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Influence of school leadership practices on implementation of the Integrated Science Curriculum among the Cherengany/Sengwer marginalised group in Kenya

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Abstract

The implementation of Competency-Based Education (CBE) requires effective school leadership, adequate instructional resources, and supportive learning environments. However, junior schools serving marginalized communities in Kenya continue to experience challenges that may undermine curriculum implementation. This study examined how school leadership and management practices influence the implementation of the Integrated Science Curriculum (ISC) in junior schools situated within the Cherengany/Sengwer Marginalised Group of Trans-Nzoia and West Pokot Counties. Guided by Gross et al.'s Theory of Curriculum Implementation and Epstein's Theory of Overlapping Spheres of Influence, the study adopted a qualitative-dominant instrumental case study design. Data were collected from 11 heads of institutions, 11 integrated science teachers, and 93 Grade Nine learners through interviews, focus group discussions, questionnaires, and structured observations. Qualitative data were analysed thematically, while quantitative data were analysed using descriptive statistics. The findings revealed that disparities in academic qualifications between heads of institutions and integrated science teachers influenced instructional supervision and curriculum support. The study further established that inadequate instructional resources, limited professional development opportunities, and contextual socio-economic challenges constrained effective curriculum implementation. However, school leaders demonstrated efforts to support teachers through mentorship, stakeholder engagement, and resource mobilization initiatives. The study concludes that effective implementation of the Integrated Science Curriculum within

marginalized settings requires strengthened instructional leadership, improved resource provision, and enhanced support structures for junior schools. The study recommends policy reforms aimed at strengthening junior school governance, instructional supervision, and access to science learning resources.

Key terms: Competency-Based Education, Integrated Science Curriculum, instructional leadership, marginalised communities, curriculum implementation.

1.0 INTRODUCTION

1.1 Background of the Study

The transition to Competency-Based Education (CBE) in Kenya has generated significant reforms in curriculum design, instructional approaches, and school leadership responsibilities. One of the major reforms introduced under the Competency-Based Curriculum (CBC) is the Integrated Science Curriculum (ISC), which seeks to develop learners' scientific literacy, critical thinking, problem-solving competencies, and practical application of scientific knowledge. Effective implementation of the curriculum requires adequate instructional resources, competent teachers, supportive school leadership, and conducive learning environments. School leaders play a central role in coordinating curriculum implementation processes, mobilizing resources, supporting teachers, and fostering stakeholder collaboration necessary for successful curriculum delivery.

Globally, successful curriculum implementation has been associated with effective instructional leadership, adequate teacher preparation, and institutional support systems. Studies conducted in both developing and developed countries indicate that school leadership significantly influences teachers' instructional practices, adoption of educational reforms, and learner outcomes (Nemes & Nderego, 2025; Ngutuku, 2025). However, curriculum reforms frequently encounter implementation challenges where leadership capacity, teacher preparedness, and resource availability are inadequate.

In Kenya, implementation of CBC and the subsequent establishment of Junior Schools have introduced new administrative, instructional, and management responsibilities for heads of institutions. School leaders are expected to support curriculum implementation, supervise instructional processes, coordinate resource utilization, and facilitate professional collaboration among teachers. Despite these expectations, reports continue to highlight challenges relating to teacher competence, instructional resources, and stakeholder engagement that may affect curriculum implementation fidelity (Government of Kenya [GoK], 2023; Muricho, 2023; Oluoch, 2024). Emerging evidence further suggests that School Leadership and Management Practices (SLMP) play a critical role in shaping the success of competency-based education reforms (Kawinzi, 2025; Usawa Agenda, 2026).

The influence of school leadership and management practices is particularly significant within Vulnerable and Marginalised Groups (VMGs), where schools often operate under multiple socio-economic and infrastructural constraints. This concern is amplified by persistent funding challenges affecting curriculum implementation. Although government capitation supports basic school operations, implementation of CBC often requires additional instructional resources whose costs may indirectly be transferred to households through localized contributions and support mechanisms (GoK, 2023; Omondi, 2025). In historically marginalized regions characterized by widespread poverty and changing donor support patterns, these pressures may contribute to learner absenteeism, school dropout, and limited participation in educational activities (MoE, 2017; Walls et al., 2025). Consequently, school leaders in such settings are required not only to manage institutions but also to ensure effective curriculum implementation despite significant resource constraints.

The Cherengany/Sengwer Marginalised Group (CSMG) is among the communities that have experienced historical marginalisation during both the colonial and post-independence periods in Kenya (NGEC, 2023). Reports from community leaders, educational stakeholders, and public representatives indicate that these communities continue to experience challenges relating to school access, retention, transition, and attainment of quality education (Kinyanjui, 2024; Mboto, 2025). In addition, difficult terrain and limited access to basic social amenities such as potable water, reliable electricity, quality housing, and all-weather road networks continue to affect the attraction and retention of qualified teachers in these regions. As a result, schools serving the CSMG frequently experience shortages of specialized teachers and other educational resources necessary for effective curriculum delivery (MoE, 2017).

