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Innovative Approaches in Management of Education Resources during Disasters in Kenya

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Abstract

The management of education resources during disasters is a critical concern in ensuring the continuity and quality of education during crises. This study explores innovative approaches used in management of educational resources during disasters in Kenya, with the objective of determining efficacy. The focus is on human resource, infrastructure, and teaching and learning materials. The study reviewed documentation of strategies used in times of crises. The research drew insights from the disaster risk reduction framework and systems theory. Findings indicate that teachers and support staff have shown resilience in adopting new methods, but gaps in their preparedness and resource availability hinder optimal outcomes. Further, while innovative approaches have provided essential solutions for maintaining educational services during disasters, the challenges contribute to inequity in access and sustainability of these innovations. It recommends strengthening teacher- preparedness, improving disaster-resilient infrastructure, and promoting equitable distribution of educational technologies.

Keywords: disasters, education resources, management, innovative approaches.

1.1 *Introduction*

Disasters such as droughts, floods, pandemics, and armed conflicts have increasingly disrupted the delivery of education services in Kenya, leading to the displacement of learners and teachers, destruction of infrastructure, and severe shortages of essential education resources (UNESCO, 2020; MoE, 2021). The COVID-19 pandemic, in particular, exposed the vulnerability of the education sector to disaster situations, forcing schools to close and challenging the continuity of learning nationwide (Wangari & Muthoni, 2021). In response to these disruptions, various innovative approaches have emerged, aimed at managing education resources more effectively to ensure learning continuity and equity during times of crisis.

Innovative approaches are creative, adaptive, and context-sensitive strategies designed to enhance the resilience of the education sector in disaster settings (UNICEF, 2021). These approaches include the use of digital learning platforms, radio and television education programs, mobile schools, community-based learning centers, decentralized resource distribution systems, cloud-based resource management systems, and the adoption of flexible curriculum

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models (KICD, 2020; UNESCO, 2020). By integrating technology, community participation, and decentralized management systems, these innovations seek to maintain access to quality education even in adverse conditions.

The *management of education resources* during disasters is critical in sustaining education services and minimizing the negative impacts of crises on learners (World Bank, 2021). This study focuses on three key categories of education resources: *Human resources* involve the availability, deployment, and capacity of teachers and education personnel during disasters, including their digital literacy skills, training on disaster-responsive teaching methods, and welfare support (MoE, 2021). *Infrastructure resources* include the physical and technological facilities required for learning, such as classrooms, ICT infrastructure, power sources, and alternative learning spaces like community halls and tents (UNICEF, 2020). *Teaching and learning resources* cover textbooks, digital devices, take-home learning packages, and other instructional materials, alongside the use of radio, television, and online educational content (Wangari & Muthoni, 2021).

1.2 *Back ground of the study*

Disaster-resilient education systems have been developed in some countries notably, Japan, Bangladesh, and New Zealand which, have demonstrated notable success in developing proactive policies and innovative resource management strategies (UNESCO, 2020). For instance, Japan's School Safety Program integrates disaster preparedness into the school curriculum while utilizing temporary learning spaces and ICT platforms to ensure continuity of learning during earthquakes and tsunamis (UNICEF, 2020). Similarly, Bangladesh has successfully implemented mobile schools and floating classrooms in flood-prone areas, ensuring uninterrupted access to education for displaced learners (World Bank, 2021).

In the African context, countries like Rwanda and South Africa have made significant progress in leveraging innovative approaches to manage education resources during disasters. Rwanda introduced nationwide e-learning platforms such as eKigali and IREMBO, enabling learners to access lessons remotely during the COVID-19 pandemic (UNICEF, 2021). The country also partnered with radio and television networks to broadcast educational content, ensuring even learners without internet access continued their studies. South Africa adopted a blended learning approach combining online platforms, printed take-home materials, and community learning centers to reach marginalized learners, particularly in informal settlements and rural areas (UNESCO, 2021).

