and tests the null hypothesis stated above.

METHODOLOGY

Research Design

The study adopted a descriptive research design, using both qualitative and quantitative approaches. According to Kerlinger (2013), descriptive research allows researchers to collect, summarize and interpret information in order to understand relationships between variables. The independent variable was the adequacy and use of teaching and learning resources (textbooks, teaching aids, classroom facilities, furniture, and digital or locally available materials). The dependent variable was quality of education, measured through learners' academic performance, retention rates and other indicators of learning outcomes.

Target Population

According to the Ministry of Education (MOE, 2019), Machakos County has eight sub-counties and 909 public primary schools, of which 403 are located in rural areas. The target population comprised 403 head teachers, 2,015 Standard Eight teachers and 756 Standard Eight pupils, a total of 3,174 individuals.

Sample Size and Sampling Techniques

The sample size was determined using the Krejcie and Morgan (1970) formula:

$$n = \chi^2 NP(1 - P) / [d^2(N - 1) + \chi^2 P(1 - P)]$$

where n is the required sample size; χ^2 is the chi-square value for one degree of freedom at the 95% confidence level (3.841); N is the population size (3,174); P is the population proportion (assumed to be 0.50, which yields the maximum sample size); and d is the degree of accuracy (0.05). Substituting these values gives $n = (3.841 \times 3,174 \times 0.25) / (0.0025 \times 3,173 + 3.841 \times 0.25) = 3,047.8 / 8.89 \approx 343$ respondents. The sample was distributed proportionately across the three sub-categories of the population, as shown in Table 1. Purposive sampling was used to select head teachers and teachers as key informants, and simple random sampling was used to select pupils to ensure fair representation.

Table 1: Target Population, Sampling Technique and Sample Size by Category

Category	Population (N)	Sampling technique	Sample (n)	Sampling fraction (%)
Head teachers	403	Purposive	43	10.7
Standard Eight teachers	2,015	Purposive	218	10.8
Standard Eight pupils	756	Simple random	82	10.8
Total	3,174		343	10.8

Note. Sample sizes were allocated in proportion to each category's share of the target population ($n_i = (N_i / N) \times n$) and rounded using the largest-remainder method so that the total equals 343.

Data Collection Instruments

Data were collected using questionnaires, interviews, FGDs, observation schedules and school records. Teachers who taught Standard Eight completed the questionnaires, FGDs were held with Standard Eight pupils, and head teachers provided school records for document analysis.

Data Analysis and Presentation

Quantitative data were screened, coded and entered into SPSS version 26.0. Descriptive statistics (frequencies, percentages, means and standard deviations) were computed to summarize responses to the five-point Likert-scale items (1 = strongly disagree to 5 = strongly agree). The strength and direction of the association between teaching and learning resources and quality education were assessed using Pearson's product-moment correlation coefficient. The relationship was then estimated using a simple linear regression model specified as $QE_i = \beta_0 + \beta_1 TLR_i + \varepsilon_i$, where QE is the quality education index, TLR is the teaching and learning resources index, β_0 is the intercept, β_1 is the slope coefficient and ε is the stochastic error term. The model was estimated using ordinary least squares. The coefficient of determination (R^2) was used to assess the explanatory power of the model, the F-test in the analysis of variance (ANOVA) to assess its overall significance, and the t-test to assess the significance of β_1 . The null hypothesis was rejected where $p < 0.05$. Qualitative data from FGDs and document analysis were analyzed thematically and presented narratively with verbatim quotations. The findings are presented in tables and narrative form.

The findings from the descriptive, correlation and regression analyses were used to draw conclusions on the influence of teaching and learning resources on quality education, and the study provides recommendations on improving the availability, adequacy and effective use of instructional materials in public primary schools in Machakos County.

RESULTS

Teaching and Learning Resources and Quality Education

The study also established the influence of teaching and learning resources on quality education in public primary schools in Machakos County, Kenya. Teachers who taught standard eight pupils were presented with a series of questions regarding teaching and learning resources. This particular economic aspect was also discussed during FGDs of standard eight pupils. In order to establish the influence of teaching and learning resources on quality education, a descriptive analysis of the responses was conducted, followed by a correlation and regression analysis.