Consequently, schools serving the CSMG require effective instructional leaders capable of mobilising resources, supporting teachers, engaging stakeholders, and sustaining curriculum implementation under challenging conditions. Heads of institutions are therefore expected to adopt leadership practices, particularly instructional leadership approaches, that facilitate effective implementation of the Integrated Science Curriculum while responding to the unique realities of marginalized communities.

The attainment of Kenya's Vision 2030 is anchored on Science, Technology and Innovation (STI). Consequently, the Integrated Science Curriculum forms a critical foundation for developing the scientific knowledge, skills, and competencies required to support national development goals. The Ministry of Education expects that at least 60% of learners transitioning from Junior School to Senior School will pursue Science, Technology, Engineering and Mathematics (STEM) pathways (Centre for Mathematics, Science and Technology Education in Africa [CEMASTEA], 2025a; Kenya Institute of Curriculum Development [KICD], 2019). Furthermore, Integrated Science is an activity-based and inquiry-oriented learning area that requires functional laboratories, adequate instructional materials, specialized pedagogical competencies, and continuous parental support (CEMASTEA, 2025b). These requirements underscore the importance of examining how school leadership and management practices influence implementation of the Integrated Science Curriculum within marginalized communities such as the Cherengany/Sengwer Marginalised Group.

1.2 Statement of the Problem

In line with the Competency Based Education Framework (CBEF), and in order to realise Kenya's Vision 2030, the ISC is supposed to support the funnelling of 60% of any cohort of JS learners for senior school STEM tracks (RoK, 2023). However, only 59% of the 2025 Kenya Junior Secondary Education Assessment (KJSEA) candidates qualified for STEM pathway placement at the senior school tier (KNEC, 2026). Integrated science is one of the foundational learning areas at junior school level for learners intending to specialise in STEM tracks. However, analysis of the KJSEA performance for various subjects reveals that integrated science performance was not strong despite the highest lesson allocation (CEMASTEA, 2025b; Kisia, 2025).

While there may be other factors that contributed to IS not showing strong performance, a new dimension has emerged. There is a documented challenge of unprogressive school leadership and management practices elsewhere (Kawinzi, 2025). There is a dearth of information regarding how school leadership and management practices is shaping ISC implementation among the VMGs and especially the CSMG. Notably, the MoE has not established distinct staffing norms, hence forcing teachers deployed to JS to teach areas they were not trained. In addition, primary school heads continue to oversee JSs, triggering intense institutional friction, which is affecting instruction in JSs (Atieno, 2025). Indeed, there is teachers' union-led resistance demanding JSs administrative and financial autonomy (Citizen, TV Kenya, 2026; Kenya Broadcasting Corporation[KBC Channel 1, 2024]).

Thrust into this compromised governance structure, institutional leaders are forced to supervise

implementation of a resource-intensive curriculum under severely challenging conditions. They must manage an un-re-tooled or partially up-skilled teaching workforce with higher or comparable academic as themselves (HoIs) who are coerced into instructing outside their specialisations (GoK, 2023). HoIs are expected to navigate absolute resource starvation and mitigate delayed insufficient government funding as well sudden withdrawal of historical external aid (such as United States Agency for International Development (USAID) that shifts instructional costs onto impoverished parents (GoK, 2023; Walls, E. et al., 2025).

The consequences of these unmitigated management challenges are already empirically visible. In the 2025 KJSEA results, IS, a foundational subject dictating learners' qualification to join the STEM pathway, underperformed. This contributed to the collapse of the national STEM actual transition quota from an envisaged 60% to only 52% (Ruto, W., 2026). While community anxiety grows, there remains a critical dearth of empirical data isolating how school leadership practices navigate these convoluted operational challenges in resource-constrained settings. Without investigating these leadership dynamics, ISC implementation shall remain superficial, and the historical marginalisation of vulnerable learners will deepen.

1.3 Research Objective

To examine how school leadership and management practices shape the implementation fidelity of the integrated science curriculum in junior schools situated within the Cherengany/Sengwer marginalised group of Trans-Nzoia and West Pokot Counties.

1.4 Research Question

How do school leadership and management practices influence the implementation fidelity of the Integrated Science Curriculum in junior schools situated within the Cherengany/Sengwer Marginalised Group of Trans-Nzoia and West Pokot Counties?

2.0 LITERATURE REVIEW

2.1 Theoretical Framework

This paper is anchored by Gross et al.'s (1971) theory of curriculum implementation, supported Epstein theory of overlapping spheres of influence, to analyse both the internal organisational constraints and external social dynamics shaping curriculum execution. Rather than viewing ISC implementation challenges in isolation, this framework provides a multidimensional picture to evaluate how institutional leadership acts as the primary coordinator managing the intertwined realities of the classroom environment.

