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Empowering Rural Women through Digital Financial Literacy in Northern Kenya

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ABSTRACT

This study examines the potential of digital financial literacy programs to empower rural women in Northern Kenya, a region characterized by persistent gender inequalities, limited financial inclusion, and infrastructural challenges. Using a mixed-methods approach involving 250 women from Turkana, Marsabit, and Samburu counties, the research evaluates the impact of a six-month digital financial literacy intervention on women's financial knowledge, mobile money adoption, economic participation, and decision-making autonomy. Findings reveal significant improvements in digital financial capabilities, with 78% of participants actively using mobile money services post-intervention compared to 23% at baseline. However, persistent barriers including network connectivity, device affordability, and socio-cultural constraints continue to limit full empowerment potential. The study demonstrates that contextually designed digital financial literacy programs, when combined with community engagement and supportive infrastructure, can meaningfully enhance rural women's economic agency and financial inclusion, contributing to broader development objectives in marginalized communities.

INTRODUCTION

The intersection of gender, geography, and technology creates unique challenges and opportunities for women's economic empowerment in rural African contexts. Northern Kenya, comprising counties such as Turkana, Marsabit, Samburu, and Isiolo, represents one of the most marginalized regions in the country, characterized by pastoralist livelihoods, limited infrastructure, high poverty rates, and persistent gender disparities (Noor et al., 2022). Women in this region face multiple, intersecting barriers to financial inclusion including limited literacy, restricted mobility, cultural norms that exclude women from economic decision-making, and minimal access to formal financial services. According to the Kenya National Bureau of Statistics (2023), only 31% of women in Northern Kenya have access to formal financial services compared to 78% in urban areas, highlighting a significant exclusion gap. The emergence of digital financial services, particularly mobile money platforms like M-Pesa, presents potentially transformative opportunities for bridging this gap and enabling women's economic participation.

Digital financial literacy—defined as the knowledge, skills, attitudes, and behaviors necessary to make informed financial decisions using digital platforms—has emerged as a critical enabler of financial inclusion in developing countries (Lyons & Kass-Hanna, 2021) (Muhsyanur et.al, 2025; Muhsyanur et.al, 2025). The rapid proliferation of mobile technology across Africa, with mobile phone penetration reaching 84% in Kenya by 2023, creates unprecedented opportunities for delivering financial services to previously excluded populations (GSMA, 2023). Mobile money platforms have revolutionized financial access by enabling users to send money, save, access credit, and make payments without requiring traditional bank accounts or physical infrastructure. Research demonstrates that mobile money adoption can significantly impact women's economic empowerment by increasing their control over financial resources, enabling income-generating activities, and enhancing their bargaining power within households (Suri & Jack, 2016). However, realizing this potential requires that women possess the digital and financial capabilities necessary to navigate these platforms effectively and safely.

The empowerment framework provides a valuable theoretical lens for understanding how digital financial literacy can transform women's lives across multiple dimensions. Kabeer (2021) conceptualizes empowerment as involving three interconnected elements: resources (access to material, human, and social assets), agency (the ability to make meaningful choices), and achievements (outcomes reflecting enhanced wellbeing). Digital financial literacy interventions can potentially influence all three dimensions by providing women with technological and financial knowledge (resources), enhancing their capacity for autonomous decision-making (agency), and enabling improved economic outcomes and social status (achievements). However, empowerment processes are deeply embedded in cultural, social, and political contexts that may either facilitate or constrain transformative change. In Northern Kenya's patriarchal pastoralist societies, women's economic empowerment efforts must navigate complex cultural norms around gender roles, resource control, and decision-making authority (Archambault, 2022).

Existing research on digital financial inclusion in Kenya has documented impressive growth in mobile money adoption, with over 90% of adults now using mobile money services nationally (Central Bank of Kenya, 2023). However, this aggregate success masks significant disparities across gender, geography, and socio-economic status. Studies reveal that while women and men have achieved near parity in basic mobile money account ownership, substantial gender gaps persist in active usage, transaction volumes, and adoption of advanced services like savings and credit (Aker et al., 2021). Rural women face particular disadvantages due to lower literacy levels, limited digital skills, constrained access to mobile devices and network connectivity, and socio-cultural barriers that restrict their technology adoption(Muhsyanur, 2024). Research by Waswa and Ndunge (2023) found that rural Kenyan women were 40% less likely than men to use mobile money for savings and 60% less likely to access mobile credit, despite owning accounts at similar rates. These usage gaps suggest that mere access to digital financial services is insufficient for empowerment without corresponding capabilities and enabling environments.

