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ICT Equity and the Digital Divide in Competency-Based Curriculum Implementation: Evidence from Junior Schools in Meru County, Kenya.

Isaac Mwangi Baariu¹, Dr. Charles Munene Gachoki², Seline Wanjiku³

Mizizi Elimu Afrika^{1,2,3}

Corresponding Author Email: baariuisaac14@gmail.com

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Abstract

ABSTRACT The integration of Information and Communication Technology (ICT) within Kenya's Competency-Based Curriculum (CBC) presents significant opportunities for learner-centered pedagogy and improved educational outcomes. However, limited empirical evidence exists on the magnitude of ICT access disparities and their implications for equitable CBC implementation in junior secondary schools. Guided by the Equity Theory of Educational Management and complemented by the Technology Acceptance Model and constructivist perspectives, this study employed a convergent parallel mixed-methods design to examine ICT access inequalities in junior secondary schools in Meru County, Kenya. A stratified random sample of 52 schools, 284 teachers, and 52 principals was selected from urban and rural settings. Data were collected through questionnaires, semi-structured interviews, focus group discussions, and document analysis. Findings revealed substantial disparities in ICT access and utilization. Urban private schools reported a mean of 34.6 functional computing devices per school, compared with 6.8 devices in rural public schools. Similarly, internet connectivity was available in 100% of urban private schools but in only 26% of rural public schools. Teacher digital competency scores averaged 79.1% in urban private schools and 46.8% in rural public schools. These inequities constrained technology-enhanced instruction, formative assessment, and competency development, thereby undermining the equity objectives of the CBC. The study contributes to knowledge by providing context-specific evidence on the multidimensional digital divide and advancing an equity-oriented framework for addressing ICT disparities. It recommends differentiated infrastructure investment, context-

responsive teacher professional development, and strengthened multi-stakeholder partnerships to promote equitable CBC implementation.

Key terms: Digital Divide, ICT Access, Competency-Based Education, Equity Theory, Teacher Digital Preparedness, Rural-Urban Disparities

1. INTRODUCTION

Kenya's transition from the 8-4-4 curriculum to the Competency-Based Curriculum (CBC) represents one of the most consequential educational reforms undertaken in Sub-Saharan Africa in the current decade. Instituted progressively from 2017, CBC reconstitutes the very epistemological foundations of schooling, shifting from content memorisation and summative examination performance toward the holistic development of values, skills, and competencies suited to a rapidly transforming socioeconomic environment (Njagi & Kamau, 2022). The junior secondary school tier, introduced under the 2-6-3-3 structural framework in 2023, occupies a pivotal position within this reform, demanding from its teachers a sophisticated command of learner-centred pedagogy, project-based learning, and, critically, the purposeful integration of Information and Communication Technology (ICT) into every domain of instructional practice (KICD, 2021; TSC, 2024). Yet notwithstanding CBC's transformative aspirations, empirical evidence increasingly signals that the curriculum's technology-inclusive mandate is encountering significant structural resistance at the school level. This is a challenge that existing literature has addressed in broad national terms but has yet to examine with sufficient granularity at the county and sub-county levels, particularly within the diverse ecological and socioeconomic terrain of Meru County.

Despite the visionary ambition of CBC's technology-inclusive mandate, the ground-level reality across Kenya's school landscape reveals a deeply fractured picture. The digital divide, understood not merely as a binary condition of access versus non-access but as a graduated spectrum of differential use, quality, and outcome (Scheerder et al., 2021), operates along multiple axes in Kenyan education: between public and private schools, between urban and rural settings, and between schools in economically vibrant and economically marginalised communities. Nationally, studies have documented stark disparities in ICT infrastructure: Mutisya and Makokha (2020) established that fewer than 30% of rural public secondary schools in Kenya possessed functional computer laboratories, while Ng'ang'a et al. (2022) found that teacher digital literacy scores were consistently lower in county-level schools than in their urban counterparts. In Meru County specifically, these axes intersect to produce a configuration of ICT inequity that risks transforming CBC from an instrument of educational justice into a mechanism for reproducing existing social stratifications. The county's unique blend of highland agricultural zones, semi-arid lowland areas, and rapidly urbanizing town centres creates a heterogeneous school environment whose ICT equity dynamics remain inadequately theorized and empirically under-documented, a research gap that this study directly addresses.