The primary analytical anchor is the Gross et al 1971 model, which establishes the internal organisational prerequisites for successful implementation of the curriculum. The model posits that implementation fidelity depends on five pillars: clarity of the innovation, implementer capability, resource availability, organisational compatibility, and management support (Gross et al., 1971).

The study conceptualised school leadership and management practices as the independent variable and implementation fidelity of the Integrated Science Curriculum as the dependent variable. Gross et al.'s (1971) Theory of Curriculum Implementation provided an explanatory framework for understanding how management support, organisational compatibility, and resource availability influence curriculum implementation. Epstein's Theory of Overlapping Spheres of Influence complemented this perspective by explaining how collaboration among schools, families, and communities contributes to educational

outcomes. Together, the two theories provided a comprehensive framework for examining both internal institutional factors and external stakeholder influences affecting curriculum implementation within marginalised communities.

Management support, provision of instructional resources and promoting organizational compatibility are at the core leadership dynamics. In addition, HoIs are also responsible for clarifying the innovation for the newly recruited teachers as well giving them opportunities to up-skill. Within this framework, HoIs are directly responsible for translating national policy into compatible school structures. When HoIs fail to provide administrative support, the remaining three pillars namely; implementer capability (teacher competence) and clarity of the innovation are severely compromised. HoIs are a linchpin in ensuring timely provision of instructional resources as well as providing an enabling teaching learning environment. The enabling environment is particularly critical since teachers deployed to teach JSs were prepared to teach more mature learners compared to JS learners.

Epstein's framework operationalises the institutional integration between schools, families, and communities. Ideologically, CBE requires parents to actively engage in the children's education. Parents, guardians and the community must support the HoI in ensuring the availability of instructional resources and a conducive teaching-learning environment. Indeed, Epstein theory reinforces the idea that student learning is maximised when these three spheres (school, community and home) collaborate symbiotically (Ranjii et al., 2025).

For institutional leaders within the CSMG enclave, Epstein's theory provides the framework for strategic community mobilisation through communication, parenting and learning at home. Moreover, to mitigate resource constraints, school heads must leverage collaboration with the community and localised financing to buffer the school's meagre resource endowments, circling back to fill the resource gaps identified by Gross et al.

2.2 Empirical Review

Within educational leadership and management discourse, school leadership is established as the primary causal determinant in realising the structural aspirations of CBE (Agboola, 2025). As frontline instructional supervisors, school leaders must transcend traditional bureaucratic management to actively guide classroom-level pedagogical execution (Agyeman & Aphane, 2024). This mandate becomes more critical within marginalized and resource-constrained contexts, where learning-focused leadership has a disproportionately stronger impact on protecting curriculum delivery quality under adverse conditions (International Bureau of Education-United Nations Educational Scientific & Cultural Organisation[IBE-UNESCO, 2020]).

2.2.1 Competency Based Education Implementation in Kenya

Kenya adopted CBE after recommendations from various taskforces and summative evaluation of 8-4-4 education system (KICD, 2019). However, despite theoretical ideals, a profound governance crisis undermines the current JS infrastructure in Kenya. The MoE's deployment strategy, which places primary school headteachers in charge of the newly created JS sections, has dramatically escalated the administrative workload of HoIs, making them to oversee up to 11 distinct classes (KEPSHA Rift Valley, 2026). In addition, HoIs are managing the primary section and JS section without non-teaching staff like bursars, store keepers and lab technologists. This structural arrangement has triggered intense institutional friction and a severe leadership pivot gap.

HoIs are overwhelmed by administrative demands and financial bookkeeping. Therefore, they routinely drift away from core instructional leadership, meaning classroom attendance fails to translate into actual

student learning (Awili & Begi, 2021; Global School Leaders, 2024). There is also intense professional friction because newly deployed JS teachers frequently hold equivalent or higher academic qualifications than their supervising primary school institutional leaders, fuelling professional inferiority complexes and straining institutional relationships (Atieno, 2025; Kawinzi, 2025). While, the above findings may be valid in their respective contexts, they not hold for the CSMG, a marginalised community in an entirely different setting demographically and geographically.

The management deficits directly cripples the delivery of the integrated science curriculum. Because the majority of JS educators received pre-service training under the moribund 8-4-4 system which emphasized separate science disciplines, they lack the multi-disciplinary Pedagogical Content Knowledge (PCK) mandated by an inquiry-based science curriculum (Sagwa et al., 2025). With state-sponsored professional development remaining structurally insufficient across Sub-Saharan (Association for Development of Education in Africa[ADEA, 2024]; Mlenge et al., 2025), proactive school leaders must independently step in to organise local Professional Learning Communities (PLCs) to bridge this teacher preparedness gap.

The government has accelerated the provision of In-Service Training (INSETs) for the JS teachers, and there is a need to find out the actual status in the study area. In addition, the findings by ADEA (2024 were from different geographical locations, besides relying on desk reviews. The current study employs direct observations and engages diverse respondents, including the learners who are directly experiencing the new curriculum.