In Kenya, the education sector has faced multiple disruptions caused by recurring droughts, floods, political conflicts, and more recently, the COVID-19 pandemic. These disasters have often resulted in school closures, displacement of learners and teachers, destruction of infrastructure, and severe shortages of teaching and learning resources (MoE, 2021). In response, several innovative approaches have been introduced, such as the Kenya Education Cloud, radio and television programs, mobile schools in nomadic areas, and community-based learning centers (KICD, 2020; Wangari & Muthoni, 2021). While these initiatives were crucial in ensuring learning continuity during the pandemic and other crises, their impact on the management of education resources particularly in relation to human resources, infrastructure, and teaching and learning materials remains underexplored. Given Kenya's susceptibility to frequent disasters and the critical role of education in national development, it is essential to assess how these innovative approaches have influenced the management of education resources during crises. Drawing lessons from successful models in other countries, this study examined Kenya's experience in managing human resources, infrastructure, and teaching and learning resources through innovative strategies during disasters.

1.3 *Statement of the problem*

While other countries have successfully adopted innovative approaches in times of disasters to sustain education services during crises, the effectiveness of similar interventions in Kenya remains unclear. In Kenya, disasters such as droughts, floods, political conflicts, and the COVID-19 pandemic have repeatedly led to school closures, displacement of learners and teachers, and severe shortages of education resources. There is limited empirical evidence on management strategies of specific innovative strategies employed during disasters. Despite the promise these interventions hold, challenges such as inequitable resource distribution, limited digital infrastructure, inadequate teacher capacity, and lack of clear resource management frameworks persist. This raises concerns about the sustainability, inclusivity, and effectiveness of management of education services in disaster-affected areas.

1.4 *Purpose of the study*

The purpose of this study is to assess the suitability of innovative approaches used in management of education resources during disasters in Kenya. To do this, the study objective was to examine management innovations in the management of education resources during disasters in Kenya. The justification for this study arises from the increasing frequency of disasters affecting education in Kenya and the growing need for innovative, sustainable, and inclusive strategies to safeguard education services. The study focus was on assessing the efficacy of innovative approaches used in the management of education resources during disasters in Kenya.

1.5 *Significance and justification*

The study was significant in filling the knowledge gap by assessing the effect of innovative approaches on the management of education resources, particularly in disaster-prone contexts. *Policy makers and education planners* will gain evidence-based insights to guide the development of disaster-responsive education policies and frameworks. *School administrators and education managers* will benefit from practical strategies on how to effectively deploy, manage, and sustain human, infrastructure, and learning resources during crises. *Development partners, non-governmental organizations (NGO), and community organizations* involved in education and disaster response will have access to research-informed recommendations to enhance their interventions and partnerships.

Researchers and scholars will find this study valuable in expanding the existing body of knowledge on education resource management and disaster resilience in the education sector. The increasing frequency of disasters affecting education in Kenya and the growing need for innovative, sustainable, and inclusive strategies to safeguard education services provided impetus for the study. Hence, this study aimed to contribute to strengthening disaster preparedness, resilience, and equity in Kenya's education sector.

1.6 *Scope of the study*

This study focused on assessing the influence of innovative approaches on the management of education resources during disasters in Kenya. It relied exclusively on *secondary data* obtained from existing literature, government reports, policy documents, scholarly articles, organizational publications, and global and national disaster response reports related to education. It examined innovative approaches that influenced the management of three key categories of education resources; *human resources* (teachers, education personnel, and support staff), *infrastructure resources* (physical and technological facilities), *teaching and learning*

resources (instructional materials and delivery platforms). Geographically, the study was limited to *Kenya*, focusing on disaster-prone regions where the education sector has experienced significant disruptions due to events such as droughts, floods, conflicts, and the COVID-19 pandemic. However, it drew comparative insights from successful experiences in other countries to inform the Kenyan context. The study concentrated on the period between 2020 and 2025, a time characterized by recurrent natural disasters in Kenya. *No primary data was collected* from the field. The study was limited to analyzing and synthesizing existing information and documented experiences.