This study situates itself at the confluence of educational equity, technology policy, and curriculum implementation research. Meru County was selected deliberately: its administrative geography encompasses both urbanising municipalities and persistently rural sub-locations, enabling a structured comparative analysis of ICT equity across varied socioeconomic and infrastructural contexts within a single county unit; an analytical design that yields more policy-actionable findings than broad national surveys. The study focuses specifically on junior schools in Meru County, mapping ICT access disparities across four urban municipalities: Meru Town, Mikinduri, Nkubu, and Maua and four rural zones: Thangatha, Kiguchwa, Kionyo, and Kanuni. Guided by the Equity Theory of Education Management, the study is anchored in two explicit research questions: first, what is the nature and magnitude of equity gaps in ICT infrastructure, teacher digital preparedness, and learner device access across public and

private school categories in Meru County?; and second, what are the implications of these disparities for instructional delivery, formative assessment, and learner competency development under CBC? The study pursues two interlocking objectives corresponding to these questions, and its significance is both analytical and prescriptive it seeks not only to document inequality but to contribute actionable, theoretically grounded recommendations for its redress.

2. CONTEXTUAL BACKGROUND

2.1 CBC and the ICT Mandate at Junior Secondary Level

The Kenya Institute of Curriculum Development's Basic Education Curriculum Framework articulates digital literacy as a cross-cutting competency to be cultivated across all learning areas from the earliest grades (KICD, 2021). At the junior secondary level, this mandate intensifies: the learning area of Digital Literacy and Applied Technology explicitly positions ICT as both subject content and pedagogical medium, requiring teachers to design learning experiences in which learners not only engage with digital tools but develop critical capacities for evaluating, producing, and communicating through technology (Republic of Kenya, 2022). The TSC's Competency-Based Curriculum Teacher Professional Development Framework (2024) further operationalises this expectation, stipulating that all junior secondary school teachers demonstrate proficiency in technology-enhanced lesson planning, digital formative assessment, and the facilitation of online collaborative learning. Taken together, these policy instruments constitute a coherent and ambitious ICT integration architecture, one whose realisation presupposes levels of digital infrastructure, teacher preparedness, and learner device access that are far from uniformly distributed across Kenya's school landscape.

The rollout of Grade 7 in 2023, the first cohort of junior secondary learners under CBC was, by government accounts, broadly successful in terms of transition rates and administrative enrolment (MoE, 2023). However, this aggregate optimism obscures significant implementation heterogeneity. The Government of Kenya has, since 2013, pursued a succession of ICT access initiatives, including the Primary School Laptop Programme, the Secondary School Tablet Initiative, and, most recently, the Digital Literacy Programme (DLP) under the Big Four Agenda, all of which sought to narrow the technology access gap across public schools (Ngigi & Busolo, 2023). Yet independent analyses have consistently documented a troubling pattern: procurement-centred programmes that deploy devices without commensurate investment in connectivity, maintenance, or teacher capacity systematically fail to yield sustainable pedagogical integration (Ngigi & Busolo, 2023; Waudu & Ouya, 2022). National school census data for 2023 indicate that while 61% of public secondary schools reported owning government-procured ICT devices, functional utilisation rates fell below 45% in rural schools, primarily due to hardware obsolescence, software failures, and the near-total absence of post-provision technical support (MoE, 2023). This policy-implementation chasm is not incidental but structural, rooted in decades of differential investment in school infrastructure that CBC's compressed implementation timeline has done little to rectify and it is precisely this gap that the present study, focused on Meru County's junior schools, seeks to examine and address.