Descriptive analysis of teaching and learning resources

The teachers were asked to give an assessment of the state of teaching and learning resources within their respective schools by rating their levels of agreement or disagreement to a series of statements. The findings as presented in Table 1 revealed that on average, the teachers disagreed on the availability of sufficient classrooms and laboratories given (Mean=1.92, SD=0.906) and adequacy of text and exercise books for the students as supported by (Mean=2.29, SD=0.997). Further, on average, the teachers also disagreed with statements regarding the availability of adequate reference materials for all subjects (Mean=2.41, SD=0.937), adequacy of digital learning resources (Mean=1.66, SD=0.810) and adequacy of furniture given (Mean=2.21, SD=0.849). However, on average, the teachers held neutral views on whether the playgrounds in the schools were adequate given (Mean=2.81, SD=1.212) and whether the teacher learner ratio is sufficient as supported by (Mean=2.68, SD=1.049). Further, the teachers on average disagreed with statements that the toilets in their schools are adequate (Mean=2.47, SD=0.951) and whether there were adequate support staff in the schools as supported by (Mean=2.37, SD=0.928). The study found out that the highest mean of responses was associated with the statement "The playgrounds in the schools were adequate" (Mean=2.81, SD=1.212) while the lowest mean was attached to the statement "Adequacy of digital learning resources" (Mean=1.66, SD=0.810).

These findings implied that there was dire need of provision of more teaching and learning resources which had negatively impacted on quality education in the public primary schools in Machakos County, Kenya. According to Modi (2013), sufficiency of educational materials such as textbooks which is the main instruction material is the most cost-effective input affecting quality education. Modi further stated that for effective teaching and learning, material resources are basic tools, hence their absence or inadequacy makes teachers handle subjects in a theoretical approach, portraying it as dry and non-exciting.

Table 2: Descriptive Analysis of Teaching and Learning Resources

Teaching and learning Resources	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std Dvn.
The school has sufficient classrooms and laboratories	35.80%	44.20%	13.50%	5.10%	1.40%	1.92	0.906
Pupils have adequate textbooks and exercise books	21.40%	44.70%	18.10%	14.90%	0.90%	2.29	0.997
All teachers have adequate reference materials for all subjects	14.90%	43.30%	30.70%	8.40%	2.80%	2.41	0.937
In the school there are adequate digital learning resources	51.60%	34.90%	10.20%	2.80%	0.50%	1.66	0.810
There is adequate furniture in the school	18.60%	49.80%	23.70%	7.40%	0.50%	2.21	0.849
The playground in the school is adequate	11.60%	36.30%	24.20%	14.90%	13.00%	2.81	1.212
There are adequate toilets in the school	13.00%	44.70%	25.60%	15.30%	1.40%	2.47	0.951
Teacher learner ratio in the school is sufficient	16.80%	24.30%	33.60%	24.30%	0.90%	2.68	1.049
There are enough support staff in the school	15.30%	46.50%	25.10%	11.60%	1.40%	2.37	0.928
Average						2.313	0.960

Standard Eight Pupil's Views on Teaching and Learning Resources

During FGDs, standard eight pupils were asked to comment on the state and availability of teaching and learning resources. The pupils remarked that the school did not provide sufficient learning materials such as exercise books and textbooks. It emerged that parents had to purchase both text and exercise books to replenish what the school provided or otherwise textbooks would be shared and some pupils would be forced to use one exercise book for

writing lesson notes for various subjects. Mostly, the textbooks were shared and on average, the pupils remarked that about three of them shared one textbook during lesson times. The pupils unanimously agreed that desks and tables were sufficiently provided however, the toilets were few and that there was need to have additional toilets in the schools. In some cases, the classrooms were not sufficient and the pupils were made to study under shades of trees or makeshift tents. Unanimously, the pupils agreed that computer laboratories in their schools were inadequate and under equipped with necessary crucial digital learning materials and that some of them had even been converted into classes, therefore not serving their intended purpose. From the FGDs it also emerged that subordinate staff such as cooks and grounds men were insufficiently available and that the available ones were over utilized.

Some of the comments given during the FGDs are as outlined;

“The school only provide a few text and exercise books; our parents have to buy additional books or else we will have to share textbooks or write different lesson notes on one exercise book” Pupil I

“Sharing textbooks is the routine, we are usually crowded around one book and some pupils feel frustrated and stop concentrating on what is being taught.” Pupil II

“The toilets in our school are old, few and dirty. Boys should not share toilets with girls. I wish more could be provided. If possible, we would be happy if the additional toilets could be made for a specific class” Pupil III

“My schools do not have enough classrooms; sometimes we have lessons under trees. This really disturbs us.” Pupil IV

“Sometimes we use tents in the place of classes; we request for more classes in our school so that we can have a better learning environment.” Pupil V

“In my school we do not have computer laboratory and computers. But we hear other schools have.” Pupil VI