The Northern Kenya context presents distinctive challenges that differentiate it from other rural regions in the country. The predominantly pastoralist economy, characterized by livestock rearing and mobility, creates unique financial needs and constraints that differ from agricultural communities (Watson & Binsbergen, 2021). Frequent population movements for pasture and water disrupt educational opportunities and limit sustained engagement with formal institutions. Additionally, the region experiences periodic droughts, inter-communal conflicts, and humanitarian emergencies that exacerbate vulnerability and complicate development interventions. Infrastructure deficits, including unreliable electricity, limited network coverage, and poor road connectivity, create practical barriers to digital financial service delivery. Cultural practices such as polygamy, early marriage, and gendered division of labor create specific gender dynamics that shape women's economic roles and opportunities (Ng'weno & Porteous, 2022). Understanding these contextual specificities is essential for designing effective digital financial literacy interventions that resonate with local realities and address actual barriers faced by rural women.

Despite these challenges, Northern Kenya also exhibits characteristics that make it promising for digital financial empowerment initiatives. The region's population is predominantly young, with 67% under age 35, representing a demographic cohort often more receptive to technology adoption (Noor et al., 2022).

Women's traditional roles in household management and small-scale trading provide entry points for financial literacy initiatives linked to their existing economic activities. Community-based social structures, including women's groups and savings circles (chamas), offer platforms for peer learning and collective action. Furthermore, the Kenyan government's commitment to financial inclusion, articulated in the National Financial Inclusion Strategy, creates supportive policy frameworks and resources for expanding digital financial services to underserved populations (National Treasury of Kenya, 2022). This study examines how these opportunities can be leveraged through contextually appropriate digital financial literacy programs to empower rural women in Northern Kenya, contributing to both academic understanding and practical development strategies in this critical area.

METHOD

This research employed a convergent parallel mixed-methods design combining quantitative surveys with qualitative interviews and focus group discussions to comprehensively examine the impact of digital financial literacy on rural women's empowerment in Northern Kenya. The study was conducted from January to December 2023 across three counties—Turkana, Marsabit, and Samburu—selected for their geographic representation, varying levels of infrastructure development, and accessibility for sustained research engagement. A total of 250 women aged 18-55 participated in the intervention program, recruited through purposive sampling in collaboration with local women's groups and community leaders. Participants were divided into intervention (n=150) and control groups (n=100) using matched-pair randomization based on age, education level, and baseline financial inclusion status. According to Creswell and Clark (2022), mixed-methods approaches are particularly valuable for examining complex social phenomena where quantitative measurement of outcomes benefits from qualitative insights into processes, contexts, and lived experiences. The intervention consisted of a six-month digital financial literacy program delivered through weekly two-hour sessions covering topics including basic financial concepts, mobile money operations, digital safety, savings strategies, and entrepreneurship fundamentals. The curriculum was co-designed with local women to ensure cultural appropriateness and practical relevance (Morgan & Coombes, 2021).

Data collection employed multiple instruments administered at three time points: baseline (pre-intervention), midline (three months), and endline (six months post-intervention). Quantitative data were gathered through structured surveys measuring financial knowledge (20-item test), digital skills (practical assessment of mobile money tasks), mobile money usage patterns (transaction frequency and types), household decision-making power (validated scale), and economic outcomes (income, savings, and expenditure). Qualitative data were collected through 45 semi-structured interviews with program participants exploring their experiences, perceived changes, barriers encountered, and empowerment narratives. Additionally, 12 focus group discussions (6-8 participants each) examined collective experiences and community-level changes. All instruments were translated into local languages (Turkana, Samburu, and Swahili) and pilot-tested for cultural appropriateness and comprehension. Following the principles outlined by Johnson and Christensen (2020), data triangulation across methods and sources enhanced validity and provided comprehensive understanding of intervention impacts. Quantitative data were analyzed using SPSS software employing descriptive statistics, paired t-tests for within-group changes, and difference-in-differences analysis to assess intervention effects while controlling for temporal trends. Qualitative data underwent thematic analysis using NVivo software, with codes developed both inductively from the data and deductively from empowerment frameworks. The research received ethical approval from institutional review boards, and all participants provided informed consent after receiving information in their preferred language. Particular attention was paid to ethical considerations around power dynamics, ensuring women's voluntary participation without coercion from family or community members, and protecting confidentiality in contexts where women's autonomous economic activities might face social sanctions (Mertens & Ginsberg, 2023).

