



Educational Disruption and Resilience during War in Sudan: Experiences and Priorities for Sustainable Reconstruction

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Abstract: *The war in Sudan has severely disrupted education through infrastructure destruction, displacement, institutional closure, and interruption of essential services. This qualitative study examined stakeholders' experiences of educational disruption and their priorities for sustainable recovery. The study was conducted from January to April 2026. Semi-structured interviews were conducted with 40 participants, including school teachers, university lecturers, secondary and university students, educational administrators, and education officials or experts. Thematic analysis generated five themes: destruction of educational environments; fragmented access and learning continuity; institutional, educator, and community resilience; constrained digital and alternative learning; and priorities for sustainable reconstruction. Participants reported that damage extended beyond buildings to laboratories, libraries, utilities, records, administrative systems, and digital connectivity. Displacement, interrupted assessment, staff mobility, and unequal access to alternatives increased the risk of educational exclusion. Flexible schedules, relocation, shared learning spaces, teacher adaptation, community initiatives, and mobile communication supported partial continuity but remained unequal and difficult to sustain. Sustainable reconstruction should integrate safe infrastructure, learner reintegration, teacher development, appropriate technology, renewable energy, emergency planning, and coordinated governance. The study concludes that educational resilience depends on restoring the interconnected conditions that enable equitable and continuous learning.*

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INTRODUCTION

Armed conflict affects education by the combined effect of insecurity, destruction of infrastructure, displacement, closure of institutions, and the loss of teachers and learning resources. Thus, these effects go beyond interrupted attendance to economical protection, social stability, structured learning, and future employment. Studies on education in emergencies indicate that conflict decreases equitable access and educational quality (Abraham & Baroud, 2025), while safe formal or informal learning environments can support learners' wellbeing and continuity (Burde et al., 2017; Almajri et al., 2025).

Since the start of the armed conflict in April 2023, Sudan has experienced a serious educational crisis. Schools and universities were damaged, closed, stolen, or used as humanitarian or military facilities. As a result, students, teachers and lectures were displaced within and outside the country. As of August 2025, only about three million of Sudan's 17 million children of primary school age had returned to school, and less than a third of the schools had been reopened (UNESCO, 2025). Higher education has also been heavily damaged. Elhag and Baleela (2025) documented the displacement, financial difficulties, academic suspension and problems of asynchronous online learning among academics, administrators and students in Sudan. Similarly, Eltahir et al. (2026) found that 104 HEIs higher-education institutions were directly affected between April 2023 and December 2024, with significant consequences for faculty and student mobility, academic continuity and institutional sustainability.

However, educational destruction cannot be understood in terms of damaged buildings only. Schools and universities depend on interconnected physical, academic, administrative and technological systems. Loss of classrooms, laboratories, libraries, equipment, electricity, water, sanitation, records and Internet connections may make it impossible to operate the institutions even if some buildings are left standing. Moreover, displacement transfers educational pressure to relatively safer regions, where receiving institutions may face overcrowding and shortages of staff and resources. They may be confronted with overcrowding and lack of staff and resources. Thus, conflict affects attendance, evaluation, progression, and institutional belonging rather than creating a single temporary interruption (Dryden-Peterson, 2016; Sulton et al., 2022; Valencia-Arias et al., 2025).

However, adaptive responses can be developed by educational institutions and communities. Relocation, flexible schedules, temporary learning centers, teacher-led adaptation, community initiatives and digital communication can help to maintain the limited learning opportunities. Digital technologies are particularly valuable for retaining contact with geographically dispersed learners, but electricity interruptions, connectivity problems, device costs, and differences in digital competence can reproduce existing inequalities (Selwyn, 2016). As a result, educational resilience should not be seen as a substitute for institutional accountability. Sustainable recovery in conflict zones requires formal support to teachers, fair reintegration of displaced students, adequate technology, emergency planning, and coordinated governance (Almaloul et al., 2026)

Despite the growing humanitarian documentation, the available evidence remains fragmentary. Humanitarian reports primarily quantify school closures, displacement, infrastructure damage, and immediate needs, while the academic research is focused primarily on higher education, displaced academics, and the specific dimensions of institutional

disruption. Comparatively limited studies have examined the experiences of school teachers, university lecturers, secondary school and university students, administrators and education officials to explore how infrastructure destruction, learning discontinuity, local resilience, digital alternatives and reconstruction priorities interact at different levels in education. This study addresses this gap through qualitative analysis of stakeholders who have direct experience of the effects of educational system.