2.2.2 Competency-Based Education Implementation in Marginalised Regions in Kenya

In historically neglected enclaves, chances of lacking specialised science laboratories and reliable electricity are high. Therefore, competent HoIs must excel at resource mobilisation and provision to ensure the curriculum is implemented as envisaged. Furthermore, HoIs must be proficient at guiding teachers to utilise locally available, low-cost materials for practical experiments while establishing data-driven monitoring and formative feedback systems (Mulinge, 2024; William & Gabrieli , 2025). While the study site for the Mulinge 2024 research fall under the areas that have traditionally been affected by marginalisation, there is dearth of research data regarding availability and utilisation of school resource endowments especially as a result of affirmative action. This warrants the current study.

Prior studies investigating CBE leadership dynamics have heavily relied on uniform respondent groups and self-reported metrics. For example, Chepkonga, (2023) established that HoIs in Marakwet East rarely engaged in direct instructional support, even so, the study relied strictly on self-reported questionnaires administered exclusively to HoIs and education officials. Consequently, Chepkonga's design was highly vulnerable to social desirability bias. While Kawinzi (2025) study highlights the friction emanating from school leadership, it did not involve the students who actually experience the curriculum execution directly. This paper bridges these gaps by investigating the implementation of the ISC through empirical triangulation. The current study captures and cross-references qualitative and quantitative insights directly from IS teachers, learners, and HoIs within the CSMG enclave. Therefore, this study exposes the unvarnished reality of classroom execution, revealing exactly how school leadership practices shape ISC execution fidelity in real time within resource-starved environments.

3.0 METHODOLOGY

3.1 Research Design and Paradigm

This study adopted a pragmatic qualitative-dominant mixed-methods orientation. The pragmatic worldview enabled the researcher to integrate qualitative insights with descriptive

quantitative evidence in order to obtain a comprehensive understanding of curriculum implementation within marginalized contexts (Creswell & Creswell, 2023). The study utilized an instrumental case study design to provide an in-depth examination of how school leadership practices influence implementation of the Integrated Science Curriculum within the Cherengany/Sengwer Marginalised Group. The design was appropriate because it facilitated collection of data from multiple sources and enabled detailed exploration of a contemporary educational phenomenon within its real-life setting (Yin, 2023).

3.2 Target Population and Sampling Procedures

The target population comprised HoIs, integrated science teachers, and grade nine learners within public JSs serving the CSMG residing in Trans-Nzoia and West Pokot counties. The accessible population consisted of 11 HoIs, 11 IS teachers, and 546 grade nine learners distributed across 11 public JSs (N=568). A multi-stage sampling approach was operationalized to select the final sample.

First, cluster sampling was used to manage geographical dispersion. The Rift Valley region was purposively selected following sentiments expressed by many speakers in KEPSHA rift valley conference held in Lodwar town in Turkana County, Kenya. In the meantime, education stakeholders, community and political leaders from marginalised communities had decried the status of implementation of CBE in their regions, (Kinyanjui, 2024; Mboto, 2025; Ndigo, 2025).

However, there are many VMGs in the Rift Valley region Kenya, hence CSMG was purposively sampled on the grounds of being the moderately spread vulnerable marginalised group. Furthermore, some of the documented complains emanated from the counties where the CSMG reside (Mboto, 2025). CSMG is spread in three counties (West Pokot, Trans-Nzoia and Elgeyo Marakwet) of the 14 counties in the Rift Valley region (NGEC, 2023). To further manage the spread, the researcher developed two clusters; West Pokot/Trans-Nzoia cluster and Elgeyo Marakwet/Trans-Nzoia cluster. The West Pokot/Trans-Nzoia cluster was randomly selected from the two clusters. The West Pokot/Trans-Nzoia cluster had 11 JSs and all of them were included in the sample to achieve data saturation. Simple random sampling was used to select one of the clusters since both clusters were ideally similar in demographics except the governance jurisdiction in terms of counties.

Further, purposive sampling was used at the institutional level to sample grade 9 learners in each of the JSs. Grade nine learners having the longest tenure at JSs were perceived as a rich source of the sought-after information. All 11 HoIs and all 11 IS teachers were also purposively sampled as key administrative managers and frontline IS curriculum implementers, respectively. The integrated science learning area was purposively selected because it did not show strong performance in KJSEA 2025 as well as national outcry by stakeholders about its implementation fidelity (Kinyanjui, 2024; Kisia, 2025).

Lastly, stratified random sampling was utilized within the learner cohorts to select 93 learners (representing at least 10% of the population per school, ensuring a minimum of 8 members per focus group) while guaranteeing equitable gender representation. The final sample size comprised 115 respondents comprising; 93 grade 9 learners, 11 HoIs and 11 IS teachers.

3.3 Data Collection Methods and Procedures

The researcher piloted the instruments in the neighbouring Elgeyo-Marakwet county in a school attended by the CSMG to enhance the dependability of the findings. Through the pilot study, appraisals from university supervisors and review of the instruments for face, construct and content validity by panel of experts from University of Eldoret, the instruments that were used to collect data were refined and subsequently deployed.