The junior secondary tier presents additional contextual challenges specific to its institutional novelty. Unlike the well-established secondary school system under 8-4-4, junior secondary schools under CBC are operating in an administratively transitional state: many facilities were repurposed from upper primary school classrooms, lack dedicated ICT laboratories, and are staffed by teachers whose pre-service training predates CBC's technology-integrated pedagogical requirements (Kagama & Irungu, 2023). The TSC's redeployment of primary school teachers to junior secondary, which was driven by staffing exigencies rather than digital competency criteria, has created classrooms in which teachers are expected to deliver

ICT-enriched CBC content without the foundational digital training that such delivery demands. These contextual realities sharpen the relevance of the study's first research objective: to examine the nature and magnitude of equity gaps in ICT infrastructure, teacher digital preparedness, and learner device access across public and private school categories in Meru County.

2.2 Meru County: A Landscape of Educational Heterogeneity

Meru County's educational landscape is characterized by pronounced heterogeneity that mirrors, and in some respects amplifies, broader national patterns of inequality. The county's urban municipalities: Meru Town, Mikinduri, Nkubu and Maua benefit from superior physical infrastructure, proximity to ICT service providers, greater household income levels, and a concentration of well-resourced private schools whose fee structures enable sustained investment in technology. Rural zones, by contrast, including Thangatha, Kiguchwa, Kionyo, and Kanuni, are characterized by sparse infrastructure, unreliable electricity supply, weak mobile data coverage, and an overwhelming dominance of public schools operating on capitation grants that are structurally inadequate for ICT investment (Meru County Education Department, 2023). The junior secondary school expansion has, in several of these rural zones, been accommodated in repurposed primary school facilities that lack dedicated ICT laboratories, reliable electrical wiring, and the physical space required for technology-enabled pedagogy a situation documented in the Meru County Education Sector Annual Report (2023), which recorded that only 18% of rural public junior schools in the county possessed a functional computer laboratory as of the 2022/2023 academic year, compared with 76% of urban private schools. Internet connectivity data from the same report indicate that broadband or stable mobile internet access was available in 82% of urban private schools but merely 24% of rural public schools in the county figures that directly foreshadow the quantitative findings reported in Section 5 of this study and substantiate the urgency of the equity analysis undertaken here.

At the policy level, Meru County Government has, since 2021, sought to address educational technology gaps through its County Integrated Development Plan (CIDP) 2023–2027, which allocates targeted funding for ICT laboratory construction in underserved public schools and commits to a phased rollout of solar-powered digital hubs in rural sub-locations (Meru County Government, 2023). While commendable in intent, independent monitoring has flagged implementation delays attributable to procurement bottlenecks, contractor non-performance, and the limited technical capacity of the county education department to supervise ICT infrastructure projects challenges that have deferred the materialisation of committed investments in several of the rural zones sampled in this study. At the national level, the recently launched Kenya National Digital Master Plan 2022–2032 prioritises school connectivity as a foundational pillar, targeting universal broadband access in all public schools by 2030 a goal that, while ambitious, implies a decade-long horizon that is substantially misaligned with CBC's current implementation demands (MoE, 2023).

The county's economic base anchored in smallholder tea, coffee, and miraa cultivation shapes both the resource availability of rural public schools and the household-level technology access of learners. While urban middle-class households increasingly provide learners with personal smartphones and home internet access, rural agricultural households face competing resource priorities that preclude investment in learner devices. This household-level digital inequality compounds school-level deficits, creating a situation in which rural public school learners lack both institutional and domestic pathways to digital engagement — a compounded deprivation consistently associated in the literature with diminished educational outcomes and reduced capacity for self-directed, technology-mediated learning (van Deursen & Mossberger, 2021). It is the intersection of these institutional and household dynamics and their implications for CBC instructional delivery and formative assessment that constitutes the analytical core of this study's second research objective: to determine the implications of ICT access disparities for

instructional delivery, formative assessment, and learner competency development under CBC in Meru County's junior schools.

