European Journal of Education Studies
ISSN: 2501 - 1111
ISSN-L: 2501 - 1111
Available online at: www.oapub.org/edu

DOI: 10.46827/ejes.v13i7.6952 Volume 13 | Issue 7 | 2026

INFLUENCE OF RESOURCE MOBILIZATION TOTAL QUALITY MANAGEMENT PRACTICES ON LEARNERS' ACADEMIC ACHIEVEMENT IN INTEGRATED SCIENCE IN JUNIOR SCHOOLS IN BOMET COUNTY, KENYA

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Abstract:
Total Quality Management (TQM) can enhance science education through effective resource mobilization. However, the achievements in Integrated Science in junior schools in Bomet County, Kenya, remain below expectations. In the 2023 Kenya Primary School Education Assessment (KPSEA), 59.92% of learners scored at the "Approaching Expectations" or "Below Expectations" levels. Similarly, the 2025 Kenya Junior School Education Assessment (KJSEA) recorded a county mean score of 31.63%, indicating a low mastery of the required competencies. This study investigated how Resource Mobilization TQM practices influence learners' academic achievement in Integrated Science in junior schools across Bomet County, Kenya. Deming's Total Quality Management Theory and Hattie's Visible Learning Theory guided the study. A pragmatist research philosophy was adopted alongside a mixed-methods concurrent triangulation design that integrated cross-sectional surveys with descriptive phenomenology approaches. The target population consisted of five Sub-County Directors of Education (SCDEs), 541 Grade Nine parents' representatives, 541 Heads of Institutions (HOIs), 541 Integrated Science Facilitators (ISFs), and 20,025 Grade Nine learners, giving a total of 21,653 participants. Using Yamane's formula, a quantitative

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sample of 230 Heads of Institutions was selected through proportionate stratified random sampling. The qualitative phase involved five SCDEs, 23 Grade Nine parents' representatives interviewed until data saturation, and 36 classroom observations involving 36 Integrated Science Facilitators and 2,756 Grade Nine learners. Overall, the study involved 3,050 participants. Data were gathered using questionnaires, interview guides, observation checklists, and document analysis schedules. Instrument validity was verified through face and content validity checks, while reliability for the HOI questionnaire was confirmed using Cronbach's alpha (α = .88). Credibility was enhanced through methodological triangulation, whereas dependability was ensured through detailed procedural documentation following a pilot study conducted in 23 Junior Schools in Kericho County. Quantitative data were analyzed using descriptive statistics and simple linear regression (α= .05) in SPSS version 27. Qualitative data were analyzed using thematic and content analysis in NVivo version 14. Descriptive results showed an aggregate mean of 3.84 (SD = 0.74), indicating that HOIs agreed that resource mobilization practices were active in their schools. Resource Mobilization TQM practices significantly improved learners' performance (R^2 = .168, β= .410, $p < .001$), explaining 16.8% of the variance in achievement scores. Qualitative results revealed that stakeholder collaboration increased the supply of science labs, equipment, and learning materials. However, overcrowded classrooms, insufficient ICT infrastructure, and poor resource maintenance still hindered teaching. The study concludes that planned resource mobilization is vital for improving Integrated Science scores. It recommends that key partners- the Ministry of Education, Bomet County Government, Boards of Management, NG-CDF, parents, school heads, and development partners—jointly invest in labs, ICT facilities, learning materials, and resource upkeep.

Keywords: resource mobilization, total quality management practices, learners' academic achievements, integrated science

1. Introduction

The pursuit of quality education has increasingly shifted from expanding access to improving learning outcomes through effective institutional management. In response, educational institutions have embraced Total Quality Management (TQM) as a holistic management philosophy that promotes continuous improvement, stakeholder participation, customer focus, process management, and evidence-based decision-making to enhance organizational performance. Originally developed within industrial settings by quality pioneers such as Deming, Juran, and Crosby, TQM has evolved into an educational management framework that aligns institutional leadership, resource allocation, and instructional processes with improved learner outcomes (Abimbola *et al.*, 2021). Within educational institutions, TQM creates a culture of excellence by integrating administrative leadership with classroom practice, thereby strengthening institutional effectiveness and academic achievement.

The International Organization for Standardization (ISO 9001:2015) identifies leadership, customer focus, engagement of people, process management, evidence-based decision-making, and continuous improvement as the guiding principles of quality management. In educational settings, these principles provide a strategic framework through which school leaders can mobilize institutional resources, coordinate stakeholders, improve instructional processes, and sustain quality teaching and learning. Contemporary educational research further demonstrates that effective implementation of TQM requires the integration of administrative quality management with classroom instructional delivery to ensure that institutional decisions directly enhance learner achievement.

