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Adapting Mobile Technology to Enhance Access to Quality, Equitable and Inclusive Education in Fragile Contexts: The Case of Kakuma Refugee Camp Primary Schools

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Abstract

This study investigated the use of mobile technology to enhance quality, equitable, and inclusive education in primary schools within Kenya's Kakuma Refugee Camp. Its objectives were to examine the influence of digital tools on teaching and learning experiences, assess learners' and teachers' digital competencies and needs, and to seek views on how a toolkit and guidelines can be developed for the purpose of optimizing mobile technology use in refugee learning centers. The target population entailed 24 primary schools, 645 teachers ,164000 leaners and 1 education officer. Utilizing a mixed-methods approach, data were gathered from 89 participants—including learners, teachers, head teachers, and an education officer—through questionnaires, interviews, and focus group discussions. Both random and purposive sampling strategies were applied. The findings indicate that mobile digital devices significantly enhance educational access, engagement, and interaction in refugee settings. However, to translate this potential into improved learning outcomes, the study underscores the need for an integrated strategy. This includes creating culturally appropriate and engaging content, equipping teachers with the necessary skills, ensuring the technology is age- and language-sensitive, expanding access to quality devices, and incorporating inclusive features. Recognizing the complex challenges of Kakuma—such as inadequate power supply, weak internet infrastructure, and overcrowded learning environments—the research advocates for a context-specific guidelines. This guide should extend beyond technical instructions to include pedagogical strategies aligned with the unique needs and constraints of refugee learners and educators. Significantly, the study positions mobile technology not as a standalone solution but as a catalyst for educational equity and inclusion when implemented thoughtfully and systematically.

Keywords: Mobile Digital Devices, Quality Education, Equitable Education, Inclusive Education & Kakuma Refugee Camp

Introduction

The global refugee crisis continues to escalate, marking one of the most pressing humanitarian challenges of the 21st century. With more than 70 million people forcibly displaced worldwide including 25.9 million refugees. The scale and complexity of displacement have intensified, driven by protracted conflicts, climate change, political instability, and socio-economic breakdowns (UNHCR, 2023). Children constitute more than half of the world's refugee population, yet they remain disproportionately excluded from educational opportunities. Globally, refugee learners are five times more likely to be out of school than their non-refugee peers, a pattern that undermines Sustainable Development Goal 4 and the promise of inclusive, equitable, and quality education for all (Dryden-Peterson, 2016). These educational disparities persist because humanitarian responses often prioritize immediate survival needs such as shelter, food, and safety leaving education chronically underfunded and under-resourced.

Regionally, the East and Horn of Africa and the Great Lakes region bear a significant share of the global displacement burden, hosting millions of refugees from countries such as South Sudan, Somalia, the Democratic Republic of Congo, Burundi, and Ethiopia. Education indicators in these contexts are particularly stark: more than 50% of school-aged refugee children in the region remain out of school, and secondary school enrollment stands at less than 10% (UNHCR, 2023). Fragile education systems struggle to accommodate large influxes of learners, while chronic teacher shortages, inadequate infrastructure, and socio-cultural barriers especially those affecting girls hinder consistent learning. The COVID-19 pandemic further magnified these inequalities, exposing the critical need for flexible and resilient learning systems that can function across disrupted environments.

Kenya exemplifies these regional challenges as it hosts over half a million refugees and asylum seekers, with Kakuma Refugee Camp serving as one of the largest and longest-standing refugee settlements in Africa. Despite progressive national and international commitments to refugee inclusion in the education sector, persistent constraints hinder meaningful progress. Overcrowded classrooms, acute shortages of trained teachers, insufficient instructional materials, and limited access to digital resources characterize much of the camp's educational landscape (UNHCR, 2022). Teachers often struggle to manage diverse, multilingual learners with minimal professional support, while socio-economic pressures such as early marriage, household labor demands, and cultural expectations continue to suppress girls' educational participation.

Amid these challenges, mobile technology has emerged as a transformative tool with the potential to bridge educational gaps in fragile and resource-constrained settings. UNESCO (2013) defines mobile learning as the use of portable digital devices to support learning anytime and anywhere, enabling access to flexible, personalized, and context-responsive education. In refugee camps, mobile technology can support both learners and teachers by offering digital content, real-time communication, and adaptive instructional support. However, successful integration remains limited by infrastructure deficits, inconsistent connectivity, restricted access to devices, and limited digital literacy among educators and learners. While NGOs such as the Lutheran World Federation and other partners provide digital interventions, the scale and sustainability of these efforts remain insufficient.

This study focuses on primary education in Kakuma Refugee Camp, home to nearly half of Kenya's refugee population. With more than 600,000 residents, 68% below the age of 18—the demand for accessible,

equitable, and quality learning opportunities continues to rise (UNHCR, 2022). The camp's more than 100 learning institutions operate under considerable strain, lacking adequate space, textbooks, and technological resources. Against this backdrop, the study argues that mobile technology holds significant promise, but only if adapted to the camp's socio-cultural and infrastructural realities. By examining how mobile tools can be contextualized for both learners and teachers, the research aims to contribute to a more resilient, inclusive, and future-oriented refugee education system.

Literature Review

The literature review explores the integration of mobile technology in improving education access and quality in fragile contexts, especially within refugee settings. It is structured around three main themes: the role of digital tools in learning and teaching, the competence and needs of learners and teachers, and the development of a digital education toolkit.