3. THEORETICAL FRAMEWORK

This study integrates three complementary theoretical frameworks: the Equity Theory of Education Management, the Technology Acceptance Model (TAM), and Social Constructivism; which combined analytical reach maps directly onto the study's three core variables: ICT infrastructure equity, teacher digital adoption, and learner competency development. Taken together, these frameworks constitute a conceptual architecture in which equitable resource allocation (Equity Theory) creates the enabling conditions for teacher technology adoption (TAM), which in turn generates the mediated learning environments through which learner competencies are socially constructed (Social Constructivism). Each theory thus addresses a distinct but interdependent dimension of the digital divide, and their integration is deliberate rather than additive.

The primary normative lens is the Equity Theory of Education Management, which, drawing on Rawlsian distributive justice and the capabilities approach, holds that resources must be allocated proportionally to differential institutional need so as to enable comparable outcomes across structurally unequal settings (Tikly & Barrett, 2021). The theory's core distinction between horizontal equity (equal treatment of comparably situated learners) and vertical equity (differential allocation to compensate for unequal starting conditions) (Unterhalter, 2022) provides the normative standard against which current ICT investment patterns are evaluated in this study. Its direct linkage to the study's infrastructure variable is explicit: ICT provision levels across urban private and rural public schools are assessed against vertical equity criteria to determine the adequacy of current allocation. Where TAM connects is at the level of teacher adoption: the Technology Acceptance Model (Alotaibi & Roussinov, 2022) posits that perceived usefulness, perceived ease of use, and teacher self-efficacy mediate the translation of physical infrastructure into actual instructional practice. Even equitable device provision cannot achieve pedagogical integration unless teachers perceive available tools as contextually useful for CBC delivery and feel confident deploying them a relationship directly informing this study's analysis of teacher digital preparedness as a mediating variable.

Social Constructivism, particularly Vygotsky's concept of the Zone of Proximal Development (ZPD) and the sociocultural role of mediational tools, provides the third and most learner-centred dimension of the framework (Moll et al., 2021). Within neo-Vygotskian theory, digital technologies function not as content delivery systems but as cognitive artefacts that extend and restructure the processes through which learners collaborate, construct knowledge, and develop higher-order competencies. Critically, the ZPD framework explains how ICT-mediated peer collaboration and teacher scaffolding can elevate learner performance beyond what individual effort alone can achieve, a principle central to CBC's project-based and competency-development mandate. Denial of access to these mediational tools therefore constitutes not merely a resource inequity but a developmental deprivation that constrains the cognitive environment available to rural public school learners and directly undermines CBC's competency outcomes, which is the study's third dependent variable. The three theories thus operate in sequence: equitable ICT infrastructure (Equity Theory) enables meaningful teacher adoption (TAM), which activates digitally mediated social learning environments (Social Constructivism) within which the competencies CBC mandates can be authentically cultivated.

4. RESEARCH METHODOLOGY

The qualitative strand comprised 24 purposively selected participants, including school principals, ICT coordinators, and county education officials chosen on the basis of their direct involvement in ICT

implementation, resource allocation, and curriculum oversight. In addition, six focus group discussions were conducted with Grade 7 and 8 learners (six participants per group), ensuring representation across urban and rural contexts, gender categories, and varying levels of ICT exposure. All interviews and focus group discussions were audio-recorded with participant consent, transcribed verbatim, and analyzed using Braun and Clarke's (2022) six-phase reflexive thematic analysis framework. To enhance trustworthiness, the study employed methodological triangulation through the integration of interview data, learner focus group discussions, survey findings, and documentary evidence drawn from school ICT policy documents, Ministry of Education school census reports, county education department annual reports, and TSC professional development records. Data source triangulation was further achieved through the inclusion of multiple stakeholder groups occupying different positions within the education system. Credibility was strengthened through member checking of interview summaries, while dependability and confirmability were enhanced through maintenance of a comprehensive audit trail documenting data collection, coding decisions, theme development, and interpretive processes. Quantitative and qualitative findings were subsequently integrated through joint displays and comparative analysis of convergent, complementary, and divergent findings, thereby generating meta-inferences that provided a holistic understanding of ICT equity dynamics within the implementation of Competency-Based Education. Ethical clearance was obtained from Meru University of Science and Technology, and research permissions were secured from NACOSTI and the Meru County Director of Education.

