

Resilient Learning Amidst Conflict: Empowering Education Through E-Learning

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Abstract

The civil war in Sudan has severely damaged the educational system, creating an urgent need for alternative solutions to ensure the continuity of education. Consequently, this study investigates the viability of online learning as a tool to address these challenges. Focusing on four schools: Oxford, Newchild, Apolo, and Manal, the research aims to determine whether online learning through the use of e-platforms can support education during a crisis. Additionally, data was collected through a survey of 30 teachers from these schools, using a mixed-method approach to assess their perspectives on the feasibility, benefits, and challenges of online learning in times of conflict. The results revealed significant obstacles to implementing online learning in conflict-affected schools. These challenges include the need for teacher training on digital tools, technical difficulties in monitoring student engagement and academic progress, and a lack of quality educational materials adapted for online learning. Despite these challenges, educators also highlighted key benefits of online education, such as facilitating student centered learning activities and maintaining continuity in the learning process during crises. The study recommends extensive teacher training in digital literacy, substantial investment in technological infrastructure to close connectivity gaps, and the development of high quality, conflict sensitive educational content. Furthermore, the findings contribute to the broader debate on recovery education in post-conflict regions and offer valuable insights for policymakers and stakeholders to position online learning as a potentially transformative solution for the future of education in Sudan.

Introduction

Conflicts have far-reaching consequences for countries, disrupting their social, economic, and educational structures. Moreover, wars are usually accompanied by forced migration, infrastructure destruction, and killings, with extremely dreadful repercussions that include poverty, health crises, and stunted development. For instance, considering the establishment, the study by (Gates et al. 2012) shows how wars destabilize regions and lead to societal breakdowns. Similarly, (Collier and Hoeffler, 2004) found that civil conflicts harm a country's economy by discouraging foreign investments and reducing economic growth. (Justino, 2014) further supports this by discussing the significant impact that civil conflicts have on education systems, particularly in sub-Saharan Africa. (Chamarbagwala & Mor'an, 2011) provide additional evidence that civil wars, like those in

Sudan, negatively affect human capital development, which includes education.

The civil conflicts in Sudan shook the land, with the crisis in Darfur and the Second Civil War. These conflicts have resulted in huge loss of lives, displacement of millions of people, and economic hardship. Many of the schools have been destroyed or put to other uses, while students have been made to join militias or another warring groups conflict (Verhoeven, 2011). Interest in providing an alternative education system has, therefore, become all the more imperative in such a scenario, as conventional education has remained elusive in war-stricken regions. To this regard, similar crises in other conflicted countries are highlighted by (Smith, 2009) hence underlining a critical need for educational solutions in the struggle zone.

E-learning, use of technology to facilitate education outside traditional class rooms, has emerged as a critical solution in areas affected by conflict. According to (Almaiah et al., 2020), e-learning provides flexible cost-effective learning opportunities that eliminate the necessity of physical classrooms and allows learners to learn at their own pace. This is particularly important in conflict zones, where it can be dangerous or impossible to access physical schools. As (Kumar & Al-Samarraie, 2018) point out, Moodle and other e-learning platforms find particular utility in developing countries facing conflicts due to the fact that they provide flexible and scalable solutions adaptable to versatile educational needs. During disasters, like war, natural disasters, and health emergencies, e-learning holds up education. Some studies prove that students can safely continue learning online during crises, such as Encarnacion et al., 2021, Pal & Vani- jja, 2020). Moreover, it provides normalcy and routine, which are essential to students while their mental health undergoes destruction due to crises (Phusavat & Buheji, 2024, Rajab & Soheib, 2021). (Dryden-Peterson, 2016), draws on the sustained education of the refugee population, which has been equably disrupted by war and conflict through the same e-learning methodologies.

Moodle, an open-source learning management system (LMS), is widely used to support online education. It offers features like discussion forums, quizzes, and assignments, allowing teachers to create engaging and interactive learning environments (Brandl, 2005). Moodle flexibility allow it to be customized to meet the specific needs of schools in conflict affected regions, making it an ideal platform for delivering education in Sudan (Al-Hamad, 2022). Research by (Nooraldaim & Saed) highlights the potential of Moodle to improve student outcomes by aligning lesson plans with educational objectives, demonstrating its effectiveness in modern education. Additional studies emphasize the importance of such platforms in enhancing the overall learning experience, particularly in regions where traditional educational methods are no longer feasible.