Role of Digital Tools in Learning and Teaching

Mobile and digital technologies are increasingly recognized for their ability to transform education in refugee settings. Trucano (2014) highlights how such tools provide flexibility and access, helping to overcome constraints of formal schooling. Tools like educational apps, e-textbooks, and video lessons enhance instructional diversity and engagement, particularly when paired with culturally appropriate content (UNESCO, 2018). The "Teachers for Teachers" initiative in Kakuma integrates digital professional development for undertrained educators (Mendenhall et al., 2017), showcasing the dual instructional and developmental roles of technology. However, Ager and Strang (2019) stress that access alone is not enough; tools must be embedded in pedagogically and culturally sound frameworks. Language learning apps like Duolingo and Google Translate help overcome multilingual barriers (Kohnert et al., 2018), making them especially relevant in diverse refugee classrooms.

Globally, digital learning has become a major component of educational continuity strategies, particularly after the disruptions caused by COVID-19. According to UNHCR (2020), many refugee-hosting countries adopted mobile-based learning platforms to mitigate school closures, highlighting the growing reliance on technology to support displaced learners. Yet, disparities in digital access remain stark: only 6% of refugee households worldwide have access to the internet at home, compared to over 60% of households in high-income nations (UNICEF, 2021). These inequalities limit the transformative potential of digital tools, especially in regions where connectivity, device ownership, and electricity remain inconsistent. Scholars argue that without narrowing this "digital divide," technology risks reinforcing rather than reducing educational inequities in crisis contexts (UNESCO, 2022).

Regionally, in the East and Horn of Africa, efforts to integrate digital learning have expanded, with countries such as Uganda, Ethiopia, and Rwanda piloting mobile learning programs to enhance foundational literacy and teacher training. However, the region still faces significant barriers, including low smartphone penetration, limited digital literacy, and inadequate infrastructure (World Bank, 2021). In Kenya specifically, digital education initiatives such as the Digital Literacy Programme and partnerships with organizations like *Learning Equality* and *UNHCR's Connected Education* framework have attempted to bridge gaps in refugee education (UNHCR, 2022). Despite these initiatives, digital uptake in refugee camps remains low due to overcrowded schools, lack of devices, unreliable connectivity, and the minimal digital

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skills of both teachers and learners. As a result, while digital tools have considerable potential in advancing quality and inclusive education, their effectiveness in Kenya's refugee settings depends on sustained investments in infrastructure, teacher capacity-building, and culturally relevant digital content.

Competence and Needs in Digital Integration

Globally, the rapid expansion of digital learning tools has not been matched by equal growth in digital competence among teachers and learners, especially in crisis and low-resource contexts. International reports highlight that while access to devices, particularly mobile phones has increased, the ability to use these tools meaningfully for learning remains limited. UNESCO and UNICEF have consistently emphasized that digital competence goes beyond operational skills to include information literacy, communication, creativity, and digital safety elements essential for navigating today's digital learning ecosystems. Kozma and Anderson's (2002) multidimensional definition of digital competence remains globally relevant, illustrating how many education systems, especially in humanitarian contexts, fall short of providing holistic digital literacy training. This global gap is compounded by persistent inequities: marginalized groups, including refugees, girls, and learners with disabilities, face greater barriers due to socio-economic constraints, limited connectivity, and cultural norms that restrict technology use (Webb et al., 2020).

Regionally, across the East and Horn of Africa including Ethiopia, Uganda, Tanzania, and Kenya the "second-level digital divide" identified by Warschauer and Matuchniak (2010) is clearly visible. Many refugee-hosting regions have some degree of device access but lack the pedagogical capacity, training structures, and aligned digital content necessary for effective integration. NGOs and regional initiatives such as GESCI's digital schools' programmes report that teachers often receive sporadic and non-curriculum-aligned ICT training, resulting in a mismatch between available tools and meaningful classroom integration. In Kenya, this challenge is further pronounced in refugee settings like Kakuma, where teachers frequently have only basic operational skills, with limited exposure to content creation, digital collaboration, or critical digital literacy. Needs assessments by Jesuit Worldwide Learning and Windle International Kenya (JWL, 2020) confirm that both teachers and learners require structured, continuous, and pedagogy-aligned training that reflects the CBC curriculum and the realities of low-resource environments. Persistent infrastructural barriers such as unreliable electricity, scarce devices, limited internet connectivity, and gendered differences in access continue to constrain the development of higher-level digital skills (World Bank, 2021; NRC, 2019). Consequently, targeted digital competence development remains essential for equitable, transformative, and sustainable integration of mobile technologies in refugee education in Kenya.

Developing a Digital Toolkit for Education

Globally, digital toolkits have emerged as a critical mechanism for translating access to technology into meaningful, pedagogically grounded learning. International stakeholders including UN agencies, NGOs, and academic partners have promoted comprehensive, adaptable toolkits that combine instructional guidance, technical support, and monitoring tools. Such resources help educators bridge the divide between simply having devices and using them effectively in classroom and remote contexts. These global initiatives emphasize modular design, low-bandwidth compatibility, and inclusivity, ensuring that toolkits can be tailored to crisis settings where infrastructure and connectivity are minimal (UNHCR, n.d.; World Bank,

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2017). By embedding formative assessments, real-time feedback loops, and user-driven adaptation, these digital resources foster resilience and continuous improvement in educational delivery.