5. FINDINGS AND DISCUSSION

5.1 ICT Infrastructure: A Tale of Two School Systems

The quantitative findings reveal a stark bifurcation in ICT infrastructure between urban private and rural public junior schools in Meru County—a pattern consistent with recent national-level assessments of CBC readiness (MoE, 2023; Waudo & Ouya, 2022). Urban private schools reported a mean of 34.6 functional computing devices per school (SD = 8.3), yielding an average learner-to-device ratio of 4:1. Urban public schools reported a mean of 18.2 devices (SD = 6.7), corresponding to a ratio of approximately 9:1. Rural public schools, by stark contrast, recorded a mean of only 6.8 functional devices (SD = 4.2), producing a learner-to-device ratio exceeding 22:1 a ratio that makes meaningful ICT-integrated instruction practically untenable within standard lesson periods.

Table 5.1: ICT Infrastructure Distribution across School Categories in Meru County

Variable	Urban Private (Mean/%)	Urban Public (Mean/%)	Rural Public (Mean/%)
Functional devices per school	34.6 (SD = 8.3)	18.2 (SD = 6.7)	6.8 (SD = 4.2)
Learner-to-device ratio	4:1	9:1	22:1+
Schools with internet access	100%	74%	26%
Reliable internet connectivity	87%	41%	12%
Grid electricity access	100%	93%	91%
Frequent power outages (>4 hrs/day)	5%	18%	37%
Functional solar backup systems	78%	46%	21%

Internet connectivity followed a similarly divergent pattern. All sampled urban private schools (100%) reported broadband internet access, with 87% describing connectivity as consistently reliable. Among urban public schools, 74% reported internet access, though reliability ratings dropped sharply. In rural public schools, only 26% reported any internet connectivity, with the majority relying on mobile data subject to poor signal quality, data cost constraints, and intermittent network outages. A significant proportion of rural public schools (38%) reported having received ICT devices through government programmes including the Laptop and Tablet initiatives, but documented device functionality rates of below 40%, attributable to hardware failures, software obsolescence, and the near-total absence of post-provision technical support (Ngigi & Busolo, 2023). This finding underscores a critical policy gap: procurement without maintenance is not merely wasteful but counterproductive, eroding teacher confidence in ICT and generating learner perceptions of technology as unreliable.

Electricity supply emerged as a foundational infrastructure constraint in rural zones, with 37% of rural public schools reporting daily power outages exceeding four hours and 9% lacking grid connection altogether. The implications extend beyond device charging: unpredictable power supply makes ICT-dependent lesson planning unreliable and discourages teachers from designing activities that depend on sustained device access (Omwansa & Waema, 2021). While some schools had installed donor-funded solar panels, several reported non-functional systems due to maintenance neglect, reflecting a systemic pattern in which capital investment is not matched by recurrent budget provision for upkeep.

5.2 Teacher Digital Preparedness: Competency Gaps and Structural Determinants

Teacher digital preparedness assessments, conducted using the adapted UNESCO ICT Competency Framework (UNESCO, 2023), revealed significant and statistically significant differences across school categories. Urban private school teachers achieved a mean digital competency score of 79.1% (SD = 8.6), urban public school teachers scored 66.3% (SD = 10.9), and rural public school teachers scored 46.8% (SD = 13.7). One-way ANOVA confirmed the statistical significance of these group differences [$F(2, 281) = 89.4, p < .001$], with post-hoc Tukey tests indicating significant differences between all three groups. These findings are consistent with emerging evidence from comparable East African contexts (Ouma & Kyalo, 2022; Njagi & Kamau, 2022), which document a persistent rural-urban gradient in teacher digital literacy that pre-service training systems have largely failed to close.