2. Literature review

The management of education resources during disasters has become an increasingly significant area of concern worldwide, as crises such as pandemics, floods, droughts, and conflicts continue to disrupt learning systems, especially in low- and middle-income countries (Anderson et al., 2020; World Bank, 2021). Effective education resource management involves the coordination of human resources, infrastructure, and teaching and learning materials to ensure education continuity and quality during emergencies (UNESCO, 2021; INEE, 2020). Globally, countries have adopted a variety of innovative approaches to overcome disaster-related disruptions. These include virtual classrooms, digital libraries, mobile schools, radio and TV lessons, floating schools, and community learning centers (UNICEF, 2021; Burde et al., 2017).

This study was hinged on two key theories; the Disaster Risk Reduction (DRR) Framework and the Systems Theory (Bertalanffy, 1968), which provide a practical foundation for understanding how innovative approaches used in management of education during disasters can influence the management of education resources. The Disaster Risk Reduction (DRR) Framework, as articulated by UNESCO (2014) advocates for a proactive and strategic approach to reducing the vulnerability of education systems to disasters. The framework emphasizes preparedness, resilience, and the safeguarding of educational infrastructure, teaching and learning materials, and human resources during crises. It underscores the need for integrating disaster risk management into education sector planning, ensuring the continuity of education, and protecting both physical and human resources from disaster-related disruptions. This aligns directly with the purpose of this study, which seeks to examine how *innovative approaches can enhance the management of educational resources* such as teachers, support staff, infrastructure, and learning materials during disaster situations in Kenya. The systems Theory, originally proposed by Bertalanffy (1968), views organizations, including schools, as interconnected systems comprising multiple components such as human resources, infrastructure, teaching and learning materials, and support services. The theory asserts that any disruption to one part of the system affects the entire system's functionality. During disasters, the education system experiences disruptions in its interconnected parts, requiring adaptive, coordinated, and innovative responses to maintain functionality. This theory supports the study by providing a framework for understanding how innovative resource management approaches can help stabilize the education system, restore balance, and ensure learning continuity in the face of disasters. It highlights the importance of managing not just physical resources but also human and organizational resources in a systemic, integrated way.

Mutonyi (2022) investigated digital teacher training in Rwanda during covid-19 and found that while many teachers adapted quickly to the use of digital tools through online courses and resources, those in rural areas faced significant challenges related to internet connectivity and infrastructure. Spaull et al. (2021) investigated the implementation of blended learning programs and digital support systems for teachers during the COVID-19 pandemic. The findings showed that teachers played a key role in facilitating home-schooling initiatives and participating in community-based learning programs, with the support of virtual mentorship and online

instructional content. However, the study did not assess the effectiveness of these innovations for support staff such as ICT officers and administrative personnel, nor did it examine the long-term welfare of teachers operating under these new systems. Wangari and Muthoni (2021), examined the involvement of Kenyan teachers in initiatives like EduTV, Kenya Education Cloud, and community-based learning programs during school closures. Their findings indicated that teachers were actively engaged in the delivery of television and radio lessons and organized small, village-based study groups to ensure continuity of learning. Despite these successes, the study highlighted a lack of formal structures to support teacher motivation, preparedness for digital teaching, and personal safety during disasters.

Across these studies, notably, there is limited research on psychosocial support mechanisms for teachers and education personnel during disasters. Secondly, the role of support staff such as ICT officers, administrators, and health workers in emergency education management has been insufficiently explored. Additionally, the existing studies reveal a lack of formalized structures for motivating, redeploying, and compensating teachers during crises. There is also minimal evaluation of the quality, effectiveness, and capacity-building measures for community volunteer teachers. Summarily, very little documentation exists on Kenya's specific experiences with managing teaching workforce during disasters.