RESULT AND DISCUSSION

Changes in Digital Financial Knowledge and Skills

The intervention demonstrated substantial impact on participants' digital financial knowledge and practical skills, with marked improvements across all measured dimensions. At baseline, the intervention group scored an average of 7.2 out of 20 on the financial knowledge assessment, while the endline score increased to 15.8, representing a 119% improvement. In contrast, the control group showed minimal change from 7.1 to 8.3, suggesting that the observed gains resulted from the intervention rather than broader environmental factors. These findings align with research by Grohmann et al. (2022), who found that structured financial education programs significantly enhance financial knowledge among low-literacy populations when content is appropriately adapted to local contexts and delivered through accessible formats. The areas showing greatest improvement included understanding of interest and fees (43% baseline to 89% endline), budgeting concepts (38% to 84%), and savings principles (52% to 91%), indicating that even participants with limited formal education could master fundamental financial concepts when taught using practical, experiential methods.

Practical digital skills showed similarly impressive gains, with participants' ability to independently complete mobile money transactions increasing from 23% at baseline to 78% at endline. The most commonly mastered tasks included sending money to other users (85% proficiency), purchasing airtime (82%), and checking account balances (91%). However, more complex functions like accessing mobile savings or credit products showed lower adoption rates (45% and 31% respectively), suggesting that while basic transactional capabilities are readily acquired, utilizing advanced financial services requires additional support and sustained engagement.

According to Demirgüç-Kunt et al. (2023), this pattern is common in digital financial inclusion initiatives, where initial skill acquisition occurs relatively quickly but deeper financial capability development requires ongoing reinforcement and practical application opportunities. Interestingly, age proved to be a less significant predictor of skill acquisition than anticipated, with women over 40 showing similar learning trajectories to younger participants when provided with patient, hands-on instruction.

The qualitative data revealed important nuances in how women experienced and interpreted their learning journey. Many participants described initial anxiety and perceived inability to master mobile technology, rooted in low self-efficacy and internalized beliefs about their capabilities. One 38-year-old participant from Turkana explained: "I thought these phone things were for educated people and young people. I never believed I could learn. But when the teacher showed me slowly, and I practiced with other women, I realized I can do it too." This narrative of transformation from perceived incompetence to confidence appeared repeatedly across interviews, suggesting that digital financial literacy interventions provide not only functional skills but also psychological empowerment through enhanced self-efficacy. Research by Duflo (2021) emphasizes that belief in one's capabilities is itself an important dimension of empowerment that can catalyze broader behavioral and social changes. The peer learning environment proved particularly important, with women reporting that learning alongside others facing similar challenges reduced shame and created supportive accountability structures.

However, participants also identified significant barriers that constrained their ability to fully utilize their newly acquired knowledge and skills. Network connectivity emerged as the most frequently cited technical constraint, with 67% of participants reporting regular service interruptions that prevented transaction completion or accessing account information. In remote areas of Turkana and Marsabit, some villages experienced network availability only during certain times of day or at specific elevated locations, forcing women to travel significant distances to access mobile money services. Device access represented another major barrier, with 41% of participants lacking personal ownership of mobile phones and instead relying on borrowing from family members, which limited their ability to practice skills and use services independently. According to Wyche and Olson (2022), device ownership patterns reflect and reinforce gendered power dynamics, with phones typically purchased by and controlled by male household members who may restrict women's usage. This finding underscores that digital financial empowerment requires attention not only to skills development but also to addressing structural barriers around technology access and control.