To achieve methodological triangulation, data were collected using four distinct mainly qualitative but also quantitative instruments. First, Focus Group Discussions (FGDs) were operationalized with the 93 grade nine learners to capture the learner-side pedagogical reality. Secondly, researcher-administered questionnaires (Interviews) with the 11 IS teachers was done to cross-validate self-reported compliance against operational challenges. Thirdly, Semi-Structured Observation Protocols (SSOP) were executed by the researcher as a participant-observer to document live instructional environments, lesson planning compliance, and resource utilization in real time and finally, in-depth interview schedules with the 11 HoIs to investigate institutional management support and administrative bottlenecks was operationalized.

During the data collection process, the researcher employed data saturation as well as collecting data from all the sampled respondents to achieve statistical saturation. To ensure credibility and confirmability, the researcher employed prolonged stay in the field for five months where member checking, audit trail by available peers were operationalized. Moreover, constant appraisals by university supervisors alongside the researcher's reflexivity aided in enhancing the research findings' trustworthiness.

3.4 Data Analysis

The collected data were analysed using an interpretive approach, blending qualitative and quantitative streams. Qualitative data in the form of audio recordings from interviews and focus groups were transcribed verbatim. The text, alongside field notes from the SSOP, was subjected to thematic analysis. Data were coded inductively, categorised, and aligned with the "management support", "instructional resources," and "organisational compatibility" pillars of the Gross et al. (1971) model to track implementation fidelity. The researcher familiarised himself with the data, generated codes, created themes, reviewed/defined themes and finally wrote the report. The whole process was iterative, and the researcher remained reflexive to avoid being clouded by personal biases.

Quantitative data yielded discrete data points from the researcher-administered questionnaires and observation checklists, which were cleaned, coded, and analysed using basic descriptive statistics with SPSS version 27, where frequencies and percentages were used to establish baseline trends. Finally, qualitative narratives and quantitative data were integrated. This entailed cross validating the questionnaire responses against direct classroom observations and interview insights.

4.0 FINDINGS & DISCUSSION

4.1 Respondent Baseline Profiles and Institutional Realities

Fieldwork yielded a 100% response rate across all participant categories (n = 115), comprising 11 heads of institutions, 11 integrated science teachers, and 93 grade nine learners. See illustration in Table 1 below

Table 1: Response Rates of respondents

Respondents	Sample size administered	Actual response	% Return rate
Heads of Institutions	11	11	100.0
Integrated Science Teachers	11	11	100.0
Learners of Integrated Science	93	93	100.0
Total	115	115	100.0%

Source: Field Survey 2026

To understand how leadership and management practices shaped curriculum execution, these demographic profiles were analysed through an institutional management lens. As illustrated by table 2 below, majority of HoIs had long tenure institutional leaders.

Table 2: Age and Tenure of Heads of Institutions

Variable	Category	n	%
Age	41–50 years	3	27.3
	51–60 years	8	72.7
Tenure as HoI	1–6 years	3	27.3
	7-10 years	2	18.2
	Above 11 years	6	54.5

Source: Field Survey 2026

HoIs of JSs within the CSMG enclave were mature and administratively experienced. The data revealed that 72.7% (n=8) of the school leaders are aged between 51 and 60 years, while the remaining 27.3% (n=3) were in the age bracket 41–50 years. This maturity correlates with extensive administrative tenure where 54.5% (n=6) of the HoIs had served as school heads for 11 years or more, 18.2% (n=2) for 7 to 10 years, and 27.3% (n=3) for 1 to 6 years. While these data imply strong institutional stability, an evaluation of the formal academic qualifications of these school leaders reveals a structural fault line. Table 3 below illustrates

Table 3: Comparison of Academic Qualifications of Teachers of ISC and HoIs

Qualification Level	n	%	Status relative to TSC CPG (2018)
Primary Teacher Education (PTE) Certificate	2	18.2	Below University Degree Requirement
Diploma in Education	5	45.4	Below University Degree Requirement
Bachelor’s Degree in Education	4	36.4	Meets University Degree Requirement
Total non-Degree Holders	7	63.6	Non-Compliant
Total Degree Holders	4	36.4	Compliant

Source: Field Survey 2026

As detailed in Table 3, the majority of heads of institutions were aged between 51 and 60 years (72.7%, n=8) and possessed extensive administrative experience, with (54.5%, n=6) having served for 11 years or more. Despite this administrative maturity, an evaluation of formal academic qualifications revealed a notable structural limitation. Only (36.4%, n=4) of the HoIs held a bachelor’s degree in education, while the remaining (63.6%, n=7) possessed primary-tier credentials—either a Diploma (45.4%, n=5) or a PTE Certificate (18.2%, n=2). Consequently, nearly two-thirds of the institutional leaders failed to meet the basic university degree requirement stipulated by the Teachers Service Commission Career Progression Guidelines (TSC CPG, 2018), echoing broader national patterns reported by Usawa Agenda (2026).