Regionally, in East and Horn of Africa refugee-hosting countries, digital education strategies increasingly reflect the need for context-sensitive toolkits. Programmes such as the African Digital Schools Initiative (ADSI) in Kenya, Tanzania, and other countries have developed frameworks for blended teacher development, open educational resources, and whole-school ICT integration that are aligned with local curricula (GESCI, 2020). UNHCR's *Connected Education* strategy for the region similarly promotes toolkits that support mobile learning, offline content delivery, and teacher capacity building in refugee and host-community schools (World Bank, 2017). Nevertheless, evaluations indicate that many digital resources fail to reach their potential when not sufficiently localized especially when developers do not address linguistic diversity, teachers' digital literacy, and alignment with national education systems. This gap underscores the importance of participatory toolkit design, with input from teachers and learners in refugee settings, to ensure cultural relevance and sustainability.

In Kenya, where digital innovation in education has been rising, the need for a refugee-adapted toolkit is particularly pressing. National programmes such as the Digital Literacy Programme (DLP) have supplied laptop devices and trained teachers in many primary schools, but their reach within refugee-hosting areas remains uneven (World Bank, 2017). In camps like Kakuma and Dadaab, non-governmental and UN partners have piloted initiatives to support mobile-based learning, offline content delivery, and teacher mentoring through blended training models (World Bank, 2017). Nonetheless, these interventions often lack curriculum-aligned, user-friendly guidance on how educators can integrate digital tools into the Competency-Based Curriculum (CBC) used in Kenyan schools. Connectivity, device access, and electricity issues further constrain meaningful use. Therefore, fragile context specific digital toolkit incorporating offline-capable resources, pedagogical guidance, and monitoring features would help bridge crucial gaps, strengthening both teachers' and learners' capacity in fragile settings.

Research Questions

The study sought to answer the following research questions:

- What is the role of digital tools in shaping the learning and teaching experiences of learners and teachers in Kakuma refugee learning centres?
- What is the level of learners' and teachers' competence and needs in integrating digital tools to broaden access to quality, equitable, and inclusive education in Kakuma refugee learning centres?
- How can a toolkit on the use of digital mobile technologies be developed to assist learners and teachers in accessing quality, equitable, and inclusive education in Kakuma refugee learning centres?

Methodology

This study employed a mixed-methods research design, integrating both qualitative and quantitative approaches to gain a comprehensive understanding of mobile technology use in education within Kakuma Refugee Camp (Oranga, Matere, & Njurai, 2025). The target population included primary school learners, teachers, head teachers, and one education officer. Based on UNHCR (2023) figures, the camp hosted 645

primary teachers across 24 schools and approximately 164,000 learners. A total sample of 89 participants was selected using Krejcie and Morgan's (1970) table, with learners and teachers chosen through random sampling, and head teachers and the education officer selected purposively. 13 participants, that is 12 head teachers and 1 education officer were selected purposively to ensure the inclusion of key informants with supervisory, administrative, and policy-level insights. The remaining 76 participants were selected through random sampling and consisted of 30 teachers and 46 learners. This distribution ensured methodological balance by combining the statistical representativeness of random sampling with the depth of insight offered by purposive selection, thereby aligning with the mixed-methods design of the study. Data collection tools included questionnaires for teachers, focus group discussions (FGDs) for learners, and semi-structured interviews for head teachers and the education officer. Quantitative data were analysed descriptively, while qualitative data were examined thematically. This methodological combination allowed for rich, multifaceted insights into the digital education landscape in a fragile context.

Data Analysis and Findings

Role of Digital Tools in Shaping Learning and Teaching Experiences

The analysis examined the various purposes for which teachers in schools in Kakuma Refugee Camp who access digital mobile devices use them for. The results are in Table 1.

Table 1: Purpose of Use of Mobile Digital Devices

		Responses		Percentage of Cases
		N	Percent	
Purpose	E-books	35	8.5%	29.7%
	Teaching Notes	88	21.4%	74.6%
	Syllabus/Designs	90	21.9%	76.3%
	Revision materials	47	11.4%	39.8%
	Online courses	39	9.5%	33.1%
	Educational videos	86	20.9%	72.9%
	Interactive apps	20	4.9%	16.9%
	Virtual labs/Animations	6	1.5%	5.1%
Total		411	100.0%	348.3%

The study results show that the majority of the teachers used the mobile digital devices to access professional tools which aid in the teaching process. These include syllabi (90), teaching notes (88) and educational videos (86). The mobile digital devices are rarely used to access virtual labs/animations (1.5%), interactive apps (4.9%), and online courses (9.5%). Further, analysis by use of cross-tabulation established the number of teachers using each device for the specific purpose. According to the results in Table 2, tablets and smartphones emerged as the most widely used devices across the majority of educational activities. Tablets were particularly prevalent in accessing e-books (35 teachers), teaching notes (67 teachers), educational videos (69 teachers), and syllabus documents (56 teachers). Smartphones closely followed, being utilised significantly for syllabi (62 teachers), teaching notes (53 teachers), and educational videos (54 teachers).