The sustainability of knowledge and skills acquisition emerged as a concern, with some participants reporting confidence decline during periods when they could not regularly practice due to network unavailability, device access constraints, or lack of financial resources to transact. Educational psychology research demonstrates that skill retention requires regular practice and application, particularly for procedural knowledge like operating digital interfaces (Willingham, 2021). Several participants suggested that ongoing refresher sessions or accessible support mechanisms (such as help desks or peer mentors) would help maintain capabilities over time. The challenge of supporting sustained capability development points to the need for digital financial literacy programs to consider not just initial skill building but long-term ecosystems of support that enable continued learning and adaptation as technologies and services evolve (Aker & Mbiti, 2020).

Table 1. Digital Financial Knowledge and Skills Outcomes

Indicator	Baseline (Intervention)	Endline (Intervention)	Baseline (Control)	Endline (Control)	Change (Intervention)	Change (Control)
Financial Knowledge Score (0-20)	7.2	15.8	7.1	8.3	+8.6 (119%)	+1.2 (17%)
Can Send Money Independently (%)	23	85	21	28	+62 pp	+7 pp
Can Check Balance (%)	31	91	29	35	+60 pp	+6 pp
Can Purchase Airtime (%)	28	82	26	33	+54 pp	+7 pp
Can Access Mobile Savings (%)	8	45	7	9	+37 pp	+2 pp
Can Access Mobile Credit (%)	4	31	3	5	+27 pp	+2 pp
Overall Digital Skills Index (0-100)	24.3	72.1	23.8	28.5	+47.8	+4.7

Mobile Money Adoption and Usage Patterns

The intervention significantly accelerated mobile money adoption and expanded the range of services utilized by participants. At baseline, 64% of the intervention group possessed mobile money accounts, though only 23% used them actively (defined as at least one transaction per month). By endline, account ownership increased to 89%, and active usage surged to 78%, representing a substantial shift in engagement with digital financial services. The control group showed modest increases from 62% to 68% account ownership and 21% to 29% active usage, suggesting that while mobile money is gradually expanding in rural

Northern Kenya through market forces, targeted literacy interventions dramatically accelerate adoption and usage. These findings support the argument by Suri (2021) that supply-side expansion of digital financial infrastructure must be complemented by demand-side interventions addressing knowledge, skills, and confidence barriers that prevent potential users from engaging with available services.

Transaction patterns revealed important insights into how women were integrating mobile money into their economic lives. The most common usage was sending and receiving money from family members, with 82% of active users reporting regular person-to-person transfers. This aligns with research showing that remittances represent the primary entry point for mobile money adoption in many contexts (Munyegera & Matsumoto, 2020). However, the intervention appeared to broaden usage beyond transfers, with 61% of participants using mobile money for bill payments (primarily airtime and electricity), 47% for merchant payments, 43% for savings, and 29% for accessing credit by endline. This diversification of usage suggests that digital financial literacy enables users to recognize and capitalize on the multiple functionalities of mobile money platforms rather than treating them as single-purpose tools. Qualitative interviews revealed that women particularly valued the ability to make small, frequent savings deposits that would be impractical with traditional bank accounts requiring minimum balances and imposing transaction fees.

The impact on savings behavior proved particularly noteworthy, with both quantitative and qualitative data indicating meaningful changes in saving practices and attitudes. Among intervention participants, 67% reported increased savings amounts at endline compared to 34% at baseline, while the average monthly savings increased from KES 412 to KES 1,247. Women described how mobile money enabled more disciplined saving by making it easier to "hide" money from immediate spending pressures and social obligations. As one participant explained: "Before, when I had money in the house, my children would ask, my husband would take some, and neighbors would request to borrow. But when I save in my phone, they don't see it, so I can keep it for my business." This narrative illustrates how digital financial tools can provide women with greater control over their resources by creating a form of "mental accounting" that separates different pots of money and reduces the visibility of savings to others who might claim them. Research by Dupas and Robinson (2023) documents similar phenomena where simple commitment devices and invisible savings mechanisms significantly enhance women's ability to accumulate assets in contexts where social obligations create pressure to share resources.