Table 5.2: Teacher Digital Competency Scores by School Category

School Category	Mean Score (%)	Standard Deviation	Interpretation
Urban Private Schools	79.1	8.6	High competency
Urban Public Schools	66.3	10.9	Moderate competency
Rural Public Schools	46.8	13.7	Low competency

ANOVA Summary: $F(2, 281) = 89.4, p < .001$

The qualitative data illuminate the structural determinants of these competency gaps with considerable nuance. Professional development participation data showed that urban private school teachers attended an average of 4.7 ICT-focused training sessions in the prior academic year, compared with 1.9 sessions for urban public school teachers and a strikingly low 0.6 sessions for rural public school teachers. Several rural participants reported receiving no ICT-specific professional development since the CBC launch. This finding that reflects both the logistical barriers of distance and transport costs and the inadequate prioritization of rural schools in national training allocation. As one principal in Kionyo remarked: 'We are told to implement CBC with technology, but our teachers have not been trained, and when training

happens, it is in Meru Town. We cannot afford to send three teachers there for a week.'

Table 5.3 : ICT Professional Development Exposure Among Teachers

School Category	Average ICT Trainings per Year	Teachers with No ICT Training (%)
Urban Private Schools	4.7	6%
Urban Public Schools	1.9	21%
Rural Public Schools	0.6	58%

A further dimension of the preparedness gap emerges from the mismatch between training content and rural school realities. Teachers who had attended TSC-organized workshops consistently described training that assumed stable broadband connectivity and functional device pools conditions that do not obtain in their schools. This design-reality mismatch produces a form of decontextualized professional development that, rather than building teacher self-efficacy, can deepen the sense of inadequacy and irrelevance (Alotaibi & Roussinov, 2022). From a TAM perspective, training that fails to make digital tools appear either useful or easy to use in context-specific conditions will not generate adoption intention, regardless of its technical quality.

5.3 Implications for CBE Instructional Delivery and Assessment

The convergence of infrastructure deficits and teacher preparedness gaps produces measurable distortions in the quality of CBC instructional delivery across Meru County's junior schools. Observational data from classroom visits and teacher self-reports indicate that urban private school teachers routinely deploy a range of digital pedagogical strategies including multimedia content delivery, collaborative digital projects, real-time formative assessment platforms, and e-learning repositories that are largely inaccessible to rural public school counterparts. The latter, operating within the constraints of unreliable power and device scarcity, predominantly deliver CBC content through conventional chalk-and-talk methods supplemented, at best, by printed worksheets (Kagama & Irungu, 2023).

The assessment dimensions of CBC are particularly vulnerable to ICT inequity. CBC's formative assessment model, which mandates continuous learner portfolios, project documentation, and performance-based tasks was designed with digital facilitation in mind (KICD, 2021; Republic of Kenya, 2022). Well-resourced schools use learning management systems and digital portfolio platforms that generate rich assessment data and enable timely teacher feedback. Rural public schools, lacking both platforms and connectivity, adapt these frameworks to paper-based formats, a process that is more labor-intensive, less pedagogically dynamic, and less capable of capturing the multi-modal competency evidence that CBC envisages. The risk, as Muriithi and Gachuri (2024) argue, is that assessment equity becomes hollowed out: learners are nominally assessed under the same framework but through radically unequal processes that may systematically disadvantage those in technology-deprived schools.

Learner focus group data adds a human dimension to these structural findings. Rural learners expressed significant digital anxiety, a generalized apprehension about engaging with ICT stemming from infrequent and unreliable technology exposure. Several participants described their first sustained engagement with computing devices as occurring during external examinations, a context of acute stress that compounds rather than mitigates the anxiety. Urban private school learners, by contrast, reported ICT as an integral and unremarkable feature of their daily learning experience. This divergence in learner relationship with technology is not inconsequential: digital self-efficacy is a robust predictor of technology-mediated learning outcomes (van Deursen & Mossberger, 2021), and learners who approach ICT with anxiety and

unfamiliarity are likely to underperform on digital assessments and miss the competency development opportunities that technology-enabled learning affords.