Table 2: A cross-tabulation of the type of mobile digital device (MMD) and purpose of use

			$DMD[a]					Total
			Smart Phone	Basic Phone	Tablet	Laptop	Others_ Desktops	
$USE_ MDD[a]	E-books	Count	23	10	35	10	0	35
	Teaching Notes	Count	53	16	67	29	7	88
	Syllabus/Designs	Count	62	10	56	29	7	90
	Revision materials	Count	30	10	32	19	7	47
	Online courses	Count	29	10	31	11	0	39
	Educational videos	Count	54	10	69	27	7	86
	Interactive apps	Count	8	0	20	8	0	20
	Virtual labs/Animations	Count	6	0	6	2	0	6
Total			74	16	76	29	7	118

The Chi-Square test for association between the type of digital mobile device accessed and the purpose for which the device is used showed that there is a significant association between the purpose for device usage and the type of digital device used among teachers in Kakuma Refugee Camp ($\chi^2{}_{(40)} = 236.753, p < 0.005$) as shown in Table 3.

Table 3: Pearson Chi-Square Test for the association between MDD and purpose

		$MDD
Purpose	Chi-square	236.753
	Df	40
	Sig.	.000[*,b,c]

Focus group discussions revealed that teachers in Kakuma Refugee Camp actively incorporate mobile digital devices into daily teaching, using them to access lesson notes, download educational materials, and enhance language instruction—particularly in English classes via online videos. These practices reflect Kukulska-Hulme's (2012) assertion that educators adopt mobile technologies based on their functional adaptability to specific pedagogical needs. Interviews with head teachers confirmed widespread device use and highlighted their value in facilitating pronunciation and vocabulary learning. To expand the benefits, teachers proposed increasing access to affordable devices (25 teachers), strengthening internet infrastructure (88 teachers), and offering subsidized data packages (61 teachers). ICT training was also recommended by 38 teachers to boost digital literacy. In response to power limitations, 33 teachers suggested the installation of electricity or solar-powered charging stations. Additionally, head teachers advocated for policies on digital inclusion and secure device storage. These recommendations align with UNESCO's (2021) call for infrastructure investment and inclusive education technology strategies in marginalized settings.

Descriptive Statistics on Role of Mobile Digital Devices in Shaping Learning and Teaching Experiences

The means and standard deviations for the distribution were computed, and results are shown in Table 4.

Table 4: Descriptive data on role of mobile digital devices in shaping learning and teaching experiences

	Mean	Std. Deviation	Cronbach's Alpha if Item Deleted
Make Access to Education easier	4.6441	.57773	.778
Digital devices have broken down geographical and physical barriers to accessing education	4.5763	2.10983	.877
Learning materials can be easily accessed through e-learning platforms	4.2373	1.19599	.782
uninterrupted learning will be achieved if teachers use mobile digital devices effectively	4.3559	.75702	.776
Accessing learning/teaching materials via mobile digital devices has opened the door to distance learning and self-study	4.6525	.61848	.776
Learning is more fun and conducive when using MDD	4.2288	1.19408	.779
MDD make it easier to access learning materials	4.5678	.65995	.777
through the use of MDD learners can now study with increased flexibility	4.4237	.72095	.779
MDD enable the use of interactive and engaging learning applications and platforms	4.2627	.99079	.771
Offer innovative learning methods	4.2797	.91414	.775
Increase learner engagement	4.4576	.93044	.770
Enable more effective collaboration and communication	4.0339	1.02058	.764

Quantitative findings from the study revealed a high level of agreement among participants regarding the positive impact of mobile digital devices (MDDs) on teaching and learning in refugee settings, with mean scores across 12 items ranging from 4.03 to 4.65 on a 5-point Likert scale. The highest-rated items such as enhanced access to learning materials and facilitation of distance learning underscore stakeholders' strong belief in the value of MDDs for overcoming educational barriers in refugee contexts (Mean = 4.6525; 4.6441; 4.5678). These findings suggest that accessibility is widely regarded as MDDs' most transformative benefit. Items with slightly lower ratings such as improved collaboration, enjoyable learning experiences, and ease of accessing e-learning platforms indicate lingering challenges, possibly tied to weak infrastructure, limited training, or inconsistent device access. Despite these, internal reliability was strong (Cronbach's Alpha = 0.76–0.88), confirming consistency in responses. The item "Digital devices have broken down geographical and physical barriers" showed more varied opinions (SD = 2.10983), hinting at uneven perceptions of accessibility. Overall, the findings align with Dahya (2016), who affirms the transformative potential of mobile learning in refugee education while emphasizing that infrastructure and pedagogical gaps must be addressed to fully realize this promise.

Competence and Needs of Learners and Teachers in Digital Integration

Results revealed a statistically significant association between users' comfort levels and their usage skill levels across all digital technologies assessed, as demonstrated in Table 5.

Table 5: Rating of skills in using the various MDDS and level of comfort with their use

| | | Not Comfortable | | Total | Chi-Square test |
		Very high	Comfortable		
Laptops	High	22	22	44	14.206 (0.003)
	Moderate	19	11	30	
	Low	30	6	36	
	Very high	8	0	8	
Tablets	High	0	44	44	31.887 (0.000)
	Moderate	8	22	30	
	Low	0	36	36	
	Very high	4	4	8	
Smartphone	High	12	32	44	48.343 (0.000)
	Moderate	1	29	30	
	Low	30	6	36	
	Very high	4	4	8	
Basic phones	High	44	0	44	15.017 (0.002)
	Moderate	23	7	30	
	Low	34	2	36	
	Very high	8	0	8	
Interactive whiteboards	High	36	8	44	28.495 (0.000)
	Moderate	15	15	30	
	Low	36	0	36	
	Very high	8	0	8	
Educational software	High	36	8	44	10.644 (0.014)
	Moderate	23	7	30	
	Low	36	0	36	
	Low			8	