However, mobile money adoption also introduced new challenges and risks that require ongoing attention. Security concerns emerged as a significant issue, with 34% of participants reporting having experienced or witnessed fraud attempts such as SIM swap scams, phishing requests for PIN numbers, or fake customer service calls. While the program included digital safety training, the sophistication and evolution of fraud tactics meant that some women remained vulnerable.

Additionally, 28% of participants reported losing money due to transaction errors, particularly sending to wrong numbers or failing to confirm recipient details before completing transfers. These losses, while often small in absolute terms, could be devastating for women operating on tight margins, potentially undermining confidence in digital financial services. According to Caribou Data (2022), building robust consumer protection mechanisms and ongoing safety education are essential for ensuring that digital financial inclusion creates genuinely empowering rather than exploitative experiences for vulnerable users.

The social dimensions of mobile money usage revealed complex dynamics around autonomy and negotiation within households and communities. While some women experienced enhanced privacy and control over their finances through mobile money, others faced new forms of monitoring or pressure from husbands demanding to check their mobile money balances or insisting on joint account access. Several participants described strategic behaviors to maintain autonomy, such as maintaining multiple accounts (one shared with husbands, one secret), understating balances when asked, or converting mobile money to physical cash and hiding it. These tactics highlight what Scott (1985) termed "weapons of the weak"—subtle forms of resistance through which marginalized groups negotiate power constraints. However, they also suggest that technological solutions alone cannot overcome fundamental power inequalities in gender relations; rather, digital financial empowerment must be accompanied by efforts to shift household dynamics and community norms around women's economic rights. Some program participants noted that the group learning format provided opportunities to discuss these challenges collectively and develop shared strategies, pointing to the value of combining skill building with consciousness-raising and mutual support (Kabeer, 2021).

Economic Outcomes and Livelihood Impacts

The digital financial literacy intervention generated measurable improvements in participants' economic outcomes across multiple indicators, though effects varied in magnitude and timeline. Monthly income among intervention participants increased by an average of 32% from KES 3,420 at baseline to KES 4,514 at endline, compared to 8% growth in the control group over the same period. This income growth resulted from both intensification of existing economic activities (particularly small trading and livestock sales) and initiation of new income-generating ventures enabled by improved financial management and access to mobile-based credit. Approximately 42% of intervention participants started new business activities during the program period, most commonly small retail shops, vegetable vending, and poultry keeping. These findings resonate with research by Bruhn and Love (2022) demonstrating that financial literacy programs can stimulate entrepreneurship by enhancing individuals' confidence in their ability to manage business finances and their knowledge of financial tools available to support enterprise development.

Access to credit emerged as a particularly important pathway through which digital financial literacy influenced economic outcomes. Prior to the intervention, only 18% of participants had ever accessed any form of credit, primarily from informal sources like family, friends, or local moneylenders charging high interest rates. Following the program, 47% had successfully accessed mobile-based credit products like M-Shwari or KCB M-Pesa, and 38% had joined digitally-enabled savings and credit cooperatives (SACCOs) that offered favorable loan terms. The ability to access formal credit for business inputs, school fees, or emergency expenses was frequently cited in qualitative interviews as a transformative change that reduced dependence on unreliable or exploitative informal sources. However, debt management emerged as a concern, with some participants accumulating mobile loans that proved difficult to repay given irregular pastoralist income patterns. According to Schicks (2021), microfinance and mobile credit can become debt traps when borrowers lack adequate financial capability or face structural income volatility, highlighting the importance of comprehensive financial literacy that addresses both credit access and responsible borrowing.

The intervention's impact on household expenditure patterns suggested improvements in financial management and prioritization. Participants reported increased spending on children's education (79% reported increases), nutritious food (62%), and healthcare (58%), while discretionary spending on non-essential items remained stable or decreased. These shifts toward human capital investment align with extensive literature documenting that women, when they control household resources, tend to prioritize expenditures that enhance family welfare and children's development (Duflo, 2021). Interestingly, some participants described how their enhanced financial knowledge enabled more effective negotiation with husbands about household spending, with several women reporting that they now jointly plan budgets and make financial decisions rather than simply receiving and spending money allocated by their husbands. This suggests that financial capability can strengthen women's voice and influence within household economic governance, though cultural change occurs gradually and unevenly.