Considering that the educational system in Sudan is still bearing the shocks of war, e-learning offers an imperative measure in ensuring education continuity in such a torn apart country. It is flexible, hence easily applicable across locations that are remotely situated or remain in a war zone, allowing students to pursue their education amidst the barriers to education created by war. Moreover, by providing structured learning environments, platforms like Moodle help mitigate the psychological impact of conflict by creating a sense of routine for students. (Zelezny Green, 2014 provides a clear example of how mobile technology has been used in Kenya to support education in conflict-affected regions, offering valuable lessons for implementing e-learning

in Sudan. (Traxler, 2017) also discusses the benefits of blended learning in developing countries, showing how such models can be effective even in areas with limited technological infrastructure.

This study is focused on how e-learning could offer possible solutions to educational problems faced by schools in conflict settings, especially with a special study in Moodle use. The study will deduce from the experience of four schools in Sudan and how e-learning would offer a solution within the post-war, disrupted educational environment.

Significance of Study

This is an important study because it investigates the potentials of e-learning to resolve the educational challenges in war impacted schools in Sudan. A case study approach on Moodle is undertaken to use the experiences from learning in four specific schools on how online education could be a continuity in learning amidst disruption caused by wars. This study identifies the key major challenges facing teachers against the implementation of e-learning under this situation of post-conflict; assesses to what extent e-learning best meets educational needs among students under such accused or ongoing conflicts; and provides practical solutions to improve effectiveness and implementation. Ultimately, this research shall attempt to render reports and recommendations useful to policymakers, educators, and stakeholders in the improvement of education outcomes in the conflict affected regions of Sudan for making education inclusive, effective, and resilient amid adversities.

Research Questions

1. What are the main obstacles that teachers face when integrating e-learning in a post-conflict environment?
2. Can online education adequately address the educational requirements of students impacted by the conflict in Sudan?
3. What techniques could be suggested to enhance the application and efficacy of e-learning in post-conflict Sudanese schools?

Literature Review

The ongoing Sudan crisis, fueled by war in multiple states, has profoundly impacted all aspects of society. Figure 1 illustrates the widespread disruption caused by the conflict across different region, including the education system. Among them, medical schools in the country had various issues that impacted their ability to provide ongoing education. Out of these universities, 17 conducted their educational operations in partnership with other institutions. However, these efforts were mostly impeded by a deficiency in network infrastructure, frequent power outages, and, particularly in rural regions, restricted bandwidth (Mahgoub et al., 2024). This highlights the necessity for collaborative endeavors to rebuild educational infrastructure and ensure that all kids can access education. A United Nations study highlights the significant consequences of conflicts on the educational achievement of children, with Sudan being one of the country's that is worst affected. The research

examines the broader consequences of armed conflict on education, highlighting the essential steps that can protect and maintain educational services during these situations (Finaud, 2024).

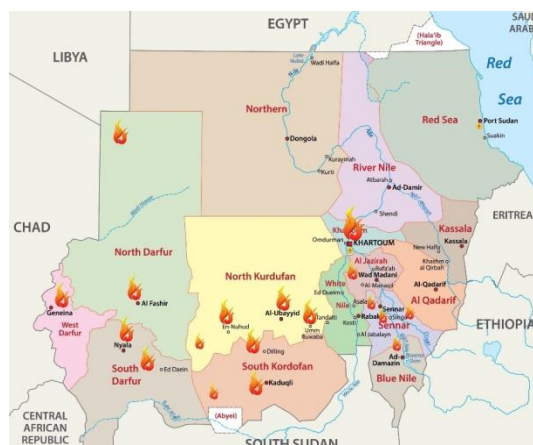


Figure 1 . Illustration showing the Spread of War across Different States in Sudan

Abstract and Keywords Global Perspectives on E-Learning in Conflict Zones

The request for global assistance and synchronized actions to reduce the negative impact of violence on education corresponds to the difficulties encountered by Sudanese universities. A study conducted in Sudan aimed to explore the experiences of university staff with learning amidst the COVID 19 crisis. Research studies have also highlighted the benefits of learning. However, challenges such as infrastructure, limited technology access and teachers lacking technical skills have posed obstacles to its implementation. The research by (Noesgaard & Ørngreen, 2015), shows the need to understand the requirements and challenges in limited resource settings for the effective introduction of e-learning, which plays a role in providing education in conflict affected nations like Sudan.