In addition to the leadership qualification deficit, a pronounced demographic juxtaposition exists between the heads of institutions and the integrated science teacher cohort (see Table 4).

Table 4: Comparison of Age, experience level and Qualification Supervision Output of Integrated Science teachers and Heads of Institutions

Variable	School Leaders (HoIs, n = 11)	Integrated Science Teachers (n = 11)
Dominant Age Bracket	51–60 years (72.7%, n=8)	21–30 years (81.8%, n=9)
Experience Level	Above 11 years tenure (54.5%, n=6	2 years and below teaching integrated science (90.9%, n=10)
Qualifications / Supervision Output	63.6% non-degree holders (n=7)	90.9% lessons without lesson plan (n=10)

Source: Field Survey 2026

The IS teaching staff represents a predominantly young and novice workforce, with 81.8% (n=9) falling into the 21–30 age bracket and 90.9%, (n=10) having taught integrated science for two years or less. This institutional mismatch—older, non-degree-holding administrators supervising novice science teachers—correlates with significant instructional oversight failures. Indeed, 90.9% (n=9) of observed lessons were executed without a written lesson plan.

This structural arrangement probably creates professional tension friction among the staff. Newly deployed JS integrated science educators, who frequently hold higher university degrees, find themselves under the direct administrative supervision of primary-trained HoIs. This academic credential gap fuels professional inferiority complexes. One of the ISC teachers noted that

The HoI is not qualified to teach in junior school. According to the TSC, for a teacher to be deployed to teach in junior school they must be a graduate with at least two teaching subjects. My HoI does not qualify to teach junior school. How can one supervise where they even don’t qualify to teach. (29/04/2026)

This strains interpersonal relationships and punctures the HoIs' authority as instructional leaders. Frustrated and incapacitated HoIs are therefore unable to provide deep pedagogical guidance for a multidisciplinary integrated science learning area. Consequently, the overwhelmed HoIs default to spatial management of curriculum implementation. This management deficit manifests clearly in subjects scheduling where HoIs routinely coerce IS teachers into unmanageable cross-curricular assignments. The teachers are compelled to teaching learning areas like Creative Arts & Sports (CAS) where they lack foundational knowledge. This structural misallocation of talent drains the teachers' instructional bandwidth which directly degrade their effectiveness and curriculum implementation fidelity during integrated science lessons.

4.2 Academic Qualification Asymmetry

The study examined how school leadership and management practices influence implementation fidelity of the Integrated Science Curriculum within junior schools serving the Cherengany/Sengwer Marginalised Group. Consistent with Gross et al.’s (1971) framework, effective curriculum implementation depends largely on management support, resource availability, organizational compatibility, and implementer capacity. Findings revealed notable differences between the academic qualifications of integrated science teachers and those of heads of institutions. While all integrated science teachers possessed Bachelor's degrees, only 36.4% (n=4) of the heads of institutions met the Teachers Service Commission degree qualification threshold. The remaining 63.6% (n=7) possessed diploma or PTE

qualifications.

A notable disparity emerged between the supervisors and the implementers within the enclave. While 100% of the deployed IS teachers held university Bachelor's degrees, only 36.4% (n=4) of the HoIs met the statutory TSC requirement of holding a bachelor's degree in education. The majority (63.6%, n=7) possessed either a Diploma in Education or a foundational PTE certificate.

This educational inversion triggered significant institutional clashes, echoing findings by (Kawinzi, 2025). Because the JSs are physically domiciled within existing primary school infrastructure, incumbent primary headteachers retain administrative control over JS-tier IS teachers. One JS teacher (TJS001) lamented

You see, when you air out your views on pertinent issues concerning learners, like the need for certain resources or requirements, the HoI feel like you are undermining him. So, instead of your concern being addressed, it feels like you are challenging their authority. In such conditions, the HoI acts in a manner to show that, regardless of level his education, he is the boss. This discourages me from asking for any resources I require in the future. You see, the outcome is predetermined. (TJS001, 25 March 2026)

Further, empirical data revealed that IS teachers perceived PTE and diploma-holding HoIs as academically unqualified to evaluate secondary science instruction. To compensate for this deficit in supervisory authority, teachers reported that HoIs engaged in aggressive administrative micromanagement to project power. Rather than providing instructional leadership, school heads actively fought to achieve administrative legitimacy. This structural tension directly undermined organisational compatibility, driving a strong clamour among teachers for complete JS autonomy.

4.3 Mobilisation and Provision of Teaching and Learning Resources (TLRs)

Resource provision dictates the pedagogical boundaries of an inquiry-driven practical learning area like integrated science. The study revealed that while HoIs successfully bridged the provision of physical classrooms, severe operational bottlenecks paralysed core instructional delivery in several ways.