The Chi-Square analysis revealed a strong correlation between users' comfort and their skill levels across all digital technologies examined, reinforcing the idea that digital competence underpins ease of use (Hatlevik et al., 2015). For laptops, a significant association was noted ($\chi^2 = 14.206$, p = 0.003), but comfort varied with skill: while 22 highly skilled users felt comfortable, 30 moderately skilled users expressed discomfort. Students appreciated laptops but also cited frustrations due to limited skills and outdated devices. Head teachers echoed these concerns, citing inadequate budgets and poor maintenance. Tablets demonstrated the strongest comfort-usage relationship ($\chi^2 = 31.887$, p < 0.001). All "very highly" and "moderate" skilled users reported comfort. Students praised tablets for their user-friendliness and portability, and head teachers noted their effective use in delivering interactive lessons, though concerns about screen time were mentioned.

Smartphones showed a highly significant association (χ^2 = 48.343, p < 0.001), but with more mixed responses. While highly skilled users generally felt comfortable, moderately skilled users struggled. Students reported difficulty with assignments on smartphones due to small screens, and head teachers were divided—some saw potential, others viewed phones as distractions. Basic phones, though statistically significant (χ^2 = 15.017, p = 0.002), were widely deemed unfit for learning, with all highly skilled users reporting discomfort. Students described them as limited to calls and texts, and educators saw them as outdated.

Interactive whiteboards also showed a significant comfort-skill link (χ^2 = 28.495, p < 0.001). "Moderate" users universally reported discomfort, whereas comfort levels increased among higher-skilled users. Students noted limited interaction—typically as passive observers—and head teachers admitted the boards were often underutilized. This reflects Ertmer & Ottenbreit-Leftwich's (2010) findings on how lack of training leads to underuse of complex educational technologies. Educational software, while yielding a lower but still significant result (χ^2 = 10.644, p = 0.014), mirrored the same trend. All "moderate" users felt uncomfortable, while only a few "very highly" skilled users expressed confidence. Students described the software as confusing without guidance, and head teachers attributed this to inadequate training for both teachers and learners. As Tondeur et al. (2017) note, user confidence and effective technology use are strongly shaped by digital literacy and familiarity. Together, these findings underscore that technological access alone does not guarantee effective use. Comfort and usability depend on digital skills, with more complex tools like interactive whiteboards and educational software demanding greater support. Developing user competence particularly in fragile, low-resource contexts is essential for maximizing the educational potential of digital technologies.

Challenges in Integrating Mobile Digital Devices (MDDs) in Teaching and Learning

The integration of mobile digital devices (MDDs) in teaching is a widely endorsed goal in modern education, yet the process remains fraught with practical and systemic challenges. Drawing on survey data from teachers (519 responses) and interviews with 8 head teachers, this section explores these barriers, whose results are shown in Table 6.

Table 6: Challenges in integrating mobile digital devices (MDDs) in teaching and learning

		% of Total Responses	% of Total Responses	% of Teachers
Integration	Limited access to mdd	75	14.5%	63.6%
	Lack of pedagogical training	63	12.1%	53.4%
	Poor internet connectivity	103	19.8%	87.3%
	Inadequate DD	62	11.9%	52.5%
	High cost of digital tools	63	12.1%	53.4%
	Lack of relevant content	24	4.6%	20.3%
	Power/electricity problems	41	7.9%	34.7%
	Internet connectivity issues	88	17.0%	74.6%
Total		519	100.0%	439.8% (multiple responses)
a. Dichotomy group tabulated at value 1.				

The study identified several key barriers to the effective integration of mobile digital devices (MDDs) in refugee camp schools, with over a third of the challenges linked to poor internet access—reported by 87% of teachers. As one head teacher explained, network downtimes and reliance on unstable mobile connections hinder the use of cloud-based tools. Additionally, **63.6%** of teachers cited limited access to devices**,** a concern echoed by head teachers who described shortages and inequitable distribution across schools. In many cases, tablets are shared among classes, and digital learning is teacher-led due to insufficient resources.

More than half (53.4%) of teachers reported a lack of pedagogical training, noting that while basic tools like PowerPoint or WhatsApp are familiar, most lack the skills to use educational apps or e-learning platforms effectively. This gap between technical literacy and teaching competence leads to underutilization of MDDs. The high cost (12.1%) and inadequacy (11.9%) of devices further constrain integration, with head teachers highlighting dependency on donor funding and outdated equipment as major hurdles. Frequent power outages (34.7%) and lack of charging infrastructure also interrupt digital lessons, especially in schools without backup systems. One head teacher noted the absence of solar alternatives and the impact of long electricity blackouts.

While only 20.3% of teachers identified a lack of relevant content as a barrier, its implications are significant. Head teachers stressed that much of the digital material is not aligned with the curriculum or available in local languages, limiting its effectiveness—particularly for early-grade learners. Ultimately, these challenges reveal that MDD adoption is not merely a technical issue but a systemic one**,** requiring infrastructure investments, teacher training, locally relevant content, and sustained policy support. As Kozma and Vota (2014) argue, successful ICT integration in education demands more than devices—it requires long-term, comprehensive strategies.