Few studies have examined the critical roles played by non-teaching staff in continuation of education during crises. Mutua (2021), explored how ICT officers, and health personnel facilitated remote learning programs during school closures. The study found that ICT support staff were instrumental in setting up digital platforms, troubleshooting online systems, and providing technical assistance to both teachers and learners. Health staff helped enforce COVID-19 health protocols in learning centers, while school administrators coordinated communication between education offices, teachers, and communities. A key gap identified in this study was the limited training opportunities and formal involvement of non-teaching staff in education emergency planning and policy formulation. Omollo and Kimani (2020), explored how support staff such as guards, matrons, cooks, and school nurses contributed to ensuring learning continuity in boarding schools and temporary learning centers. The findings showed that these personnel played a significant role in enforcing safety protocols, maintaining infrastructure, and offering psychological support to students. However, the study noted a gap in recognition and resource allocation for support staff, who were often excluded from government support packages and training programs.

Kwesiga and Tusiime (2019) examined how administrative and logistical support staff helped manage teaching and learning resources during refugee influxes in Northern Uganda. The findings highlighted that these staff members managed temporary learning shelters, organized distribution of teaching aids, and assisted in learner registration and welfare services. The study identified a gap in clear operational frameworks, inadequate incentives, and lack of disaster preparedness training for support personnel. Security guards, health officers, and administrative clerks participated in emergency drills and infrastructure maintenance (Mwangi, 2018). Their involvement was often informal and poorly structured, due to the absence of formal policies, training, and disaster management protocols for support staff, despite their frontline role in ensuring school safety and continuity.

Mutonyi (2021) explored the impact of floods on educational infrastructure in Kenya, focusing on how recurrent flooding affects school buildings, learning resources, and accessibility, particularly in rural areas. The study found that flood-prone regions experienced significant damage to school buildings and classrooms, as well as destruction of learning materials. It highlighted the lack of proper drainage systems and flood-resistant infrastructure as major challenges. However, the study did not assess the role of local communities in securing school infrastructure. A study by Ndegwa and Njoroge (2020) says schools in drought prone areas experienced significant disruption of learning due to lack of water. This was so yet the schools in

these regions lacked sufficient water storage and sanitation infrastructure. The study did not explore alternative water provision systems, such as rainwater harvesting or the potential role of community involvement in managing resources during droughts.

Wambua and Mwangi (2022) examined the role of management in securing school infrastructure during the COVID-19 pandemic. The study explored how schools adapted their physical infrastructure to comply with health protocols such as social distancing and sanitation measures. It found that urban schools with adequate infrastructure were able to implement these measures effectively, while rural schools struggled due to limited resources, including inadequate handwashing facilities and insufficient classroom space. This study, however, did not consider the long-term sustainability of these infrastructural changes or explore how remote learning infrastructure was supported in rural areas, leaving room for further investigation into the enduring challenges faced by schools in these areas.

Karanja and Mwende (2021) focused on the management challenges of digital learning infrastructure during the pandemic. They found that rural schools lacked the necessary infrastructure, including reliable internet and digital devices, which hindered the continuation of learning during the lockdowns. Urban schools, on the other hand, had the infrastructure to transition to online learning. Kamau and Kinyua (2020) looked into management of infrastructure developed for education in conflict-affected areas of northern Kenya. The study found that infrastructure in these regions was heavily damaged due to violence and insecurity. Schools had to rely on temporary classrooms and mobile learning setups, but the lack of basic utilities such as water, electricity, and sanitation facilities made the learning environment less conducive. The study did not delve into the psychological impact on managers of working in temporary or makeshift structures, nor did it explore the long-term sustainability of such infrastructure.