Amid the conflict, in Ukraine (Bondar et al., 2023), HyFlex Art Therapy workshops utilized distance to encourage student participation and active engagement. The need for asynchronous interactions arose from frequent interruptions therefore necessitating flexibility. Utilizing online psychotherapy techniques such as virtual mandala drawing and therapeutic fairy tales proved to be highly motivating for learners and yielded positive results. The importance of stress management was prioritized in order to establish a learning environment that fosters compassion and enhances cognitive and emotional well-being. Using this approach could be beneficial for students facing challenges. Research into education for displaced people, against the backdrop of the conflict in Gaza, highlights the need to keep options open in times of chaos. Moreover, it shows the role that can be played by play, storytelling, and cultural participation in engendering emotional intelligence. The education system ensures learning is uninterrupted while at the same time adapting to the situation in Sudan. A research conducted by (Phusavat & Buheji, 2024) explored the impact of distance learning in Ukraine during the war. The study highlighted difficulties faced in education while underscoring the success of e-learning in maintaining educational opportunities as noted by (Galynska & Bilous, 2022). The assistance provided by university staff such as support, and adaptable study timetables played a role in reducing the impact

of the conflict, on students' academic performance and mental health. The research emphasizes the capability of learning to sustain consistency in challenging environments especially amidst the conflict in Ukraine. Students and teachers show resilience and flexibility when faced with resources and the demand, for innovative teaching methods as noted by (Matviichuk et al., 2022). Several other research projects have delved into the realm of learning in conflict ridden areas. For instance, a research conducted in Ethiopia investigated how the persisting conflicts affect the education of teenagers emphasizing that technology can help alleviate disruptions in their journey (Jones et al., 2022). Research conducted in war torn Syria also showed that mobile learning tools played a role, in maintaining consistency for students who had been displaced granting them flexibility and easy access to education in unstable settings (Alsswey & Al-Samarraie, 2019).

During the war, in Yemen a study explored how incorporating e - learning platforms could help maintain continuity when conventional schooling is disrupted. Despite facing obstacles, like a lack of internet connectivity and power outages online learning offered a solution to ensure that education continued (Butcher, 2023). The research emphasized the importance of infrastructure. Also showed that, in Somalia community led online learning projects, backed by global organizations were vital in sustaining educational programs during times of unrest. The efforts were centered on educating teachers shaping the curriculum and utilizing community assets to establish an online learning setting (Anguko, 2015).

In conflict affected areas, a variety of studies highlight the role of learning in maintaining educational continuity. Valuable insights and strategies are offered to enhance the use of e learning, in schools in conflict Sudan with tailored content to maximize its effectiveness, in such environments.