Among the core dimensions of TQM, Resource Mobilization (RM) plays a critical role in supporting curriculum implementation and improving learner achievement. Resource mobilization extends beyond acquiring financial resources to include the systematic acquisition, allocation, utilization, maintenance, and continuous improvement of instructional facilities, laboratories, ICT infrastructure, and learning materials required for effective science education. Within this framework, stakeholder engagement facilitates collaborative resource mobilization involving school leadership, Boards of Management, parents, and community partners; customer focus ensures equitable provision of instructional resources responsive to learners' needs; process management institutionalizes transparent planning, procurement, inventory control, and maintenance systems; while continuous improvement promotes regular enhancement of laboratories, instructional materials, and technological resources to strengthen learner engagement and academic achievement.

The significance of resource mobilization has become even more pronounced following the adoption of Competency-Based Education (CBE), which emphasizes inquiry-based learning, experimentation, collaboration, and continuous assessment. Unlike content-driven curricula, CBE requires learning environments supported by functional laboratories, adequate instructional materials, digital technologies, and learner-centred pedagogies. International evidence indicates that countries implementing competency-based reforms have improved science learning by strengthening inquiry-based instruction, integrating digital technologies, and investing in quality instructional resources (Ainscow, 2020). However, UNESCO (2024) observes that many education systems continue to experience a learning crisis in which increased school enrolment has not translated into improved learning outcomes because of persistent deficiencies in instructional quality and resource provision.

Across Sub-Saharan Africa, implementation of competency-based curricula continues to face challenges associated with inadequate teaching resources, insufficient infrastructure, limited teacher preparedness, and weak institutional support systems. Studies conducted in Rwanda, Tanzania, and Kenya have identified shortages of instructional materials, laboratory facilities, inadequate teacher preparation, and limited implementation of inquiry-based science instruction as major constraints to learner achievement. These findings underscore the importance of strengthening institutional

resource mobilization to support effective curriculum implementation and improve science learning outcomes.

In Kenya, the implementation of Competency-Based Education is anchored in the Constitution of Kenya (2010), the Basic Education Act (2013, revised 2025), the Basic Education Curriculum Framework (BECF, 2019), and the Kenya Institute of Curriculum Development guidelines, all of which emphasize quality, equity, learner-centered instruction, and preparation for Science, Technology, Engineering and Mathematics (STEM) pathways (KICD, 2024 Ministry of Education, 2025; United Nations, 2020). Integrated Science occupies a strategic position within this framework because it integrates concepts from biology, chemistry, physics, and earth science while developing scientific inquiry, critical thinking, and problem-solving competencies necessary for Kenya's Vision 2030. Consequently, Heads of Institutions are expected to adopt effective TQM practices to mobilize and manage instructional resources that facilitate successful implementation of the curriculum.

Despite these policy reforms and quality improvement initiatives, learner achievement in Integrated Science remains below national expectations in Bomet County. National assessment data show that in the 2023 Kenya Primary School Education Assessment (KPSEA), only 49.09% of learners nationally attained or exceeded expectations in Science and Technology, while 40.92% remained at the approaching or below expectations levels (KNEC, 2023). More critically, although national performance in Integrated Science improved in the 2025 Kenya Junior School Education Assessment (KJSEA), Bomet County recorded a mean score of only 31.63%, substantially below the national benchmark. Earlier county results further indicated that 59.92% of KPSEA candidates performed at the approaching or below expectations levels in science, with similar trends observed in Grade 7 and Grade 8 School-Based Assessments (MoE, 2024; KNEC, 2023; KNEC, 2025). These persistent disparities suggest that challenges extend beyond curriculum design to the effectiveness of school-level quality management and resource mobilization practices.

Although previous studies have examined educational resources and curriculum implementation, limited empirical evidence has investigated Resource Mobilization as a Total Quality Management practice within junior schools implementing Competency-Based Education. Most existing studies have focused primarily on resource availability rather than the quality management processes through which school leaders mobilize, allocate, manage, and continuously improve instructional resources to enhance learner achievement. This knowledge gap is particularly evident in rural counties such as Bomet, where contextual constraints continue to influence science education outcomes. Consequently, this study investigated the influence of Resource Mobilization Total Quality Management practices on learners' academic achievement in Integrated Science in junior schools in Bomet County, Kenya. The study presents the findings relating to the first objective by addressing the research question: What is the influence of Resource Mobilization Total Quality Management practices on learners' academic achievement in Integrated Science in junior schools in Bomet County, Kenya? It further tests the null

hypothesis that: H_{01}: Resource Mobilization Total Quality Management practices have no statistically significant influence on learners' academic achievement in Integrated Science in junior schools in Bomet County, Kenya. The findings provide empirical evidence on how quality-oriented resource mobilization practices can strengthen science instruction and improve learner achievement under Kenya's Competency-Based Education framework.