Oduor (2018) explored how droughts affect the availability of teaching and learning resources, specifically in Turkana County. His findings highlighted that prolonged droughts led to shortages of food, water, and teaching materials, with frequent school closures due to the displacement of families. Teachers also faced challenges reaching remote areas to deliver lessons, resulting in a significant disruption of the learning process. Muthoni and Kamau (2020) explored the impact of floods on education. The study found that, during floods, many schools turned to community-based learning centers, utilizing available resources such as printed materials and locally developed teaching aids. Some schools also adapted by using mobile learning units to cater to displaced children. There was also insufficient focus on teacher professional development during such disasters. A study by Wangari and Muthoni (2021), revealed that the Kenyan government made substantial efforts to provide resources such as EduTV, radio broadcasts, and online learning platforms during disasters. Despite these efforts, rural and marginalized regions faced major challenges, as they had limited access to these resources. Additionally, teachers struggled with remote teaching, especially due to a lack of training in digital tools. Otieno and Karani (2019) report that in conflict prone regions where displacement of students and teachers occurs, damage to infrastructure, and a severe shortage of learning materials follow. Their study also revealed that many schools in conflict-affected areas could not function properly due to insufficient resources. While the study acknowledged the role of teachers and local communities in continuing education, it did not address alternative learning methods such as community-based or mobile education solutions, nor did it explore strategies for post-conflict recovery in education.

The reviewed literature suggests that while responses addressed immediate challenges like resource shortages and disrupted learning, they did not adequately focus on *long-term recovery strategies* or how innovative approaches could be sustained beyond the crisis period. Most interventions lacked emphasis on *inclusive education strategies* for learners with disabilities. Additionally, there was limited exploration of the *integration of digital technologies* in resource management, especially in rural and under-resourced areas. The role of *support staff* in managing and supporting educational resources was also largely ignored, despite their

importance in ensuring school operations during crises. Furthermore, little attention was given to *teacher professional development* in disaster-responsive resource management and the use of ICT tools. Overall, the studies missed opportunities to propose *structured, coordinated, and scalable systems* for managing teaching and learning resources in both emergency and post-disaster contexts.

3. Methodology

A descriptive research design was used to systematically describe and interpret existing information regarding the influence of innovative approaches on the management of education resources during disasters in Kenya. This design allowed for the examination of documented facts, patterns, and practices from already existing studies, reports, and official records. Data sources include:

- Published academic journal articles;
- Government policy documents and reports from the Ministry of Education and disaster management agencies;
- Publications from relevant stakeholders like UNESCO, UNICEF etc.;
- Reports education sector reviews;
- Official disaster response reports related to education during crises.

4. Findings

The findings are organized thematically by the following indicators; *human resource, infrastructure, and teaching and learning resources*. Innovative approaches like the use of virtual training platforms, community-based volunteer programs, and psychosocial support initiatives were effective strategies for retaining and supporting education personnel in crisis settings. Gaps exist in long-term planning for teacher support and the limited inclusion of non-teaching staff in disaster preparedness programs. While technology-based training and remote teaching innovations were implemented, these interventions were often limited to urban or better-resourced areas, excluding rural and marginalized regions.

Disasters such as floods, droughts, and armed conflict have caused widespread damage to school infrastructure in Kenya, affecting the continuity of learning. Physical learning spaces are usually destroyed or repurposed during a crisis and this disrupts normal education programs. Innovative responses, include the establishment of temporary learning spaces, mobile schools, and the use of radio and television classrooms are practical solutions during periods of infrastructural disruption. Gaps exist in the sustainability of these interventions, with challenges in scaling them up or maintaining quality learning in the absence of stable physical infrastructure. The unequal distribution of these solutions, especially in arid and conflict-prone counties, was also noted.

Innovative approaches in use in learning materials during crises include; online learning platforms, mobile libraries, digital content distribution, and community-based learning hubs. Gaps in the inclusivity and equity of these initiatives were described. Most digital interventions favored well-resourced urban schools, leaving behind learners in remote and underserved areas. The literature also pointed out the lack of locally adapted content and culturally sensitive materials suitable for crises.

Summarily, the study revealed significant disparities in the reach and sustainability of the management interventions. Most were concentrated in urban or better-resourced areas,

leaving rural regions underserved. Similar findings were reported by Nakitare (2021), Chepkemboi (2020), who document that suitable online interventions were effective in mitigating learning disruptions in urban settings. The study strengthening of staff preparedness and investing in long-term, technology-driven professional development programs. The study also recommends disaster-resilient infrastructure and learning materials for schools. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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