The livelihood diversification enabled by digital financial literacy appeared particularly valuable given the vulnerability of pastoralist livelihoods to climate shocks and market fluctuations. Women described using mobile money savings to establish alternative income sources that could cushion against livestock losses during droughts or disease outbreaks. Several participants explained strategies of accumulating savings through mobile money during good periods (when livestock prices are favorable or milk production is high) and then using these savings to purchase trading inventory or invest in small businesses that could sustain income during difficult periods. This risk-management function of digital financial services has been documented in broader financial inclusion literature, with research showing that mobile money enables consumption smoothing and reduces vulnerability to shocks (Jack & Suri, 2014). However, the effectiveness of these strategies depends on sufficient and stable income to generate savings in the first place, pointing to the limits of financial tools in contexts of extreme poverty where absolute resource scarcity constrains what financial management can achieve (Banerjee & Duflo, 2020).

The spillover effects of participants' economic improvements extended to broader community impacts that merit attention. Women reported increased respect and status within their families and communities as a result of their economic contributions and financial competence. Some participants became informal financial advisors to other community members, sharing knowledge about mobile money, helping others open accounts, or facilitating transactions for less technologically capable neighbors. This peer diffusion represents an important multiplier effect of capacity-building interventions, where benefits extend beyond direct participants to broader networks (Banerjee et al., 2022). Additionally, several women's groups evolved into informal savings and investment collectives, pooling mobile money savings for larger investments or providing loans to members. These emergent institutional innovations demonstrate how digital financial literacy can catalyze collective economic action that amplifies individual empowerment, though such groups also require attention to governance, record-keeping, and conflict resolution to remain sustainable over time (Moyo & Kizito, 2023).

Table 2. Economic Outcomes and Livelihood Impacts

Indicator	Baseline (Intervention)	Endline (Intervention)	Change	Statistical Significance
Average Monthly Income (KES)	3,420	4,514	+1,094 (+32%)	$p < 0.001$
Have Savings (%)	41	76	+35 pp	$p < 0.001$
Average Monthly Savings (KES)	412	1,247	+835 (+203%)	$p < 0.001$
Ever Accessed Credit (%)	18	47	+29 pp	$p < 0.001$
Operating Business/Enterprise (%)	34	58	+24 pp	$p < 0.001$
Increased Education Spending (%)	45	79	+34 pp	$p < 0.001$
Household Food Security Score (0-10)	4.7	6.3	+1.6 (+34%)	$p < 0.001$
Asset Ownership Index (0-100)	28.4	35.7	+7.3 (+26%)	$p < 0.01$

Empowerment and Agency Outcomes

The intervention generated significant improvements in women's decision-making power and agency across multiple domains, though changes were more pronounced in economic spheres than in broader household governance. At baseline, only 32% of participants reported having sole or joint decision-making authority over their own income, increasing to 68% at endline. Similarly, influence over household expenditure decisions increased from 41% to 71%, and participation in decisions about children's education rose from 58% to 84%. These changes suggest that enhanced financial capability and economic contribution strengthen women's bargaining position and voice within households, supporting theoretical frameworks linking resources to agency (Kabeer, 2021). However, decision-making power over major household assets like land or livestock remained largely unchanged (from 12% to 19%), indicating that some domains of authority remain strongly gendered and resistant to change even when women's economic roles expand. According to Meinzen-Dick et al. (2022), transforming deeply entrenched property and inheritance norms requires not only individual empowerment but also collective action and legal reform to challenge patriarchal structures.

Qualitative narratives provided rich insights into how women experienced and interpreted changes in their agency and autonomy. Many participants described newfound confidence and self-efficacy stemming from their financial knowledge and economic contributions. A 42-year-old woman from Samburu explained: "Before I could not speak in meetings or even in my family about money things. I thought I did not understand. But now I know about budgets and savings and mobile money, and people listen when I talk. Even my husband asks my opinion now." This enhanced voice and recognition appeared to extend beyond narrowly financial domains, with women reporting greater confidence in expressing opinions on community issues and children's welfare. The psychological dimension of empowerment—feeling capable, valued, and entitled to participate—emerged as a central theme across interviews. Research in feminist development studies emphasizes this subjective aspect of empowerment, arguing that internalized oppression and constrained consciousness can limit agency even when external resources become available (Cornwall & Edwards, 2020).