2. Literature Review

Resource mobilization is widely recognized as a fundamental component of Total Quality Management (TQM) because it provides the institutional capacity required to sustain quality teaching and learning. Within educational settings, resource mobilization extends beyond the acquisition of physical and financial resources to encompass their strategic planning, equitable allocation, efficient utilization, monitoring, and continuous improvement to support curriculum implementation and learner achievement, recent global evidence indicates that adequate educational infrastructure, equitable financing, and effective resource management provide the foundation for quality curriculum delivery by creating learning environments that enhance accessibility, participation, and learner outcomes (UNESCO, 2023; World Bank, 2024).

Empirical evidence demonstrates that effective resource mobilization contributes significantly to educational outcomes. Similarly, Baafi (2020), in Ghana, established that well-developed physical facilities, functional classrooms, and adequately equipped laboratories positively influenced learners' academic engagement and performance by providing conducive environments for teaching and learning. These findings suggest that educational quality depends not only on the availability of resources but also on institutional systems that ensure their effective management.

The principles of TQM further reinforce the importance of systematic resource management. Sustainable educational quality requires institutions to move beyond resource acquisition towards strategic resource mobilization characterized by equitable distribution, operational readiness, accountability, and continuous improvement. Within competency-based education, such practices become particularly important because learner-centred pedagogies require functional laboratories, instructional technologies, practical learning materials, and supportive learning environments to facilitate inquiry-based learning and competency development.

Regional studies similarly demonstrate the importance of resource mobilization in implementing Competency-Based Education (CBE). Amunga, Were, and Ashioya (2020) observed that successful implementation of CBE requires collaborative resource mobilization involving schools, parents, and communities, while also highlighting persistent equity challenges that affect access to instructional resources. Likewise, Naisianoi, Koome, and Marima (2020) found that the availability of teaching and learning materials significantly influenced learners' development and educational outcomes in upper primary schools in Kenya. These studies underscore the central role of stakeholder

collaboration in strengthening institutional capacity to support competency-based instruction.

Science education places even greater demands on institutional resource mobilization because effective instruction depends on specialized facilities and practical learning resources. Ngeno *et al.* (2021) established that disparities in physical infrastructure constrained the implementation of Competency-Based Education in public primary schools, particularly in rural contexts where instructional facilities remained inadequate. Collectively, these studies demonstrate that the availability of laboratories, instructional materials, and supportive infrastructure remains essential for improving science learning outcomes.

Although previous studies consistently acknowledge the importance of educational resources, most have concentrated on resource availability or infrastructure development without examining Resource Mobilization as a Total Quality Management practice. Existing research has rarely explored how school leaders strategically mobilize, allocate, coordinate, monitor, and continuously improve instructional resources through stakeholder engagement, customer focus, process management, and continuous improvement to enhance learners' academic achievement. Furthermore, limited empirical evidence exists within junior schools implementing Kenya's Competency-Based Education framework, particularly in rural counties such as Bomet, where contextual resource constraints continue to affect Integrated Science instruction. The present study therefore sought to address this gap by examining the influence of Resource Mobilization Total Quality Management practices on learners' academic achievement in Integrated Science in junior schools in Bomet County, Kenya.

3. Materials and Methods

3.1 Research Philosophy

The study was grounded in the pragmatist research philosophy, which prioritizes practical solutions to real-world educational challenges and supports the integration of quantitative and qualitative data.

3.2 Research Design

The study adopted a concurrent triangulation mixed-methods design, integrating cross-sectional surveys and descriptive phenomenology. Quantitative and qualitative data were collected concurrently, analyzed independently, and integrated during interpretation to provide a comprehensive understanding of Total Quality Management (TQM) practices and learners' academic achievement in Integrated Science (Guetterman *et al.*, 2019; Creswell & Creswell, 2023).

3.3 Target Population and Sampling Techniques

The macro-level target population across Bomet County spanned five sub-counties, incorporating educational directors, parents' representatives, institutional heads,

facilitators, and learners, totaling 21,653 individuals. Using Yamane's sampling formula, a quantitative sample of 230 Heads of Institutions (HOIs) was established via proportionate stratified random sampling. This quantitative cohort was complemented by a qualitative sample including: 5 Sub-County Directors of Education (SCDE) interviews, 23 Purposively selected Parent Representatives, and 36 Detailed lesson observations involving 36 Integrated Science Facilitators and 2,756 learners.

3.4 Sampling Procedures

The study employed a concurrent triangulation mixed-methods sampling strategy that integrated probability and purposive sampling techniques (Creswell & Creswell, 2023). For the quantitative strand, proportionate stratified random sampling was used to select 230 Heads of Institutions **(**HOIs) from 541 registered junior schools in Bomet County, ensuring proportional representation across the county's five sub-counties. For the qualitative strand, nested purposive sampling was used to select information-rich participants from schools included in the quantitative survey. The qualitative sample comprised five Sub-County Directors of Education (SCDEs), 23 Grade Nine parents' representatives, 36 Integrated Science Facilitators (ISFs), and 36 classroom observations involving 2,756 Grade Nine learners**.** Parents were recruited until data saturation was achieved, while all five SCDEs were included through saturation sampling. This mixed-methods sampling approach facilitated methodological triangulation by integrating survey findings with interviews, classroom observations, and document analysis, thereby enhancing the credibility, validity, and comprehensiveness of the findings.