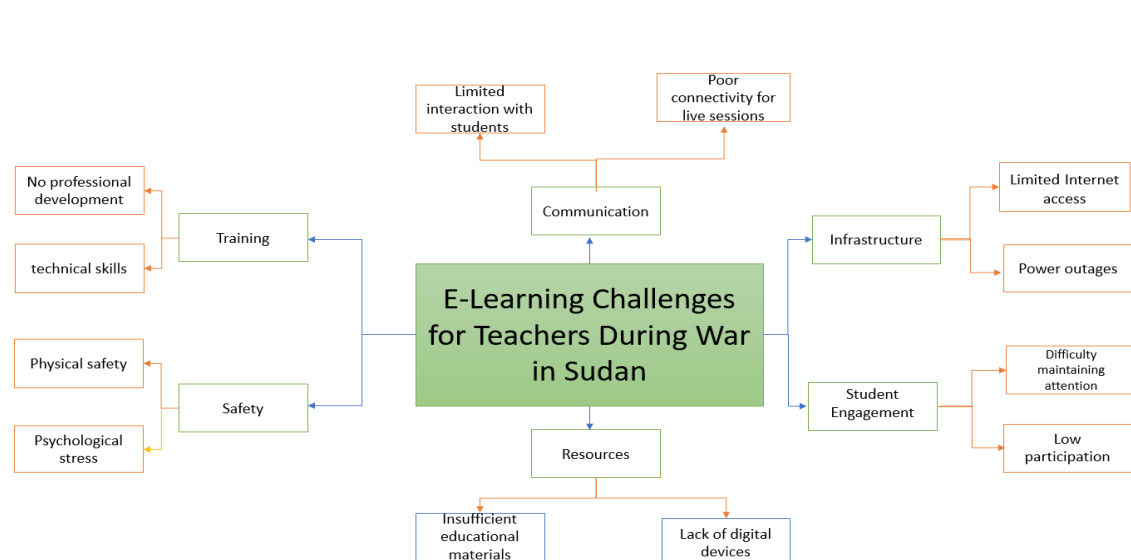


Figure 2. E-Learning Challenges for Teachers during War in Sudan

Challenges and Opportunities for E-Learning in Post- Conflict Sudanese Schools

Sudanese schools face obstacles when trying to introduce e learning as a substitute, for education that has been disrupted during periods of conflict. To enhance the adoption and efficiency of e-learning, it is necessary to

comprehend these barriers, evaluate its potential, and offer practical advice. The data provided collectively highlights the main challenges, probable efficacy, and practical recommendations for adopting e-learning in post-conflict Sudanese schools. The data provided highlights several advantages of e-learning, including accessibility, cost-effectiveness, flexibility in learning style, and the ability to learn at one's own pace. These benefits are facilitated through various methods of content delivery, such as webinars, video lectures, online courses, and educational apps (refer to Figure 2).

After the war, e-learning has the potential to fulfil educational requirements with the assistance of goodwill and support. Figure 3 illustrates some obstacles that hinder teachers from efficiently delivering e-learning: insufficient educational resources, absence of digital technologies, limited student engagement, unstable internet connectivity, power outages, inadequate technological skills, and psychological stress. In Figure 4 illustrates the interplay among students, teachers, e-learning platforms, and content suppliers, highlighting the need for improved infrastructure, resource allocation, enhanced teacher training, and addressing safety concerns to promote the adoption and efficacy of e-learning. These trends emphasize the necessity of resolving infrastructural and resource deficiencies, offering technical instruction, and guaranteeing a secure learning atmosphere in order for e-learning to become a feasible educational choice after a war.