Solutions to the Challenges of Integrating Mobile Digital Devices in Teaching and Learning

To overcome the identified challenges in integrating mobile digital devices (MDDs), 118 teachers offered practical and targeted solutions. The total of 735 responses indicates that teachers suggested multiple strategies, reflecting the multifaceted nature of the problem. The most commonly suggested solutions focused on infrastructure, training, affordability, and content enhancement, as shown in Table 7.

Table 7: Solutions to Challenges in Integrating Mobile Digital Devices (MDDs) in Teaching and Learning

		N	% of Total Responses	% of teachers
sol[a]	Access to a wider range of MDD	88	12.0%	74.6%
	digital skills training	67	9.1%	56.8%
	pedagogical training	84	11.4%	71.2%
	improved internet connectivity	90	12.2%	76.3%
	affordable MDD	78	10.6%	66.1%
	affordable internet bundles	78	10.6%	66.1%
	power backups	41	5.6%	34.7%
	more interactive content	92	12.5%	78.0%
	more relevant digital content	62	8.4%	52.5%
	support from peers and mentors	55	7.5%	46.6%

Total	735	100.0%	622.9% (Multiple Responses)
a. Dichotomy group tabulated at value 1.			

The suggestions by teachers and head teachers are organised and discussed within some specific thematic areas:

Infrastructure Investment in Internet and Power

All eight head teachers (100%) emphasized the need for reliable electricity and improved internet connectivity, describing them as the foundation for technology integration. *"We can't integrate technology if there's no power or internet. That's the foundation,"* stated the Head Teacher of School B. This view mirrors the perspectives of 76.3% of teachers who prioritized internet upgrades, and 34.7% who advocated for power backup systems. While teachers focus on classroom-level challenges, school leaders stressed school-wide infrastructure like solar power and broadband. Strong digital learning infrastructure is especially critical in underserved settings (UNESCO, 2020).

Budget Support and Device Provisioning

A significant 87.5% of head teachers cited budget constraints and called for centralized or subsidized device distribution. Many noted that most educators cannot afford personal devices, making institutional provisioning essential. This aligns with 74.6% of teachers recommending expanded access to mobile digital devices and 66.1% urging affordability through strategic interventions. Head teachers emphasized government and private-sector partnerships to promote equity. Sustainable digital learning in low-resource settings hinges on consistent device access and aligned content (World Bank, 2021).

Training in Pedagogy and Digital Literacy

All head teachers agreed that teachers require more than just basic tech skills; they need pedagogical training. *"There is a need for teacher training that will equip them with the knowledge and skills on how to teach with these tools, not just how to turn them on,"* shared one leader. Teacher support data concurred: 71.2% cited the need for pedagogical training, and 56.8% for digital skills enhancement. Both groups advocated for CPD models enriched with mentoring. Successful tech integration demands ongoing training underpinned by policy and leadership (Karam et al., 2018).

Localized Digital Content

Five out of eight head teachers (62.5%) criticized the lack of contextualized, curriculum-aligned content. *"The content needs to speak to our learners—in language, culture, and curriculum,"* was a recurring sentiment. While teachers emphasized interactivity (78.0%), school heads pushed for locally relevant content ideally hosted on national platforms. Localized materials enhance learner engagement and educational relevance (Trucano, 2016; Unwin, 2015).

Peer Support and Collaboration

Half of the head teachers backed peer mentoring and internal professional learning communities as cost-effective, scalable strategies. This resonates with 46.6% of teachers who advocated peer-led support. Head

teachers recommended formal integration of this model into school plans. Such collaboration boosts confidence and tech adoption (Liu et al., 2020; Borko, 2004).

Policy and Leadership Support

Five head teachers (62.5%) emphasized the absence of clear ICT guidelines and resources. *"We need clear guidelines and resources to implement ICT meaningfully, not just policy documents,"* one stated. Though not echoed in teacher surveys, this gap reveals the importance of structured leadership and monitoring. Strong national ICT policies and active school leadership are key to sustainable digital transformation (Anderson & Dexter, 2005).

Development of a Toolkit for Digital Mobile Technologies in Education

The study sought to determine whether there is a need for a guide to assist teachers in the effective use of mobile digital devices for teaching and learning in the Kakuma Refugee Camp. The study confirmed a strong demand for a toolkit to support teachers in using mobile digital devices for instruction in the Kakuma Refugee Camp. A majority—70.34% (n = 83)—of teachers surveyed affirmed the need for such guidance, highlighting widespread challenges in integrating these tools effectively. The head teachers' interviews echoed this concern, emphasizing that structured pedagogical support is crucial. In emergency and resource-constrained environments like Kakuma, professional development is limited, making toolkits essential for quality teaching (Power, Gater, Grant, & Winters, 2014). These findings underscore the value of tailored instructional resources to enhance digital integration in learning environments.

Table 8: Table 8: Responses on the Need for a Guide

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	35	29.7	29.7	29.7
	Yes	83	70.3	70.3	100.0
	Total	118	100.0	100.0	

Qualitative insights from eight head teachers strongly underscored the need for a structured guide to support the use of mobile digital devices in refugee education settings. Their consistent concern centered on teachers limited digital literacy and lack of confidence in integrating these tools into pedagogy. While some schools had access to mobile devices, many educators reportedly struggled to apply them effectively in instruction. As one head teacher noted, *"Most teachers lack confidence in using digital devices. A guide would be helpful in offering step-by-step support."*

This need extends beyond a basic manual, with another leader stating, *"We need more than just a manual, we need a guide that supports both pedagogy and technical use of devices."* These sentiments reflect Kafyulilo's (2014) observation that teacher confidence and skill in digital integration are often low in low-resource settings, and that tailored, practical guides can bridge this gap. Head teachers advocated for a context-specific toolkit that addresses refugee-specific challenges such as unstable electricity, weak internet access, and overcrowded classrooms.