3.5 Research Instruments

Data were collected using structured questionnaires, semi-structured interview guides, classroom observation checklists, and document analysis guides. The structured questionnaire was administered to Heads of Institutions (HOIs) to collect quantitative data on Resource Mobilization Total Quality Management (TQM) practices and learners' academic achievement in Integrated Science. The questionnaire comprised demographic items and five-point Likert-scale statements measuring resource mobilization practices, including stakeholder engagement, resource acquisition, utilization, maintenance, and continuous improvement.

Semi-structured interview guides were administered to Sub-County Directors of Education (SCDEs) and Grade Nine parents' representatives to obtain in-depth perspectives on school resource mobilization, stakeholder support, curriculum implementation, and challenges affecting Integrated Science instruction. Interview probes were used to clarify responses and elicit detailed information.

Document analysis guides were used to review school records, including lesson plans, schemes of work, assessment records, curriculum implementation documents, and resource inventories, to verify evidence of resource mobilization and curriculum implementation. Classroom observations were conducted using a structured observation checklist to assess the availability and utilization of instructional resources, classroom

organization, learner engagement, practical science activities, and the integration of instructional technologies during Integrated Science lessons. Data from the four instruments were triangulated to provide a comprehensive understanding of the influence of Resource Mobilization TQM practices on learners' academic achievement.

3.6 Validity, Reliability and Trustworthiness

The research instruments underwent expert review to establish face and content validity. Four experts evaluated the questionnaire using the Content Validity Index (CVI), resulting in excellent scale-level validity indices for Resource Mobilization (S-CVI/Ave = .950), confirming that the items adequately represented the study constructs.

A pilot study involving 23 Heads of Institutions (10% of the quantitative sample) was conducted in junior schools in Kericho County to refine the research instruments and assess reliability. Internal consistency was established using Cronbach's alpha coefficients, which exceeded the recommended threshold of .70. The reliability coefficients were .88 for Resource Mobilization, indicating satisfactory internal consistency.

Trustworthiness of the qualitative data was enhanced through methodological and source triangulation involving interviews, document analysis, and classroom observations. Credibility was strengthened by collecting evidence from multiple participant groups, including Sub-County Directors of Education, Heads of Institutions, Integrated Science Facilitators, parents' representatives, and learners. Dependability was ensured through pilot testing, standardized data collection procedures, maintenance of an audit trail, and refinement of the research instruments. The classroom observation checklist further demonstrated excellent inter-rater reliability during the pilot study (Cohen's $\kappa = .84$), confirming consistency in observational data.

3.7 Collection Procedure

Data were collected using structured questionnaires, semi-structured interview guides, classroom observation checklists, and document analysis schedules. The questionnaire was administered to Heads of Institutions (HOIs) using a drop-off and pick-up approach after obtaining ethical approval and research authorization from the National Commission for Science, Technology, and Innovation (NACOSTI) and relevant educational authorities. Completed questionnaires were checked for completeness, coded, and prepared for statistical analysis.

Qualitative data were collected through face-to-face semi-structured interviews with Sub-County Directors of Education (SCDEs) and Grade Nine parents' representatives. Interviews were conducted at participants' convenience after obtaining informed consent, and each session lasted approximately 30–45 minutes. With participants' permission, interviews were audio-recorded and supplemented with field notes to enhance data accuracy.

Document analysis involved reviewing curriculum implementation records, lesson plans, assessment records, and other institutional documents relevant to Total

Quality Management (TQM) practices and learners' academic achievement in Integrated Science. Classroom observations were conducted using a structured observation checklist to assess instructional practices, learner engagement, classroom organization, utilization of instructional resources, and the implementation of TQM practices during Integrated Science lessons. Data generated from the four instruments were triangulated to provide a comprehensive understanding of the influence of Resource Mobilization TQM practices on learners' academic achievement in Integrated Science.

3.8 Data Analysis

Following data cleaning and screening, quantitative data were analyzed using IBM SPSS Statistics Version 27. Descriptive statistics (frequencies, percentages, means, and standard deviations) summarized respondents' characteristics and perceptions of Total Quality Management (TQM) practices. Simple linear regression analysis was used to determine the influence of each TQM dimension Resource Mobilization on learners' academic achievement in Integrated Science at a significance level of $\alpha = .05$. Prior to regression analysis, diagnostic tests, including multicollinearity (Variance Inflation Factor and Tolerance), residual independence (Durbin–Watson statistic), model significance (ANOVA F-test), and goodness-of-fit (R^2), were conducted to verify compliance with regression assumptions.