“We have computer laboratories but most of the computers are broken and outdated.” Pupil VI

“The available support staffs are not enough. Regularly, girls are requested to cook for teacher’s lunch. Other times the grounds men act as cooks.” Pupil VIII

These findings imply that infrastructure in the area of study posed a challenge towards learning of the pupils. According to Ndirangu (2015) learning experiences are fruitful when there are adequate quantity and quality of physical resources; and that unattractive school buildings, crowded classrooms, non-availability of playing ground and surroundings that have no aesthetic beauty can lead to a low quality of education. Findings of Guloba et al. (2016) confirm that the physical conditions and organization of schools may lead or fail to lead to a construction of a culture of success.

Head Teachers’ Comments on Teaching and Learning Resources

From the data provided by the head teachers, it was clear that the teacher learner ratio was a desirable one. On average, the ratio was 1:45. This implied that there was need for more teachers in the study area. On average, the head teachers reported that 1 toilet was shared by several classes in most of the sampled schools in the study area. This had an implication that there was need to have additional toilets for the pupils.

Regarding availability of furniture, on average, there were 21 desks against 63 standards eight

pupils and one table per class. From the above finding, there was a need to provide sufficient furniture in order to relieve the pressure on the available furniture. This was emphasized by MOEST (2015) who explained the importance of ensuring that there are adequate and appropriate facilities for teaching and learning so that educational programmes could be implemented effectively. Moreover, the findings were similar to those of Kimondo (2013) who found that more than 60% of all schools in Africa lack sufficient sanitation facilities. The World Health Organization (WHO, 2005) adds that even in schools with facilities, unhygienic sanitation derails the ability of students to concentrate and learn. Further, the findings implied that there was need for more teachers and support staff since this is a metric that affects teaching and learning. Waita (2012), found out that in a school setting, human resources consist of teachers and support staffs who engage in the process of teaching and learning hence their adequacy or inadequacy affects performance of the learners to a great extent.

Correlation between Teaching and Learning Resources and Quality Education

Correlation analysis was carried out in order to establish the relationship between teaching and learning resources and quality education in public primary schools in Machakos County, Kenya. The findings outlined in Table 2 show that there was a very strong, positive and significant correlation between teaching and learning resources and quality education in public primary schools in Machakos County, Kenya ($r=0.858$, $p=0.000$, $p<0.05$). The findings implied that teaching and learning resources and quality education in these schools were significantly associated and hence changed in the same direction. The findings were in agreement with that of Lyons (2012) who found out that learning is a complicated engagement that involves interplay of students' motivation, teaching resources, physical facilities, and skills of teaching and curriculum demands. Status of teaching and learning resources therefore impacts on the effectiveness of schools as they are the basic inputs that bring about good academic performance among the pupils.

Table 1: Correlation between teaching and learning resources and quality education

		Teaching and learning resources	Quality of education
Teaching and learning resources	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	215	
Quality of education	Pearson Correlation	.858**	1
	Sig. (2-tailed)	.000	
	N	214	214

** . Correlation is significant at the 0.01 level (2-tailed).

Regression Analysis between Teaching and Learning Resources and Quality Education

The study carried out bivariate regression analysis to show the relationship between teaching and learning resources and quality education in public primary schools in Machakos County, Kenya. The main aim was to quantify the influence of teaching and learning resources on quality education. The following hypothesis was therefore tested:

H01: There is no significant relationship between teaching and learning resources and quality education in public primary schools in Machakos County, Kenya.

Model Summary

Table 3 outlines the model summary results for the influence of teaching and learning resources

on quality education. The findings revealed that teaching and learning resources explained a significant proportion on quality education in public primary schools in Machakos County, Kenya. The coefficient of determination (R-Square) was $R^2 = 0.737$ which meant that 73.7% of the changes in quality education in public primary schools in Machakos County, Kenya could be attributed to changes in teaching and learning resources. The rest of the changes, 26.3%, were attributable to other factors not considered in this model. The findings implied that teaching and learning resources was a satisfactory predictor in explaining the quality of education in public primary schools in Machakos County, Kenya.

Table 2: Model summary for the Effect of Teaching and Learning Resources on Quality Education

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.858 ^a	.737	.735	15.596

a. Predictors: (Constant), Teaching and learning resources

Analysis of Variance

The study carried out ANOVA test to determine the fitness of the model for the relationship between teaching and learning resources and quality education in public primary schools in Machakos County, Kenya. The findings as displayed in Table 4 showed that the model used in showing the link between teaching and learning resources and quality education in public primary schools in Machakos County, Kenya was significant given $F(1, 212) = 592.990$, $p = .000 < 0.05$. The findings also implied that teaching and learning resources were satisfactory predictors of quality education in Machakos County, Kenya.