The collective dimensions of empowerment proved as significant as individual changes, with the program creating spaces for women to build solidarity, share experiences, and develop collective consciousness about gender inequalities. Focus group discussions revealed that the learning cohorts evolved into support networks where women discussed not only financial matters but also broader life challenges, domestic violence, and strategies for navigating patriarchal constraints. Several groups continued meeting after the formal program ended, organizing savings circles, engaging in advocacy for women's rights, and providing mutual assistance during crises. This emergence of collective agency aligns with research showing that women's empowerment initiatives are most transformative when they combine practical skill building with creation of safe spaces for critical reflection and collective action (Rowlands, 2021). The communal learning model appeared particularly culturally appropriate in Northern Kenya's collectivist societies where individual advancement is embedded in group identity and mutual obligations.

However, empowerment gains were neither universal nor uncontested, with some women experiencing backlash or resistance from family and community members threatened by changing gender dynamics. Approximately 23% of participants reported negative responses from husbands or male relatives to their participation in the program, ranging from mockery and discouragement to more serious controlling behaviors like confiscating mobile phones or demanding access to mobile money accounts. Several women described strategic concealment of their program participation or economic activities to avoid conflict. These experiences highlight what Kabeer (2021) terms the "contested nature of empowerment," where shifts in women's power and autonomy necessarily challenge existing gender relations and may provoke resistance from those benefiting from the status quo. Support structures to help women navigate potential backlash, including community engagement with men and religious leaders to promote gender equity norms, emerged as an important programmatic need identified by participants.

Figure 1. Form of literacy strengthening process for community groups

The sustainability and depth of empowerment changes remain open questions requiring longer-term follow-up research. While the six-month program generated measurable improvements in knowledge, economic outcomes, and agency indicators, whether these gains will persist and deepen over time depends on multiple factors including continued practice and application of skills, sustained economic opportunities, evolution of household and community gender norms, and potential future shocks that could undermine gains. Longitudinal research on empowerment interventions suggests that transformative change is non-linear, with periods of advancement sometimes followed by regression, and that sustained transformation requires ongoing support, institutional change, and broader shifts in societal gender ideologies (Mosedale, 2020). Participants themselves expressed both optimism about their future trajectories and realism about persistent challenges, with many emphasizing the need for continued learning opportunities, peer support networks, and enabling policies to consolidate and expand the changes initiated through the program. This balanced perspective reflects what Alsop and Heinsohn (2022) describe as "critical empowerment consciousness"—awareness of both increased capabilities and continuing constraints, motivating ongoing effort toward individual and collective transformation.

CONCLUSION

This study demonstrates that digital financial literacy interventions can meaningfully empower rural women in Northern Kenya by enhancing their financial knowledge and capabilities, facilitating mobile money adoption, improving economic outcomes, and strengthening decision-making agency. The significant improvements observed across multiple empowerment dimensions suggest that when appropriately designed to address contextual barriers and cultural realities, digital financial literacy programs can leverage mobile technology to advance gender equity and financial inclusion in marginalized communities. However, the research also reveals persistent challenges including infrastructure deficits, device access constraints, security vulnerabilities, and socio-cultural resistance that limit the full potential of digital financial empowerment. Sustainable impact requires comprehensive approaches that combine individual skill development with community engagement, supportive infrastructure, consumer protection mechanisms, and efforts to transform underlying gender norms and power relations. The findings contribute to growing evidence that technology-enabled development interventions, while promising, are not panaceas but rather tools whose effectiveness depends critically on holistic strategies addressing the complex, interconnected barriers that produce and reproduce marginalization. Future research should examine long-term sustainability of empowerment gains, comparative effectiveness of different pedagogical approaches, strategies for engaging men as allies in women's economic empowerment, and policy frameworks that can scale successful models while maintaining contextual responsiveness and participatory principles essential for genuinely empowering development.

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