Firstly, HoIs failed to achieve the mandatory 1:1 textbook-to-learner ratio. Severe distribution failures forced learners to share textbooks at an obstructive ratio of 1:5. This was worsened by volatile publisher content and uneven government supply lines, validating former TSC Chief Executive Officer (CEO) Ms Nancy Macharia's concerns regarding curriculum content instability (Citizen TV, Kenya, 2024). Furthermore, class sizes exhibited extreme regional disparities, fluctuating from a manageable 9 learners in remote outposts to heavily overcrowded classrooms peaking at 82 learners. These findings on overcrowded classes and inadequate instructional resources are similar to Mlenge et al., (2025) in Tanzanian studies on leadership strategies used in CBE implementation.

Secondly, Junior schools were profoundly starved of laboratory equipment and Learner Digital Devices (LDDs). While HoIs blamed the government's constrained provision of LDDs and inadequate and delayed capitation, a concerning administrative apathy emerged. One HoI explicitly minimised the urgency of providing laboratory-related instructional resources, justifying their inaction by claiming that teachers rarely utilised the few laboratory resources that were available.

Thirdly, direct classroom observation through SSOP revealed that in multiple institutions, the few available science materials were locked inside the HoI's or Deputy Head of Institution (DHoI) office, unknowingly discouraging their daily use. Furthermore, qualitative teacher interviews surfaced critical allegations of financial diversion, where HoIs reportedly misappropriated capitation funds explicitly earmarked for the JS to subsidise primary school operations.

Lastly, there emerged a sharp geographical disparity. While schools within the West Pokot cluster benefited from a government-sponsored school feeding program, which educators confirmed drastically

minimized learner truancy. The situation in JSs in the neighbouring Trans-Nzoia County but within the CSMG enclave lacked nutritional support, exacerbating challenges of school truancy and eventual school dropouts severely affecting transition rates, a conclusion reached in an earlier study, (MoE, 2017).

4.4 Cultivating a Conducive Teaching and Learning Environment

While HoIs faced a myriad of challenges, they attempted to foster supportive environments through targeted administrative adjustments. For instance, to mitigate the psychological friction of university-trained teachers operating within a primary school compound, HoIs implemented mentorship sessions and strategically assigned institutional leadership responsibilities to integrated science teachers to foster a sense of belonging. Additionally, several HoIs abolished mandatory teacher financial contributions for staff meals to ease the economic burden on newly deployed integrated science teachers.

With regard to severe lack of science laboratories, proactive HoIs initiated collaborative networks with neighbouring senior schools to grant JS learners access to functional laboratories. However, the study found that where HoIs failed to establish formal, memoranda of understanding (MoU), such collaborations failed. Teachers of integrated science faced institutional bureaucracy and gatekeeping from senior school principals, rendering this sharing strategy ineffective in practice due to lack of proper MoU on utilization of the laboratories.

4.5 Promotion of Continuous Teacher Professional Development (CTPD)

Since majority of current JS educators received pre-service training under the moribund 8-4-4 system which emphasized isolated discipline; they lack the multi-disciplinary PCK required for integrated science (Sagwa et al., 2025). School-based capacity building is therefore vital.

The study established that while HoIs routinely shared information regarding external training workshops organized by Semi-Autonomous Government Agencies (SAGAs), they fundamentally failed to fund them. HoIs revealed that due to depleted school coffers, they (HoIs) were unable to financially sponsor IS teachers, leaving unable to afford registration fees. Critically, 0% (n=0) of the 11 audited HoIs had initiated or formalized any localized, school-based CTPD programs to bridge the pedagogical gaps of their staff, mirroring the broader Sub-Saharan deficit in teacher professional support (ADEA, 2024).

4.6 Stakeholder Engagement and Instructional Supervision

In line with Epstein's Theory of Overlapping Spheres of Influence, HoIs maintained active Boards of Management (BOMs) and Parents Associations (PAs) to authorize local levies to supplement the inadequate state funding. Grade nine learners revealed that HoIs had initiated working collaborations with local chiefs and members of provincial administration to manage learners' truancy and school dropout cases. However, the extreme structural poverty of the CSMG consistently neutralized these initiatives.

For instance, leadership attempts to organize experiential field trips to reinforce complex scientific concepts collapsed across the board because parents could not fund the excursions. During one focus group, a grade 9 student (LJS009) explained how poverty stopped their practical learning:

"Our teacher organized a trip for us to go out to Turkwel Gorge, ... KenGen power station to learn about electricity, but we did not go, ... because very few learners were able to pay… Even a trip to an agriculture field day failed just because parents could not pay." (Learner, LJS009)

In terms of instructional supervision, it emerged that HoIs struggled. Overwhelmed by expanding administrative workloads, HoIs delegated classroom lesson observations to Deputy HoIs or Senior teachers (Kenya Primary Schools Heads Association [KEPSHA Rift Valley, 2026]). Paradoxically, DHoIs and

senior teachers in primary school have comparable qualifications as the HoIs and may lack the subject-matter expertise to evaluate integrated science pedagogy.