Such guidance would not only support teacher competence but also help standardize digital practices across classrooms. Damani & Mitchell (2020) affirm that localized, easy-to-use guides are crucial in crisis settings, enabling teachers to address both pedagogical and technical hurdles. To be effective, the toolkit must be

user-friendly, accessible offline, and rooted in local realities (Haßler et al., 2016). Collectively, these findings demonstrate a widespread and urgent demand for practical tools to enhance digital education in Kakuma and similar contexts.

To support the assertions by head teachers, the teachers also provided responses on how the guide will help them integrate MDDs into their teaching. The results are based on multiple response data, indicating that respondents gave more than one expected benefit. A total of 172 responses were recorded from the sampled teachers. Their responses are summarised in Table 10:

Table 9: Ways through which the guide will help them integrate MDDs into their teaching

		Responses		Percentage of Cases
		N	Percent	
NEED[a]	Provide best practice	23	13.4%	27.1%
	Improve digital literacy	49	28.5%	57.6%
	For Reference during lessons	68	39.5%	80.0%
	Makes learning and teaching easy and flexible	32	18.6%	37.6%
Total		172	100.0%	202.4%
a. Dichotomy group tabulated at value 1.				

The findings demonstrate a strong and multifaceted demand among teachers for a practical guide to support the use of Mobile Digital Devices (MDDs) in classrooms. The most frequently cited benefit—identified by 80.0% of teachers (n = 68)—was the guide's potential to serve as a lesson-time reference, offering immediate support for instruction and troubleshooting. This highlights the need for quick-access, easy-to-navigate materials to enhance delivery in real time.

Another significant benefit identified was improved digital literacy, reported by 57.6% (n = 49) of teachers. This response reflects their self-awareness of existing skill gaps and a belief that structured, instructional guidance could effectively bridge these. These perceptions reinforce earlier findings highlighting limited technical knowledge as a key barrier to successful MDD integration. Tondeur et al. (2012) stress that professional development and access to relevant resources significantly build educators' digital competence—an assertion echoed by Spiteri and Chang Rundgren (2020), who found that targeted support materials improve teachers' confidence and effectiveness. In addition, 37.6% of teachers (n = 32) believed the guide would make teaching more flexible and engaging, enabling them to better adapt to learners' needs—particularly vital in resource-limited settings such as refugee camps. Lastly, 27.1% (n = 23) noted the guide's role in helping them apply best practices in pedagogy with MDDs. Taken together, these insights underscore the need for a context-sensitive, modular, and accessible guide designed to boost teacher autonomy, classroom innovation, and instructional consistency (UNESCO, 2013).

Recommended Content for the Mobile Digital Devices Guide

In addition to expressing the need for a guide, respondents were asked to identify specific aspects they would like to be included in the guide. This multiple-response question yielded a total of 404 responses, reflecting diverse expectations about the content of a useful and effective guide, and re shown in Table 10.

Table 10: Recommended Content for the Mobile Digital Devices Guide

Aspects		Responses		Percentage of Cases
	Step by step guides	N	Percent	
	Video Tutorials	90	22.3%	76.3%
	Interactive modules	75	18.6%	63.6%
	Case studies	94	23.3%	79.7%
	Resource Libraries	83	20.5%	70.3%
Total		404	100.0%	342.4%
a. Dichotomy group tabulated at value 1.				

The findings highlight a clear preference among teachers for a multimedia, user-friendly guide to support Mobile Digital Device (MDD) integration in classrooms. The most favored feature was interactive modules, cited by 79.7% (n = 94) of teachers, underscoring the importance of hands-on, experiential content to promote active learning. Step-by-step guides followed closely, selected by 76.3% (n = 90), reaffirming the demand for clear, actionable instructions, especially critical in high-stress, low-resource environments.

Additionally, 70.3% (n = 83) of teachers emphasized the need for resource libraries with accessible teaching materials, including lesson plans, subject tools, and Open Educational Resources (OERs). Visual learning was also highly valued—63.6% (n = 75) opted for video tutorials to simplify the learning of device operations, particularly for those with limited digital literacy. The need for offline accessibility was particularly important in refugee settings with limited connectivity.

While selected by a smaller percentage (52.5%, n = 62), case studies were noted for their potential to offer relatable, real-world examples of effective MDD use. These narratives could serve to inspire and ground the guide in authentic teaching experiences.

Collectively, the responses affirm the need for a practical, flexible, and context-aware guide tailored to the diverse instructional needs of refugee educators (Tondeur et al., 2012; Spiteri & Chang Rundgren, 2020).

How The Guide on Mobile Digital Devices Will Help Improve Teaching and Learning

The study sort views on how a toolkit and guidelines can be developed for the purpose of optimizing mobile technology use in refugee learning centers. The study revealed that teachers in the Kakuma Refugee Camp see a guide on Mobile Digital Devices (MDDs) as a vital professional tool to improve teaching and learning. The most cited benefit mentioned by 82.2% of teachers was technical support, such as troubleshooting procedures. Teachers emphasized the need for practical, easy-to-follow instructions to resolve common issues like device malfunctions and software glitches, especially in settings lacking IT support. This aligns with Unwin et al. (2010), who highlight the importance of basic troubleshooting guidance in low-resource schools.