Table 3: Analysis of Variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	144230.535	1	144230.535	592.990	.000 ^b
	Residual	51563.858	212	243.226		
	Total	195794.393	213			

b. Predictors: (Constant), Teaching and learning resources

The findings implied that teaching and learning resources was a reliable variable of quality education in public primary schools in Machakos County, Kenya.

Regression Coefficient for Teaching and Learning Resources

The regression output as presented in the Table 5 below helped the researcher in determining the extent to which teaching and learning resources influence quality education outcomes in public primary schools in the area of study. The findings revealed that teaching and learning resources had a significant positive effect on quality education outcomes given ($\beta = 45.526$, $t = 24.351$, $p = .000$) since $p < 0.05$. The findings implied that a unit increase on teaching and learning resources would increase school performance by 45.526 units holding all the other factors constant.

These results led to the rejection of the null hypothesis and hence the conclusion that teaching and learning resources had a significant influence on quality education outcomes in public primary schools in Machakos County, Kenya.

The following linear regression model was therefore fitted;

$$\text{Quality education} = 132.772 + 45.526 \text{ Teaching and learning resources}$$

Table 4: Regression Coefficient for teaching and learning resources

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	132.772	4.463		29.747	.000
	Teaching and learning resources	45.526	1.870	.858	24.351	.000

Conclusion

The study concludes that teaching and learning resources in the sampled public primary schools in Machakos County are inadequate. Teachers disagreed that classrooms and laboratories, textbooks and exercise books, reference materials, digital learning resources, furniture, toilets and support staff were adequate (overall mean = 2.31), and held neutral views only on playgrounds and the teacher–learner ratio. Digital learning resources were rated lowest. Pupils' accounts in the FGDs (for example, textbook sharing and lessons held under trees or in tents) and head teachers' records (for example, a teacher–learner ratio of 1:45 and one toilet shared by several classes) corroborated these shortages.

The study further concludes that teaching and learning resources have a strong, positive and statistically significant relationship with quality education ($r = .858$, $p < .05$). Resources explained 73.7% of the variation in quality education ($R^2 = .737$), and the model was significant, $F(1, 212) = 592.990$, $p < .05$. The null hypothesis was therefore rejected. The findings indicate that adequate teaching and learning resources are a key determinant of educational quality in public primary schools in the county, although, as the design was cross-sectional, they establish a strong association rather than strict causation.

Implications of the Study

Implications for theory: The findings support the education production function theory by showing that school inputs are a strong predictor of educational outputs in rural Kenyan public primary schools. By including digital and human resources alongside physical facilities and instructional materials, the study shows that the input set in the production function should reflect the full range of resources needed for learning.

Implications for policy: Education policymakers at the national and county levels need to treat resource adequacy as a central lever for improving quality. Resource allocation should be based on identified deficits, with priority to digital learning resources, classrooms and laboratories, textbooks, sanitation facilities, furniture and staffing, and should be monitored to ensure equitable distribution across schools.

Implications for practice: Head teachers and teachers need to maximize the use of the resources available, repair and equip existing facilities such as computer laboratories, and improvise with locally available materials, since adequacy alone does not guarantee effective use.

Recommendations

Based on the findings, the study recommends that:

- i. The Ministry of Education and the County Government of Machakos should increase and target resource allocation to public primary schools, prioritizing digital learning resources, classrooms and laboratories, textbooks (to end textbook sharing), toilets and furniture.
- ii. The Teachers Service Commission and school management should recruit and deploy additional teachers and support staff to improve the teacher–learner ratio and relieve overstretched support staff.
- iii. Head teachers and boards of management should repair, equip and restore computer laboratories to their intended use, and ensure that available resources are maintained and equitably used.
- iv. Teachers should move beyond sole reliance on textbooks and incorporate a variety of instructional materials, such as visual aids, manipulatives, locally available resources and digital content, to address diverse learning styles and improve learning outcomes.
- v. Quality assurance officers should conduct regular audits of teaching and learning resources in schools to guide the supply and distribution of resources.

Areas for Further Research

Teaching and learning resources explained 73.7% of the variation in quality education, leaving 26.3% to other factors. Further studies should examine other determinants, such as teacher quality, school leadership and parental involvement, apply multiple regression to establish the influence of each dimension of resources separately, and replicate the study in other counties and over time.

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