To compensate for this inability to conduct meaningful technical supervision and evaluation, some HoIs resorted to spatial micromanagement by physically relocating the JS classrooms directly adjacent to the HoIs' office to monitor teacher attendance and basic syllabus coverage visually. This implies that instead of inspiring, stimulating, and actively guiding instructional activities (Barasa, 2023), citing (Ogbo, 2015), school leaders within this marginalised enclave remain trapped in a limitation for basic structural control.

5.0 SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5. 1 Summary

Following the foregoing presentation and discussion, the researchers summarised the key findings. First, a severe structural qualification gap exists between supervisors and frontline ISC educators. While 100% of the IS teachers held university degrees, 63.6% of the HoIs lacked a Bachelor's degree, holding primary-tier credentials (diploma or PTE certificates). This asymmetry undermined the HoIs' supervisory legitimacy, generating institutional friction and ISC teacher clamour for JS administrative autonomy.

Secondly, HoIs were burdened by heavy workloads. Consequently, HoIs largely abandoned technical pedagogical oversight. Mandated lesson observations were routinely delegated to primary school deputies and senior teachers. Moreover, to compensate for inability to directly supervise IS teachers, several HoIs resorted to superficial, spatial micromanagement, visually monitoring basic teacher attendance by physically relocating grade nine classrooms adjacent to the administration block.

Thirdly, some leadership practices actively restricted instructional material utilization. HoIs failed to maintain a functional 1:1 textbook-to-learner ratio, leading to a severe 1:5 sharing bottleneck in one of the counties, probably due to inaccurate baseline data tracking. Further, critical instructional apparatus and learner digital devices were routinely unavailable, inadequate and sometimes locked away inside administrative offices to prevent damage. Some teachers expressed concerns regarding the allocation and utilisation of resources designated for junior school programmes. These perceptions suggest the need for greater transparency and accountability in resource management to support effective curriculum implementation.

Fourthly, HoIs provided mentorship to teachers of integrated science by incorporating them in various committees in the school. The school administrators encouraged teachers to positively take their current responsibilities and assist the learners as their grievances are resolved.

Lastly, HoIs were pro-active in sharing available opportunities for teachers to undergo upskilling. However, they never supported teachers financially to attend such trainings due to lack of funds in the school. Paradoxically, the HoI never organised internal seminars or workshops to re-tool teachers.

5.2 Conclusions

The study concludes that school leadership and management practices significantly influence implementation of the Integrated Science Curriculum within junior schools serving marginalized communities. The findings indicate that disparities in academic qualifications between heads of institutions and integrated science teachers may affect instructional supervision and curriculum support.

The study further concludes that implementation fidelity is constrained by inadequate instructional resources, limited science infrastructure, insufficient opportunities for teacher professional development, and persistent socio-economic challenges affecting learners and

their families.

Despite these constraints, heads of institutions demonstrated commitment to supporting implementation through mentorship, stakeholder engagement, and local resource mobilization initiatives. However, sustainable implementation of the Integrated Science Curriculum requires stronger policy support, improved institutional capacity, and enhanced investment in science education infrastructure within marginalized regions.

5.3 Recommendations

Based on the empirical findings and conclusions of this study, the following recommendations are structured under policy formulation, institutional practice, and areas for further research:

1. Policy Recommendations

The Ministry of Education and the Teachers Service Commission should strengthen governance structures for junior schools by ensuring that administrators responsible for curriculum supervision possess the requisite academic and professional competencies to support implementation of the Integrated Science Curriculum. In addition, clear operational guidelines should be provided to promote effective coordination between junior and primary school sections where integrated institutional arrangements continue to exist.

2. Practical Recommendations

Capacity Building for Heads of Institutions (HoIs): Pending full structural autonomy, the Directorate of Quality Assurance and Standards (DQAS) should design and implement targeted technical training for existing HoIs to equip them with the supervisory skills required for secondary STEM curriculum implementation.

Streamline Administrative Financial Management: The MoE should immediately recruit and deploy qualified school bursars to handle financial and procurement operations, thereby freeing HoIs to focus on instructional leadership and curriculum supervision.

Direct Provision of STEM Infrastructure through School Equipment Production Unit (SEPU). To prevent institutional diversion of standard financial capitation, the MoE should utilize the SEPU to directly procure and distribute science apparatus, chemicals, and mobile laboratory benches directly to marginalized schools.

3. Recommendations for Further Research

Impact Evaluation of Leadership Autonomy: Future research should evaluate the educational outcomes and administrative efficiency of pilot JSs operating under fully autonomous leadership versus those under comprehensive school management.

Cost-Effectiveness of Mobile Science Infrastructure: Empirical studies are recommended to assess the long-term cost-effectiveness and pedagogical impact of mobile laboratory units compared to fixed laboratory infrastructure in resource-constrained schools.

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