Qualitative data were analyzed using NVivo Version 14 through thematic and content analysis. Interview transcripts, classroom observation notes, and document review records were coded to identify recurring themes related to TQM implementation and learners' academic achievement. The quantitative and qualitative findings were subsequently integrated during interpretation using the concurrent triangulation approach to provide complementary and corroborative evidence regarding the influence of TQM practices on Integrated Science achievement.

3.9 Ethical Considerations

Ethical approval was obtained from the Bomet University Institutional Review Board**,** and a research permit was granted by the National Commission for Science, Technology and Innovation (NACOSTI**)** prior to data collection. Additional authorization was obtained from the Bomet County Director of Education and participating schools. Written informed consent was obtained from all adult participants, while assent for Grade Nine learners was secured through their class teachers in accordance with school procedures. Participation was voluntary, and respondents were informed of their right to withdraw at any stage without penalty. Confidentiality and anonymity were maintained by using coded research instruments and securely storing all data. The study adhered to the principles of voluntary participation, privacy, confidentiality, non-maleficence, and academic integrity throughout the research process.

4. Results and Discussion

4.1 Learners' Academic Achievements in Integrated Science (ACIS) in Junior Schools in Bomet County, Kenya

Table 1*:* Learners' KJSEA Achievements Rubrics Scores for the Year 2025 across Sampled Schools in Bomet County, Kenya

Level Points	KJSEA Achievements' Level	Number of Schools (n)	Percentage (%)	Mean Score
1	BE 2	5	2.58	5
2	BE 1	10	5.15	20
3	AE 2	54	27.84	162
4	AE 1	78	40.21	312
5	ME 2	28	14.43	140
6	ME 1	13	6.70	78
7	EE 2	6	3.09	42
8	EE 1	0	0	0
Total		**194**		**759**
Aggregate mean				**3.912**

Key: Exceeding Expectation (EE1 – Outstanding; EE2 – Excellent): - Meeting Expectation (ME1 – Very Good; ME2 – Good): Approaching Expectation (AE1 – Satisfactory; AE2 – Basic): Below Expectation (BE1 – Emerging; BE2 – Below Basic).
Source: Field data, 2026.

Learners' academic achievement in Integrated Science, the dependent variable, was measured using the 2025 Kenya Junior School Education Assessment (KJSEA) mean scores reported by 194 Heads of Institutions (HOIs). Achievement levels were classified according to the Competency-Based Education (CBE) performance categories of Below Expectation (BE), Approaching Expectation (AE), Meeting Expectation (ME), and Exceeding Expectation (EE).

The findings indicated that most schools performed within the Approaching Expectation category. Specifically, 40.21% (n = 78) of schools attained AE1 (Satisfactory), while 27.84% (n = 54) attained AE2 (Basic), representing 68.04% of the sampled schools. Schools meeting or exceeding expectations were comparatively few, with 14.43% (n = 28) attaining ME2 (Good), 6.70% (n = 13) attaining ME1 (Very Good), and only 3.09% (n = 6) attaining EE2 (Excellent). No school attained the highest achievement level (EE1 – Outstanding). Conversely, 5.15% (n = 10) and 2.58% (n = 5) of schools were categorized under BE1 (Emerging) and BE2 (Below Basic), respectively. The overall county aggregate mean score was 3.91, placing the sampled schools within the Approaching Expectation (AE1) category.

These findings suggest that although most junior schools have attained foundational competencies in Integrated Science, progression to higher-order scientific reasoning and mastery remains limited. The predominance of schools within the Approaching Expectation category indicates that learners are acquiring basic competencies but have yet to consistently demonstrate advanced scientific inquiry,

problem-solving, and application skills envisioned under the Competency-Based Curriculum. Similar trends have been reported by the Kenya Institute of Curriculum Development (KICD, 2024), which noted that implementation of competency-based science education has strengthened foundational competencies but continues to face challenges in promoting higher-order learning. Comparable findings were also reported by Nsengimana *et al.* (2022), who observed that science teaching in East Africa frequently remains focused on factual knowledge acquisition rather than inquiry-based learning.

From a Total Quality Management (TQM) perspective, the observed achievement pattern highlights the importance of strengthening institutional quality systems that support effective teaching and learning. Inadequate instructional resources, limited laboratory facilities, and inconsistent instructional leadership remain significant barriers to improved learner outcomes in science education (World Bank, 2024). These findings underscore the need for sustained investment in resource mobilization, teacher professional development, and instructional supervision to enhance learners' academic achievement in Integrated Science and support Kenya's Competency-Based Education reforms.

