

An E-Learning Avalanche in Sudanese Medical Education from Emergency Response to Enduring Transformation

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“Those of us who will remember 'e-learning' as a concept, will be similar to those who, referring back to Archimedes' drawings in the sand, still remember slide projectors, tape-slide or the laser disk: everything changes, everything remains the same.” AMEE guide 32.(1)

E-learning, defined as the strategic application of technology to enhance and broaden educational practices, has become a fundamental component of contemporary medical education. In Sudan, its importance has increased significantly in response to various national crises, including the COVID-19 pandemic, the December 2019 revolution, and the 2023 ongoing war. Each of these events has disrupted traditional educational systems and highlighted the necessity for resilient, technology-driven solutions in a country with a rich legacy in medical education, which dates back to 1924 with the establishment of Kitchener Medical College. (2) Today, Sudan is home to 103 medical faculties, comprising 33 public and 70 private institutions. (3)

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A recent article in SJHS (4) examined the e-learning experiences of educators within undergraduate medical programs. The study indicated that while many educators acknowledged the advantages of e-learning, particularly its flexibility and accessibility, they also faced significant challenges. These challenges included unreliable internet connectivity, limited learner engagement, technical difficulties, and a lack of digital literacy among staff members. Nevertheless, despite these obstacles, the general sentiment among educators remains cautiously optimistic about the potential of e-learning. This article delves into various aspects related to these findings.

Necessities and usage of e-learning by e-learner, e-educator and e-systems: E-learning encompasses e-teaching, e-portfolio, and e-assessment, aided by virtual learning environments and learning management systems, with a focus on content delivery and the learning process. The e-learning is considered an avalanche; the term “avalanche” was aptly utilized by Michael Barber and colleagues in their 2013 publication, “An Avalanche is coming: Higher education and the revolution ahead.” (5) In this document, they emphasized the significant statement made by

David Puttnam at the Massachusetts Institute of Technology in June 2012. “It’s tragic because, by my reading, should we fail to radically change our approach to education, the same cohort we’re attempting to “protect” could find that their entire future is scuttled by our timidity”. In low-income regions, e-learning democratizes education by connecting remote learners with expert educators and global resources. It reduces disruptions, promotes flexibility, enhances education quality, fosters inclusivity, and supports Sustainable Development Goal 4. (6)

Challenges of E-Learning: E-learning in Sudan is fraught with multifaceted challenges, which span four critical domains. (A) Technology-dependent barriers include fragile infrastructure, intermittent electricity, limited internet access, and reliance on low-bandwidth platforms. Amid the ongoing war, connectivity has worsened, with many relying on satellite services like Starlink, which are logistically challenging and pose security risks. The financial burden is significant, with monthly costs often exceeding one-third of a middle-class salary, making digital education inaccessible for many. (B) Human-dependent, where limited digital literacy among educators and learners complicates the transition to online platforms and diminishes essential elements like mentorship and collaboration. (C) Curriculum-dependent issues, particularly those related to assessment integrity and

feedback mechanisms. E-assessment, both formative and summative, presents substantial difficulties in ensuring validity, reliability, and fairness, especially in unstable environments. (D) Youth-dependent challenges have emerged as a critical and often overlooked domain. The pervasive use of social media platforms such as TikTok, Facebook, and WhatsApp has introduced significant "phubbing", digital distractions, diverting learners' attention from academic tasks and impairing performance. Studies have shown that learners frequently engage in off-task behaviours during online learning, with up to 60% of laptop users spending 40% of class time on non-academic activities. (7) Moreover, it may be linked to anxiety and depression. (8) In Sudan, the excitement surrounding unfolding war events is heightened by a constant craving for news updates. The analysis conducted by M. B. M. Ahmed et al. (9) Highlights the resilience and satisfaction of Sudanese learners but also reveals significant levels of depression, anxiety, and stress that need attention. Bhat et al. highlight the importance of thoughtfully integrating digital learning tools while prioritizing in-person, experiential learning to equip students with essential skills for patient care and professional development (10).