The second most frequent benefit, identified by 71.0% of respondents, was the guide's potential to offer pedagogical clarity. Teachers expressed a need for structured approaches to integrate MDDs into lesson planning, delivery, and engagement not just technical operations. Palvia et al. (2018) similarly note that teacher empowerment through practical knowledge enhances instructional continuity and reduces dependency on external help.

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Although only 7.5% of teachers mentioned lesson continuity, this group saw the guide as a means of minimizing classroom disruption by enabling quick, confident responses to tech issues. Taken together, these findings show the guide is expected to boost both technical autonomy and instructional quality—critical goals in Kakuma's complex, under-supported education environment (Enriquez, 2010).

Table 11: How the Guide on Mobile Digital Devices Will Help Improve Teaching and Learning

		Responses		Percentage of Cases
		N	Percent	
help[a]	Provide clarity on the effective use of the tool	76	44.2%	71.0%
	Provide Technical support e.g. troubleshooting procedures	88	51.2%	82.2%
	Minimize Disruption of lessons	8	4.7%	7.5%
Total		172	100.0%	160.7%
a. Dichotomy group tabulated at value 1.				

Focus group discussions with students in the Kakuma Refugee Camp revealed that the use of Mobile Digital Devices (MDDs) enhances lesson engagement and enjoyment, especially when teachers are confident in using them. However, students reported inconsistent experiences—some teachers integrate devices effectively, while others avoid or struggle with their use, resulting in unequal learning opportunities. Many students expressed a desire for practical digital skills like typing and internet use, and believed that a teacher guide could promote more hands-on learning. Technical disruptions due to device malfunctions also frustrated students, who felt a guide could minimize such interruptions.

These insights align with the broader understanding that teacher preparedness significantly affects student motivation and learning outcomes. According to Koehler and Mishra's (2009) TPACK framework, integrating technology effectively requires alignment with pedagogy and content. Gudmundsdottir and Hatlevik (2018) further emphasize the value of structured pedagogical guidance. When combined with teacher and head teacher feedback, it's evident the guide is seen as a foundational tool for building confidence, consistency, and quality in digital teaching. In a setting like Kakuma, where resources and training are scarce, the guide is envisioned as a low-cost yet impactful resource that supports capacity building, lesson continuity, and transformation of educational practices (Puentedura, 2013).

Conclusions and Recommendations

The study concludes that Mobile Digital Devices (MDDs) have significant potential to enhance equitable, quality education in Kakuma Refugee Camp's primary schools among leaners. Teachers too widely access smartphones and tablets, enabling them to integrate digital content like syllabi and videos into instruction. These tools foster more flexible, learner-centered teaching even in a resource-constrained environment.

Despite this promise, persistent barriers exist. Connectivity issues, power shortages, and limited access to devices remain major hurdles. Many teachers particularly those with less formal training struggle with digital literacy and lack pedagogical strategies for effective technology use. Additionally, the scarcity of age-appropriate, culturally relevant, and multilingual content limits inclusivity, leaving some learners, especially those with disabilities or diverse backgrounds, underserved.

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Nonetheless, both statistical analyses and stakeholder feedback affirm the transformative value of MDDs in improving access, engagement, and instructional flexibility. However, gaps in collaboration and learner enjoyment suggest further investment is needed in infrastructure and teacher training to fully unlock their potential.

A key outcome of the study is the widespread call for a structured, context-sensitive guide to support educators and leaners. Teachers, head teachers and leaners view it as vital for building digital confidence, pedagogical clarity, and instructional consistency. Such a guide is not optional it's essential for bridging the gap between access and meaningful classroom integration.

Recommendations

The study makes the following recommendations:

The recommendations emphasize a holistic approach to enhancing digital education in the Kakuma Refugee Camp. First, expanding access to Mobile Digital Devices (MDDs) through government and private sector support is essential, alongside solar-powered electricity solutions and reliable internet connectivity. Next, continuous, hands-on ICT training particularly for teachers with limited digital experience is vital to building equitable digital competencies.

The design of digital learning content should be inclusive, culturally relevant, and accessible to diverse learners, including those with special needs. Features like text-to-speech and visuals are recommended to improve engagement and learning outcomes. Policy frameworks should also be established to guide safe, equitable, and sustainable integration of mobile technology, complemented by support systems such as community resource centers.

A modular, multimedia teacher guide is a central recommendation. It should offer offline-accessible interactive content, clear pedagogical strategies, and localized examples to support instruction in low-resource environments. This guide is envisioned not only as a classroom aid but also as a tool for sustained teacher development, onboarding, and quality assurance. When embedded in training and monitoring systems, the guide can enhance consistency, confidence, and effectiveness in digital learning across refugee schools.

Recommendations for Further Study

The study recommends several areas for further research to deepen understanding of digital education in refugee settings. These include exploring how diverse content formats like interactive apps and virtual labs can enhance inclusivity, particularly for learners with disabilities or language barriers. It also calls for assessing the cost-effectiveness of infrastructure solutions addressing power, data, and device access. Further investigation into how gender, age, and other demographic factors influence MDD usage and digital confidence could guide more targeted training. Longitudinal studies are suggested to evaluate the long-term impact of MDDs on learning outcomes, alongside research at higher education levels beyond primary school.

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