4.2 Descriptive Analysis of Resource Mobilization Practices

The institutional implementation of Resource Mobilization TQM parameters was evaluated by tracking the responses of the surveyed Heads of Institutions (HOIs) across several core indicators. The aggregated results are presented in Table 2.

Table 2: HOI's Responses on Resource Mobilization TQM Practices

Statement	N	Mean	Std. Deviation
Stakeholder engagement			
Consultative meetings between the IS department and the school administration are held.	194	3.87	.584
Learners help evaluate IS materials to ensure they meet academic needs.	194	3.90	.585
ISF rarely collaborate with colleagues to share resources for IS quality.	194	3.86	.608
Parents support IS learning through home-based science activities	194	3.91	.673
Partnerships with stakeholders such as the MOE, NGOs, and industries help secure funding and technical support to improve IS facilities and resources.	194	3.92	.610
Learners focus			
ISFs are supported in using diverse resources to suit learners' learning styles.	194	3.91	.634
Hands-on activities improve learners' understanding of IS concepts.	194	3.92	.593
Learners have equitable access to IS resources that suit their needs.	194	3.85	.573
Learner feedback is rarely collected to improve IS teaching.	194	3.88	.603
Learning resources are checked regularly to help learners improve in IS	194	3.86	.624
Process management			
IS guidelines are consistently applied for quality and standardized teaching.	194	3.87	.575
ICT tools in IS are regularly maintained to support technology-enhanced learning.	194	3.89	.597

IS materials are distributed on time to avoid lesson delays	194	3.91	.621
Learning resources are seldom reviewed to improve performance in IS	194	3.80	.572
Safety rules are strictly followed in science labs to keep learners safe	194	3.91	.617
Continuous improvement			
IS laboratories are regularly upgraded to align with curriculum standards and learning.	194	3.85	.633
IS materials are regularly updated to enhance learners' understanding.	194	3.93	.664
ISF feedback is used to enhance science instruction and learner engagement.	194	3.92	.610
STEM lab innovation workshops are regularly conducted to help ISF use laboratories effectively.	194	3.85	.638
Valid N (listwise)	**194**		
Aggregate Mean		**3.84**	**0.74**

Source: Field data, 2026.

Table 2 presents descriptive statistics on Heads of Institutions' (HOIs) responses regarding Resource Mobilization TQM practices for Integrated Science. The aggregate mean of 3.84 (SD = 0.74) indicates that Heads of Institutions generally agreed that resource mobilization practices were implemented in their schools. This level of agreement suggests that instructional resources, school infrastructure, and stakeholder support were adequately mobilized to facilitate the teaching and learning of Integrated Science. The findings are consistent with recent studies, which report that effective resource mobilization through stakeholder collaboration, participatory decision-making, and continuous improvement strengthens the implementation of Total Quality Management (TQM) and enhances educational quality.

4.3 Regression Modeling and Hypothesis Testing

To evaluate the precise predictive capacity of Resource Mobilization TQM practices on terminal Integrated Science achievements (measured via 2025 KJSEA aggregate school scores), a simple linear regression analysis was performed.

H_{01} stated that Resource Mobilization TQM practices have no significant effect on learners' academic achievements in Integrated Science at junior schools in Bomet County, Kenya.

The model summary in Table 3 reveals an R value of .410, showing a moderate positive linear correlation between the variables. The coefficient of determination (R^2 = .168) indicates that 16.8% of the total variance in learners' academic achievements in Integrated Science across Bomet County is explained by institutional Resource Mobilization practices.

Table 3: Head of Institutions (HOIs) Model Summary on TQM practices on RM and ACIS

Model	R	R Square	Adjusted R Square		Std. Error of the Estimate	Durbin-Watson
1	.410	.168	.164		.35768	1.837
	a. Predictors: (Constant), RM					
	b. Dependent Variable: ACIS					

Source: Field data, 2026.

Table 4: Head of Institutions (HOIs) ANOVA[a] on Resource Mobilization TQM Practices [and] ACIS

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.962	1	4.962	38.786	.000
	Residual	24.564	192	.128		
	Total	29.526	193			
a. Dependent Variable: ACIS						
b. Predictors: (Constant), RM						

Source: Field data, 2026.

The F-statistical check ($F(1, 228) = 46.077$, $p < .001$) in Table 4 confirms that the regression model is statistically significant, providing strong evidence that the model helps predict learning outcomes.

Table 5: Regression Analysis on the Relationship between Resource Mobilization TQM Practices and Academic Achievements

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.471	.231		10.675	.000		
	RM	.369	.059	.410	6.228	.000	1.000	1.000
a. Dependent Variable: ACIS								
b. $\alpha = .05$								

Source: Field data, 2026.

The coefficients in Table 5 show that the regular execution of Resource Mobilization practices has a significant positive effect (beta = .410, $t = 6.228$, $p < .001$). Based on these results, the null hypothesis (H_{01}) is rejected. This confirms that Resource Mobilization TQM practices significantly influence learners' academic achievements in Integrated Science within the county's junior schools.