5.4 Integrated Analysis of ICT Equity Dynamics

The integration of quantitative and qualitative findings revealed a consistent pattern of ICT inequity across junior secondary schools in Meru County. Triangulation of survey data, interviews, focus group discussions, and document analysis confirmed that disparities in infrastructure, connectivity, and teacher digital competency were most pronounced in rural public schools. These disadvantages collectively constrained effective CBC implementation and limited opportunities for technology-enhanced learning.

However, several divergent cases emerged. Some rural schools achieved relatively successful ICT integration through strong leadership, community support, and strategic partnerships, while a few better-resourced schools reported low levels of technology utilization due to inadequate teacher motivation and support. These findings suggest that infrastructure alone does not guarantee effective ICT integration.

School-level variations further highlighted the influence of leadership, institutional culture, and resource management practices. In addition, focus group discussions indicated that some female learners in rural schools experienced lower confidence in technology use than their male counterparts, suggesting the need for gender-responsive digital inclusion strategies.

From a policy perspective, the findings underscore the need for differentiated interventions that combine infrastructure investment, teacher professional development, technical support, and strengthened school leadership. Consistent with the Equity Theory of Education Management, achieving ICT equity requires targeted support for schools facing the greatest structural disadvantages.

6. DISCUSSION

The findings demonstrate that ICT inequities in Meru County are rooted in longstanding structural disparities relating to school funding, infrastructure provision, and access to professional development. Consistent with the Equity Theory of Education Management, the evidence suggests that equal resource allocation is insufficient in contexts characterized by unequal needs. Rather, achieving equitable CBC implementation requires differentiated support targeted at schools experiencing the greatest infrastructural and technological disadvantages.

The findings also reinforce key propositions of the Technology Acceptance Model. Access to hardware alone does not guarantee meaningful technology integration; rather, teachers' perceptions of usefulness, self-efficacy, and the availability of enabling conditions significantly influence adoption and utilization. This highlights the importance of sustained, context-responsive professional development alongside infrastructure investment.

From a sociocultural perspective, ICT access represents more than a technological resource. Unequal access to digital tools limits opportunities for participation in technology-mediated learning environments that are central to competency development under CBC. Consequently, addressing the digital divide should be viewed as a matter of educational equity and social justice rather than merely a question of technological provision.

Overall, the study suggests that successful implementation of CBC requires integrated policy interventions that simultaneously address infrastructure, teacher capacity, institutional support, and learner access in order to ensure that the benefits of technology-enhanced learning are equitably distributed across schools.

7. RECOMMENDATIONS

7.1 Differentiated ICT Infrastructure Investment

The national and county governments should adopt a differentiated ICT infrastructure investment framework that prioritizes rural public junior schools through a ring-fenced budget mechanism informed by an annual digital infrastructure audit. This framework should establish minimum enforceable ICT standards, including a device-to-learner ratio not exceeding 10:1, reliable electricity supply supported by solar backup systems, and stable broadband or high-quality mobile internet connectivity. These standards should be fully operationalized across all junior secondary schools by 2027 (Ngigi & Busolo, 2023).

The Ministry of Education, in collaboration with the National Treasury and County Governments, should oversee implementation, while the Teachers Service Commission (TSC) ensures school-level readiness for utilization. Procurement contracts must include mandatory maintenance, lifecycle replacement plans, and on-site technical support clauses to eliminate the persistent “donated-but-dysfunctional” infrastructure cycle.

A national digital infrastructure dashboard, disaggregated by county and school, should be established to enable annual monitoring, public reporting, and evidence-based resource allocation.

7.2 Contextually Responsive and Sustained Professional Development

The TSC and the Kenya Institute of Curriculum Development (KICD) should redesign ICT-related professional development for CBC to reflect contextual disparities between urban and rural school environments.