Accordingly, the study asks: 1. How has war-related destruction affected educational institutions and learning environments in Sudan? 2. How has the conflict fragmented educational access, teaching, assessment, and learning continuity? 3. What institutional, educator, community, and student responses have supported educational resilience? 4. What opportunities and limitations characterize digital and alternative learning during the conflict? 5. What priorities should guide sustainable, equitable, and resilient educational reconstruction in Sudan? The study contributes a systemic interpretation of educational recovery by examining the interaction among infrastructure, access, educator capacity, community support, technology, and institutional preparedness. Its central premise is that reconstructing any one of these components in isolation will be insufficient to establish sustainable educational resilience.

METHODS

The study used a qualitative design because the research sought to understand participants' experiences, perceptions, and responses to educational disruption during an ongoing conflict, including how different stakeholders interpreted resilience and reconstruction priorities. A qualitative approach was therefore appropriate for examining experiences and contextual processes that could not be adequately captured through numerical indicators alone (Lewis, 2015). The study investigated how the war in Sudan affected educational infrastructure, learning continuity, institutional resilience, and sustainable reconstruction. Purposive sampling recruited 40 participants with direct experience of educational disruption: 10 school teachers, eight university lecturers, eight university students, six secondary-school students, four educational administrators, and four education officials or experts. The sample provided different perspectives from school and university settings in Khartoum Bahri, Sudan

Data were collected from January to April 2026 through semi-structured interviews conducted face-to-face or remotely according to participants' locations, accessibility, and security conditions. Interviews lasted approximately 10–15 minutes and addressed infrastructure destruction, educational continuity, resilience responses, digital learning, and reconstruction priorities. The relatively short interview duration reflected the exceptional conditions under which the study was conducted. Ongoing insecurity, displacement, unstable communication, and participants' circumstances made longer interviews difficult to conduct consistently and safely. The interviews were therefore deliberately focused on a common set of key questions directly related to the research objectives, with follow-up questions used when clarification or further explanation was needed.

Interviews were conducted primarily in Arabic, recorded with consent, transcribed, and translated into English. Participation was voluntary, and confidentiality was protected through participant codes. Formal institutional ethical approval was not obtained because the research

was conducted under ongoing wartime conditions, in which normal institutional research-ethics procedures were not consistently accessible. Nevertheless, ethical safeguards were applied throughout the study. Participants were informed about the purpose of the project. The voluntary nature of their participation, and informed consent was obtained before each interview.

The data were analyzed thematically through transcript familiarization, initial coding, category development, and theme refinement, following the principles of thematic analysis described by Lewis (2015). Five themes were identified: destruction of educational environments; fragmented access and continuity; institutional, educator, and community resilience; constrained digital and alternative learning; and sustainable reconstruction priorities. Perspectives across participant groups were compared to identify shared and differing experiences. Trustworthiness was strengthened through comparison of accounts across the six participant groups, repeated review of transcripts and codes, and discussion of the developing themes among the researchers. Peer debriefing was used to examine coding decisions and theme interpretations and to reduce dependence on a single researcher's perspective. Reflexivity was maintained throughout the analysis by considering how the researchers' assumptions and disciplinary backgrounds could influence coding and interpretation. Where clarification was required, participant accounts were checked against the interview records before themes were finalized. The findings were interpreted through education-in-emergencies, educational resilience, Education for Sustainable Development, and SDG 4.

RESULTS AND DISCUSSION

War-Related Destruction of Educational Environments

The interviews revealed that the war damaged not only individual schools and universities but also the interconnected educational ecosystem required for effective teaching and learning. Participants described an environment in which physical destruction, institutional closure, insecurity, and the interruption of essential services operated together. Classrooms, laboratories, libraries, administrative offices, equipment, electricity, water, sanitation, and internet connectivity were therefore not experienced as separate concerns. Instead, damage to one component frequently reduced the usefulness of the others, leaving some institutions unable to operate even when parts of their buildings remained standing.