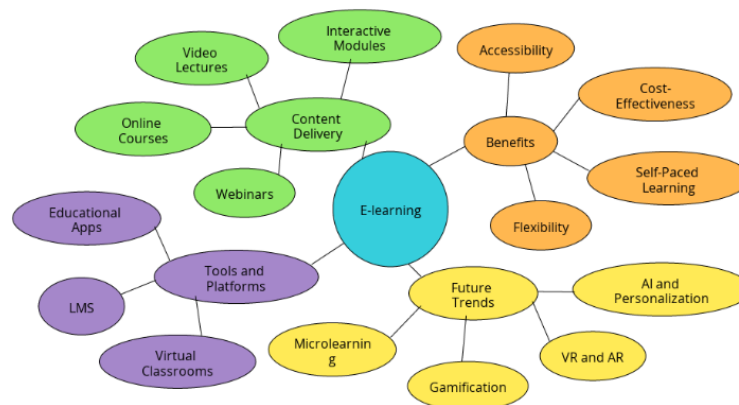


Figure 3. Components, Benefits, and Future Trends of E-Learning

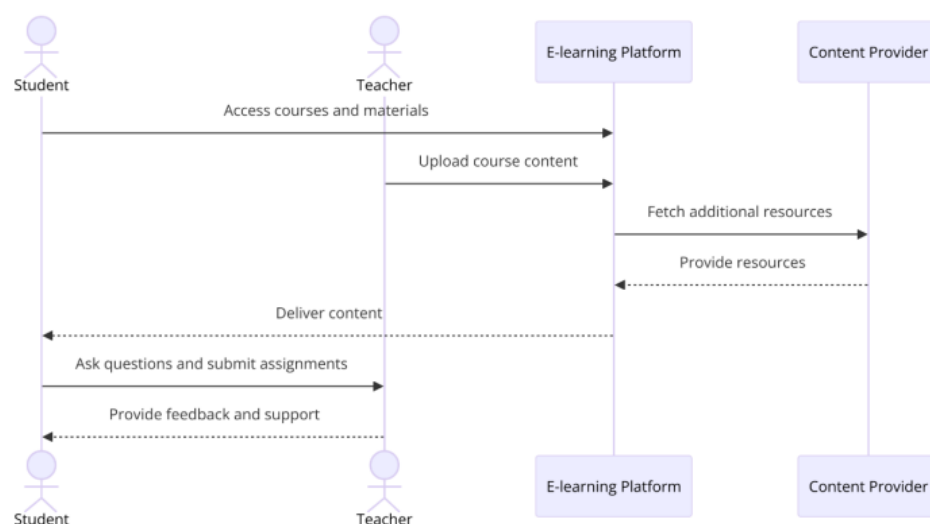


Figure 4 . Interaction Diagram for E-Learning

Method

Research Design

The study adopts a mixed methods approach, integrating both quantitative and qualitative research to provide a comprehensive understanding of the adoption and impacts of e-learning in post-conflict educational settings. This design allows for an in-depth exploration of statistical trends as well as individual teacher experiences and perceptions, which supports the ongoing discussion about rebuilding education in conflict affected areas. The ultimate goal is to evaluate whether e-learning can serve as a sustainable solution for education in post-war Sudan.

Research Population

The research population consists of 30 teachers employed at four specific schools in Sudan: Oxford, Newchild, Apolo, and Manal School. These schools were chosen based on the fact that their geographical areas differed, and there was variation in terms of exposure to conflict related disruptions, making them representative of different challenges and successes within the implementation of e-learning solutions.

Data Collection Instruments

A structured questionnaire was prepared, comprising closed ended (multiple choice and scale questions) and open-ended questions for data collection. The instrument was designed to gather quantitative data about contextual aspects such as: resource availability; student levels of engagement; effectiveness of different kinds of e-learning tools, including those that could be used either as a single entity or in groups. Open-ended questions were designed to elicit teachers' descriptions of challenges encountered in using the e-learning mode, their views regarding pros and cons of e-learning, and suggestions for improvement.

Validity Tests

The instrument was first piloted with a small group of teachers from a similar educational background to check on the validity and reliability of the questionnaire. Feedback from the pilot has been taken on board to ensure refinement of the questions for clarity, lack of bias, and appropriateness to elicit the information required.

Data Analysis

Quantitative data from questionnaires will be used to compute statistical methods designed to establish trends and relationships between various variables involved in e-learning implementation. Qualitative responses will be coded and analyzed thematically for common themes related to benefits, challenges, and recommendations for enhancing e-learning practices. The mixed-methods data analysis will enable a holistic understanding of the teachers' experiences and the operational dynamics of e-learning systems in the context of post-conflict Sudan.

Results

The survey revealed several key challenges teachers face when implementing e- learning in a post-conflict environment. The most frequently reported issues were technical problems, such as unreliable internet connectivity, and a lack of training and resources, both of which were identified by 21 teachers. These issues hindered teachers' ability to deliver quality lessons and engage students effectively. Furthermore, 15 respondents highlighted that the content available on e-learning platforms was often insufficient or not of high enough quality, making it difficult for teachers to cover the curriculum comprehensively. Eighteen teachers also mentioned difficulties in engaging students and assessing their performance, with the latter being particularly challenging due to the lack of direct interaction that is usually possible in a traditional classroom setting. These challenges are summarized in Table 1.

Table 1 . Challenges Faced by Teachers Across Schools

Challenges	Number of Responses
Technical Issues (e.g., Connectivity)	21
Lack of Training or Resources	21
Insufficient Content or Features	15
Difficulty in Engaging Students	18
Challenges in Assessing Performance	18

Teachers' comfort levels with using e-learning platforms varied significantly. As shown in Table 2, 13 respondents rated their comfort level with the technology at a moderate level (3 out of 5), while 7 teachers expressed a high degree of proficiency (5 out of 5). However, 4 teachers rated themselves at a lower comfort level (2 out of 5), indicating the need for further training and technical support.