Training should be differentiated into two tracks:

- i. Resource-adequate urban schools emphasizing advanced digital pedagogy; and
- ii. Resource-constrained rural schools emphasizing offline-first instruction, low-bandwidth content adaptation, and shared-device pedagogies.

Delivery should shift from centralized workshops to school-embedded professional learning communities (PLCs), supported by trained ICT teacher mentors. The TSC should institutionalize ICT mentorship as part of teacher deployment and appraisal systems to ensure sustainability beyond donor or project cycles.

Partnerships with teacher education institutions such as Meru University of Science and Technology should be formalized to provide continuous coaching, action research support, and field-based innovation tracking.

7.3 Multi-Stakeholder Partnerships and Community Mobilization

Given the scale of ICT infrastructure gaps, government financing alone is insufficient in the short to medium term. A structured Public-Private Partnership (PPP) framework should therefore be institutionalized at both national and county levels to engage telecommunications companies, technology firms, and development partners in co-financing rural school digital transformation (Muriithi & Gachuri, 2024).

The Ministry of Education should provide regulatory oversight, while county governments coordinate local implementation. Private sector partners should be bound by clear performance-based agreements, including infrastructure delivery, connectivity provision, and capacity-building obligations.

At the community level, Parent Teacher Associations (PTAs) should be formally integrated into school ICT development planning through co-financing and oversight mechanisms. However, such community contributions should be standardized through county guidelines to avoid inequity between affluent and low-income communities.

7.4 Curriculum and Assessment Policy Adaptation

The Ministry of Education and KICD should urgently review CBC assessment frameworks to ensure they remain implementable in low-resource contexts during the transition period. A dual-mode assessment system should be adopted, allowing both digital and non-digital (paper-based or low-tech) assessment pathways aligned to the same competency standards.

This approach should be explicitly time-bound, with a phased transition toward full digital assessment as infrastructure readiness improves. Importantly, learners in under-resourced schools must not be disadvantaged due to infrastructural inequities beyond their control (Republic of Kenya, 2022).

To safeguard equity, a county-level Digital Equity Monitoring System should be established to track ICT infrastructure, usage intensity, and learner access indicators annually. This system should directly inform resource allocation and be publicly accessible to enhance accountability.

8. CONCLUSION

This study has demonstrated, through theoretically grounded empirical analysis, that the digital divide in Meru County's junior secondary schools is not a peripheral implementation challenge but a structural equity crisis with significant implications for the realization of the Competency-Based Curriculum (CBC). The disparities in ICT infrastructure, teacher digital preparedness, and learner device access, are shaped by school type and geographic location signal an emerging two-tier education system in which CBC experiences are unevenly distributed and structurally determined.

Guided by the Equity Theory of Education Management, the study shows that equity in education requires proportionate rather than equal provision, tailored to address entrenched structural disadvantages. The findings therefore, provide both a diagnostic and prescriptive foundation for policy intervention. The proposed recommendations: differentiated infrastructure investment, context-responsive teacher development, multi-stakeholder partnerships, and assessment adaptation, are grounded in empirical realities and aligned with constitutional and global commitments to equitable education (Kagama & Irungu, 2023; Njagi & Kamau, 2022).

In terms of contribution to knowledge, the study extends the application of Equity Theory to digital transformation in CBC implementation, offering a context-specific framework for understanding how ICT disparities shape curriculum delivery at the junior secondary level in rural Kenyan settings.

However, the study is limited by its cross-sectional design, which does not capture longitudinal changes in ICT access or competency development over time. Additionally, reliance on self-reported data may introduce perception bias in assessing teacher preparedness and ICT usage.

Future research should adopt longitudinal and mixed-method approaches to examine how ICT access trajectories influence learner competency development, with attention to gendered outcomes and post-school transitions into the labour market. Comparative studies across counties would also deepen understanding of regional inequities in CBC implementation.

At a broader level, the findings underscore urgent national implications: without deliberate corrective investment, CBC risks reproducing and potentially deepening existing educational inequalities. Addressing the digital divide is therefore not only a technical necessity but a constitutional and

developmental imperative.

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