Table 1. Dimensions and Educational Consequences of Infrastructure Disruption

Dimension	Evidence	Educational consequence
Physical facilities and safe access	Damaged, closed, or inaccessible schools and universities	Reduced availability of safe learning spaces
Academic facilities and resources	Loss of classrooms, laboratories, libraries, computers, and equipment	Decline in practical instruction, research, and educational quality
Essential services	Interrupted electricity, water, sanitation, and internet connectivity	Facilities remained unsuitable or unable to support regular education

Administrative and academic systems	Disruption of records, communication, supervision, and institutional operations	Reduced capacity to organize teaching and maintain academic progression
Regional pressures	Severe destruction in conflict-affected areas and overcrowding in relatively safe areas	Greater geographical inequality and pressure on receiving institutions

Participants across various educational levels emphasized that damaged or inaccessible facilities deprived students of safe and stable learning environments. Buildings that remained physically in good conditions were often unusable because insecurity restricted access or essential services, including electricity, water, sanitation, and internet connectivity. A school teacher explained, *“When the school cannot open, the important thing is to find a safe place where the children can meet their teachers and continue learning”* (ST4). This account shows that educational infrastructure encompasses safe access, essential services, and sustained interaction between teachers and learners, rather than buildings alone.

These experiences support evidence that armed conflict disrupts education through the interconnected effects of violence, displacement, institutional closure, and loss of protection (Davies, 2004; Muthanna et al., 2022). In Sudan, as mentioned before, only approximately 3 million of the country’s 17 million school-age children had returned to school by August 2025, while less than one-third of schools had reopened (UNESCO, 2025). The simultaneous deterioration of facilities, public services, population stability, and institutional operations means that reopening buildings alone cannot constitute complete educational recovery (Dominguez et al., 2025).

University participants particularly emphasized the loss of laboratories, libraries, computers, research materials, and technical equipment. One lecturer observed that *“a university may reopen in another place, but without laboratories and libraries, the educational experience is not the same”* (UL3). A university student similarly described the limitations of temporary arrangements: *“We were able to follow some lectures after relocating, but without reliable electricity, internet, and access to the library; it was difficult to study or complete our assignments”* (ST1). Although relocation may restore limited access, it cannot necessarily reproduce laboratory work, practical training, specialized software, or sustained access to academic resources. Studies show that the war has threatened the operational capacity and sustainability of Sudanese higher education (Elhag & Baleela, 2025; Eltahir et al., 2026). Meaningful recovery therefore requires appropriate institutional and learning conditions, rather than the formal resumption of classes alone (Ottaway, 2002; Willis et al., 2025).

Physical damage was further intensified by the loss of administrative capacity. Participants described disruption to student records, enrolment, examinations, staff supervision, communication, and institutional coordination. As one administrator stated, *“The problem is not only the classroom; the whole educational system around the classroom has been disrupted”* (EA2). This systemic perspective explains why isolated repairs are insufficient when the administrative and academic structures required organizing education no longer function effectively (Alriteemi et al., 2026).

The consequences were also geographically unequal. Severely affected areas experienced destruction, insecurity, and prolonged closure, whereas relatively safer regions faced increased pressure from displaced students and educators. One administrator in a

receiving institution explained, “*Our institution remained open, but the arrival of many displaced students created overcrowded classrooms and placed additional pressure on teachers, equipment, and essential services*” (EA2). Thus, relative safety did not prevent educational disruption. Instead, the effects of conflict were redistributed through overcrowding and competition for limited resources (Alakhdar, 2024; Ishneebeesh et al., 2026).

Fragmented Educational Access and Learning Continuity

Educational disruption in Sudan was experienced as repeated fragmentation of attendance, academic progression, assessment, and institutional belonging rather than as a single temporary interruption. Participants described irregular academic calendars, delayed examinations, repeated displacement, teacher mobility, and prolonged periods outside structured education. These disruptions interacted with students’ socioeconomic circumstances and access to alternative learning opportunities. Consequently, the ability to continue education differed considerably across participants, raising concerns that temporary interruptions could develop into long-term exclusion for the most disadvantaged learners.