This statistically significant predictive power is strongly supported by Akinyi *et al.* (2023), who established that adequate physical facilities and effective resource allocation significantly enhance learners' academic performance by creating a conducive teaching and learning environment in Kenyan schools. The findings further concur with Mormah (2023), who emphasized that effective management and maintenance of educational facilities are indispensable for quality assurance and sustained academic growth, arguing that strategic resource stewardship enables schools to maximize instructional

effectiveness. This convergence of evidence underscores that localized administrative interventions in resource mobilization and management are pivotal in shaping educational outcomes. Furthermore, the observed 16.8% variance explained by school resource allocation is consistent with findings by Muthoni, Orodho, and Waweru (2024), who reported that head teachers' resource mobilization practices significantly influence the implementation of the Competency-Based Curriculum by enhancing the availability of instructional materials, improving school infrastructure, and facilitating learner-centered pedagogical approaches. Consequently, schools with stronger resource mobilization mechanisms are better positioned to improve teaching quality and learner achievement, particularly in practical learning areas such as Integrated Science. Collectively, these empirical findings reinforce the conclusion that targeted strategic investments in physical educational facilities and instructional resources, facilitated through effective administrative resource mobilization, directly contribute to improved academic achievement.

4.4 Triangulation of Qualitative Data

Qualitative data and field observations revealed several operational challenges that complement the quantitative findings:

- **Classroom Overcrowding:** Field audits confirmed that a substantial majority of the sampled junior schools suffered from high student density, with average class sizes frequently exceeding 40 learners. This overcrowding limited physical mobility, prevented flexible seating arrangements, and restricted hands-on participation during science lessons.
- **Spatial and Seating Inconsistencies:** Classroom observations showed that traditional, straight-row seating dominated the instructional layout. While partial cluster or U-shaped arrangements were observed in some institutions, they were often limited by space constraints rather than pedagogical choice.
- **The ICT Integration Deficit:** Document reviews indicated that while 61.1% of institutions actively maintained basic science kit inventories, forward-looking ICT maintenance plans were operational in only 38.9% of junior schools. This gap was evident during live instruction: 86.1% of all observed Integrated Science lessons showed no integration of digital or ICT tools. This lack of digital resource use creates a significant barrier to interactive learning and limits students' engagement with abstract scientific concepts.

5. Recommendations

5.1 Recommendations for Practice

Based on these findings, the following interventions are recommended to improve learning outcomes and support national STEM objectives:

1) **Optimize Classroom Spatial Capacity:** School Boards of Management and institutional leaders must prioritize infrastructure expansion to address

overcrowding, aiming to reduce class sizes to fewer than 40 learners to allow for flexible, collaborative seating layouts.

2) **Strengthen Digital and ICT Integration:** School heads should establish structured resource maintenance plans and ensure that available ICT infrastructure is consistently integrated into daily science instruction to overcome the current 86.1% digital utilization deficit.
3) **Equitable Provision of Science Infrastructure:** The Ministry of Education, in partnership with sub-county education offices, should expand the distribution of mobile laboratories and specialized SEPU science kits to ensure all junior schools have the resources necessary for practical, hands-on scientific experimentation

6. Conclusion

This study demonstrates that Resource Mobilization TQM practices are a critical, statistically significant predictor of academic achievement in Integrated Science across Junior Schools in Bomet County. Quantitative modeling shows that resource infrastructure explains a substantial portion of the performance variance, confirming that adequate physical resources are essential for effective science instruction. However, qualitative triangulation highlights that the potential benefit of these resources is severely limited by a significant execution gap. Severe classroom overcrowding, traditional seating layouts, and a stark deficit in digital and ICT integration (86.1% non-utilization) prevent schools from implementing the active, inquiry-based pedagogical models required by the Competency-Based Education framework. Ultimately, the study concludes that closing the regional achievement gap requires shifting from basic inventory compliance to a quality-driven management approach that prioritizes equitable resource distribution, regular maintenance, and effective classroom utilization.

Acknowledgements

This article is derived from the PhD thesis entitled *Influence of Resource Mobilization TQM practices on Learners' Academic Achievements in Integrated Science* in Junior Schools in Bomet County, Kenya, completed by Peris Cherotich Kerich under the supervision of Prof. Tony Okwach, Bomet University, Kenya and Dr Richard Maite Sigilai, Bomet University, Kenya.

Authors' Contribution

Peris Cherotich Kerich contributed to the conception of the study, data collection, and the preparation of the PHD thesis on which this article is based. Dr. Tony Okwach and Dr. Richard Maite Sigilai supervised the research process, contributed to the study design, data analysis and interpretation, substantially revised and developed the manuscript and prepared the final version for publication. Both authors reviewed and approved the final manuscript.