Unlocking the potential of e-learning: strategic insights from Sudan: Due to ongoing conflict, economic instability, and health emergencies, e-learning is evolving from a temporary fix to

a necessary strategic transformation. Sudan's educational landscape presents unique opportunities for scalable and sustainable digital education focused on resilience, equity, and innovation. Sudan has several potentialities for enhancing digital education: (A) Sociocultural capital: The collectivist ethos and strong diaspora engagement promote collaborative online learning, with digitally savvy youth driving peer-led initiatives. (B) Mobile-first outreach leverages high mobile phone usage for cost-effective content delivery, enhanced by digital learning infrastructure from the COVID-19 pandemic. In early 2025, there were 21.6 million active mobile connections in Sudan, representing 42.4 percent of the population.(11) (C) Curricular flexibility: The diverse medical curricula in Sudan are suited to blended learning approaches. (D) Commitment to professional development: Sudanese educators' dedication to digital pedagogy and culturally responsive teaching can improve e-learning outcomes. (E) Research-driven innovation: Emerging research highlights implementation gaps, leading to context-sensitive solutions for better digital education quality. (F) Lifelong learning: Digital platforms support ongoing professional development, aligning with the WFME trilogy criteria (12) and the global health workforce development goals.

Strategic pillars for implementation: Drawing from global best practices and regional insights, we propose six foundational pillars for an effective e-learning strategy in Sudan: (A) Governance: Develop national policies, ethical frameworks, and quality standards to guide digital education. (B) Stakeholders' partnership: Form partnerships with telecom companies, local institutions, global networks, and diaspora experts to ensure sustainability and secure funding. Promote collaboration for resource sharing, faculty exchange, and joint virtual and mixed reality simulation. (C) Technology infrastructure: Invest in reliable, accessible, and equitable digital tools, including mobile-first platforms and offline content delivery. (D) Curriculum mapping should align competencies, milestones, and Entrustable Professional Activities (EPAs) (13) With blended delivery formats, differentiating online and experiential components. The Vallée et al. systematic review (14) highlights that blended learning outperforms traditional methods in health education, improving knowledge retention and learner satisfaction. (E) Capacity building: Implement competency-based training for educators and learners, emphasizing digital literacy, mental resilience, and culturally relevant pedagogy. (F) Research and Informatics: Establish continuous evaluation mechanisms using learning analytics, AI-driven feedback systems, and adaptive learning technologies. (Figure 1)

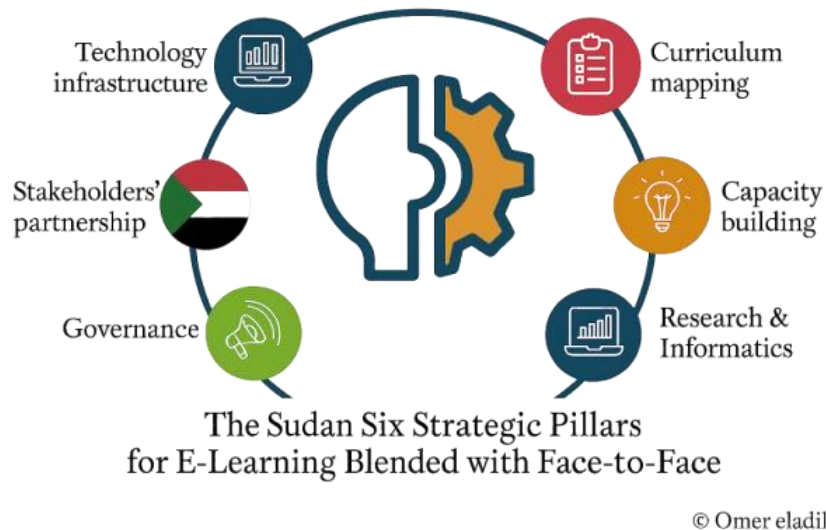


Figure 1: The six strategic pillars essential for the successful integration of e-learning with face-to-face instruction.

Conclusion: A blueprint for resilient medical education: E-learning in Sudan is no longer a stopgap; it is a cornerstone of educational resilience. The convergence of crisis and innovation presents a unique opportunity to transform medical education into a more equitable, modern, and sustainable blended system. Strategic investment in infrastructure, educator development, and learner-centred models will be essential. Mobile technology and affordable data plans offer promising

avenues to reach underserved populations, reduce costs, and expand access in partnership with tele companies.

By embracing these opportunities and addressing barriers through inclusive policies and evidence-based planning, Sudan can pioneer a resilient a blended e-learning framework that not only withstands disruption but thrives in its wake, serving as a model for other low-income, crisis-affected nations.

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