Table 2 . Comfort Level Responses

Comfort Level	Number of Responses
1	0
2	4
3	13
4	6
5	7

The frequency of e-learning platform uses also varied among respondents, as shown in Table 3. Ten teachers reported using the platforms several times a week, while 9 indicated they used them less than once a week. This discrepancy suggests that e-learning is not yet fully integrated into everyday teaching practices for all educators, which may reflect the varying levels of comfort and training associated with the technology. Teachers' satisfaction with e- learning platforms was similarly varied. As seen in Table 4, teachers who used the platforms more frequently tended to report higher satisfaction levels, with 9 respondents giving a satisfaction rating of 4 and 7 respondents rating their satisfaction at 5. However, a small number of teachers (3 respondents) gave the

lowest possible satisfaction rating, likely due to the challenges they faced with platform performance, content quality, and technical issues.

Table 3. Comfort frequency Responses

Frequency	Responses
Less than weekly	9
Weekly	6
Several times a week	10

The survey reveals significant challenges teachers face in implementing e-learning in post-conflict. Environments, including technical issues, inadequate training, and insufficient content. While some teachers adapt, many still require additional support. The study also highlights the uneven adoption of e learning across schools, with teachers using platforms more frequently reporting higher satisfaction. Targeted interventions are needed to improve infrastructure, training, and content quality.

Table 4 . Satisfaction Level Responses

Satisfaction Level	Number of Responses
1	3
2	4
3	7
4	9
5	7

Discussion and Conclusion

The findings of this survey illuminate key dimensions of Sudanese teachers' attitudes towards e-learning in post-conflict settings, their proficiency with digital educational tools, and the challenges that influence their ability to effectively implement such technologies for inclusive education. Implementing e-learning in post-conflict Sudanese schools reveals significant challenges but also presents opportunities. The survey highlights technical problems such as unreliable internet connectivity and a lack of training and resources, which hinder teachers' ability to deliver quality lessons and engage students effectively. Aligning with findings from studies in medical colleges in Sudan (Mahgoub et al., 2024), it's clear that addressing these challenges is crucial for effective e-learning implementation. Teachers frequently encounter technical issues like connection failures and platform inefficiencies, similar to challenges in other conflict-sensitive areas like Ethiopia and Ukraine (Bondar et al., 2023; Galynska & Bilous, 2022; Jones et al., 2022). The poor quality and limited range of e-learning content further restrict teachers' ability to comprehensively cover the curriculum, underscor- ing the need for improved content quality, as observed in Gaza and Ukraine (Matviichuk et al., 2022; Phusavat & Buheji, 2024). The need for structured training programs is evident from the survey, high- lighting that teachers require more support to use e-learning platforms effectively. Enhancing internet reliability and platform usability can reduce

disruptions, while developing high-quality content aligned with the curriculum can help teachers deliver effective instruction. This study is limited by its focus on only four schools, potentially not representing the broader educational challenges across Sudan. Additionally, the reliance on teacher feedback may not fully capture the students' experiences and challenges with e-learning. Further research is essential to deepen our understanding of e-learning in post-conflict environments.

As Conclusion, E-learning in post-conflict Sudan has the potential to significantly enhance educational accessibility, cost-effectiveness, and flexibility. However, it faces substantial barriers including inadequate teacher training, technical challenges, and poor content quality. By addressing these issues through targeted initiatives and continued research, e-learning can play a crucial role in revitalizing education in conflict-affected regions.

Future studies should consider expanding their scope to include a broader demographic by incorporating more schools from various regions of Sudan. This would provide a more comprehensive view of the unique challenges and opportunities within different educational contexts. Additionally, incorporating student feedback could offer valuable insights into the actual effectiveness of e-learning, highlighting areas that require further support. Longitudinal studies would be beneficial to evaluate the long-term impact of these educational interventions on student outcomes. Lastly, comparative studies between post-conflict regions and those without such disturbances could help identify the most effective strategies for implementing e-learning in challenging settings.

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