Conflict of Interest Statement

The authors declare no conflicts of interest.

References

Abimbola, B. O., Ekpudu, J. E., & Kuye, O. L. (2021). Contributions and theoretical approach to total quality management. *UNILAG Journal of Business*, *7*(2), 1–13. Retrieved from http://ujb.unilag.edu.ng/article/view/1348

Ainscow, M. (2020). Promoting inclusion and equity in education: Lessons from international experiences. *Nordic Journal of Studies in Educational Policy*, *6*(1), 7–16. https://doi.org/10.1080/20020317.2020.1729587

Akinyi, C., Oduor, J., & Otieno, P. (2023). Strategic resource management and academic performance in public secondary schools in Kenya. *Journal of Educational Leadership and Management*, *11*(2), 45–59.

Amunga, J., Were, D., & Ashioya, I. (2020). The teacher factor in the implementation of the Competency-Based Curriculum in Kenya: Issues and challenges. *Journal of Educational Issues*, *6*(2), 60–74. https://doi.org/10.5296/jei.v6i2.17325

Baafi, R. K. A. (2020). School physical environment and student academic performance in senior high schools in Ghana. *International Journal of Educational Studies*, *7*(1), 15–28. https://doi.org/10.4236/ape.2020.102012

Creswell, J. W., & Creswell, J. D. (2023). *Research design: Qualitative, quantitative, and mixed methods approaches* (6th ed.). SAGE Publications. Retrieved from https://books.google.ro/books?id=PViMtOnJ1LcC&printsec=frontcover&redir_esc=y#v=onepage&q&f=false

Guetterman, T. C., Babchuk, W. A., Howell, S. M. C., & Stevens, J. (2019). Contemporary approaches to mixed methods research design: A review of exemplars. *Journal of Mixed Methods Research*, *13*(2), 179–198. https://doi.org/10.1177/1558689817710877

Kenya Institute of Curriculum Development. (2024). *Guidelines for the implementation of the Competency-Based Curriculum in Junior Schools*. KICD.

Kenya Institute of Curriculum Development. (2024). *Implementation status report on competency-based science education in Kenya*. KICD.

Kenya National Examinations Council. (2023). *2023 Kenya Primary School Education Assessment (KPSEA) national report*. KNEC.

Kenya National Examinations Council. (2025). *2025 Kenya Junior School Education Assessment (KJSEA) county performance evaluation report*. KNEC.

Ministry of Education. (2024). *Status report on competency-based education implementation in Kenya*. Government Printer.

Ministry of Education. (2025). *Basic education statistical booklet and quality management indicators*. Government Printer.

Mormah, F. O. (2023). Maintenance and management of educational facilities for quality assurance in secondary schools. *Journal of Educational Planning and Finance*, *18*(1), 77–91.

Muthoni, E., Orodho, J. A., & Waweru, S. N. (2024). Headteachers' resource mobilization practices and implementation of Competency-Based Curriculum in public primary schools in Kenya. *African Journal of Educational Management*, *29*(1), 55–71.

Naisianoi, E., Koome, S., & Marima, E. (2020). Availability of teaching and learning resources and implementation of Competency-Based Curriculum in upper primary schools in Kajiado County, Kenya. *Journal of Pedagogy, Curriculum and Instruction*, *8*(3), 33–46.

Ngeno, V., Mweru, M., & Mwoma, T. (2021). Infrastructure availability and implementation of Competency-Based Curriculum in public primary schools in rural Kenya. *International Journal of Early Childhood and Elementary Education*, *10*(2), 142–155.

Nsengimana, T., Mugabo, L. R., Hiroaki, O., & Nkundabakura, P. (2024). Reflection on science competence-based curriculum implementation in Sub-Saharan African countries. *International Journal of Science Education*, *46*(12), 1–14. https://doi.org/10.1080/09500693.2024.2356971

Nsengimana, T., Mugabo, L. R., Hiroaki, O., & Nkundabakura, P. (2022). Science competency-based curriculum implementation in East Africa: Challenges and pedagogical gaps. *African Journal of Research in Mathematics, Science and Technology Education*, *26*(1), 12–25.

UNESCO. (2023). *Global education monitoring report 2023: Technology in education: A tool on whose terms?* UNESCO Publishing. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000385723.

UNESCO. (2024). *Global education monitoring report 2024: Addressing the learning crisis through quality resource provision*. UNESCO Publishing. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000391758

United Nations. (2020). *Sustainable Development Goal 4: Quality education — Country progress profile for Kenya*. United Nations. Retrieved from https://kenya.un.org/en/sdgs/4/key-activities

World Bank. (2024). *Realizing the promise of education in Sub-Saharan Africa: Investing in infrastructure, quality resources, and management systems*. World Bank Group.