Table 2. Forms of Educational Discontinuity and Most Affected Groups

Form of discontinuity	Participant-reported experience	Groups facing greater risk
Interrupted calendars and assessments	Irregular teaching periods and delayed examinations	Students approaching graduation or transition points
Uncertain academic progression	Difficulty predicting completion of school or university	Final-year and professionally oriented students
Displacement and repeated transfer	Movement between locations and institutions	Internally displaced and repeatedly relocated learners
Teacher and lecturer mobility	Staff shortages and interrupted teaching or supervision	Institutions in conflict-affected and receiving areas
Reported learning loss	Declining knowledge, skills, and study routines	Learners experiencing prolonged interruption
Unequal access to alternatives	Differences in family support, resources, and opportunities	Low-income, rural, and displaced learners
Risk of educational exclusion	Weakening connection with formal education	Learners facing multiple and prolonged disadvantages

Interrupted calendars and examinations were among the most immediate manifestations of educational discontinuity. Participants reported irregular teaching periods, delayed assessments, and uncertainty about whether academic years or university programs could be completed. For students, these disruptions affected not only the amount of instructional time available but also their expectations about graduation, employment, and future study. One university student explained, “*we do not only lose months of study; we also lose the feeling that we know when we will finish our education*” (US4). This statement shows that

interruption had both temporal and psychological consequences. Students were not simply waiting for classes to resume. They were experiencing uncertainty about whether their educational trajectories remained achievable.

Moreover, delayed progression affected students differently according to their stage of education. Those approaching school completion, university graduation, practical training, or professional qualification were particularly concerned about postponed examinations and interrupted course requirements. Education-in-emergencies research similarly demonstrates that prolonged instability can transform an initially temporary break into cumulative educational disadvantage, especially when learners experience repeated disruptions without predictable arrangements for progression or assessment (Priyadarshni, 2025).

Teacher and lecturer mobility created a parallel disruption. When educators were displaced or left affected areas, institutions lost experienced personnel and those who remained faced additional workloads. A school teacher described this interaction clearly: *“when students move, they need a new school, but when teachers also move, the school may have students without enough teachers”* (ST7). At university level, lecturer mobility also affected specialized teaching, academic supervision, departmental coordination, and the completion of research projects. Consequently, expanding enrolment in receiving institutions could not guarantee meaningful continuity when sufficient educators were unavailable. Research on educational resilience emphasizes that teachers are central to maintaining learning during emergencies; however, their capacity to do so depends on professional protection, institutional support, and workable conditions (Shah et al., 2020). Also, studies from African higher education setting highlight the importance of staff capacity and institutional support for sustaining educational quality (Ramdhan et al., 2025; Shalghoum et al., 2025).

Participants additionally perceived that prolonged periods outside structured education contributed to learning loss. They referred to weakened study routines, declining recall of previously learned material, and difficulty maintaining academic engagement. However, the study did not administer achievement tests or compare students' performance before and after the disruption. Therefore, learning loss should be understood here as a participant-reported experience rather than an objectively measured decline in achievement (Chasanah et al., 2026).

Access to alternative education was also unequal. Some students could maintain contact with teachers, study independently, obtain learning materials, or receive family assistance, whereas others lacked the financial, social, or educational resources needed to remain engaged. Displaced and low-income learners were considered particularly vulnerable because educational participation competed with immediate concerns involving safety, housing, movement, and household survival. Furthermore, students in remote locations faced fewer institutional alternatives. This pattern reflects the wider principle that crises do not affect all learners equally. Instead, they often intensify inequalities that existed before the emergency (Jones et al., 2022; Masoud et al., 2025).

The cumulative effect was a risk that some learners would become permanently disconnected from education. Repeated interruption, displacement, financial hardship, and weak access to alternatives could gradually reduce the possibility of returning when institutions resumed regular operations. This finding is directly relevant to SDG 4, which calls for inclusive and equitable quality education (Alrumayh et al., 2025; Omran et al., 2025). In the Sudanese context, achieving this goal will require more than reopening institutions. It will also

require flexible enrolment and transfer arrangements, recognition of interrupted studies, remedial support, and targeted assistance for learners facing the greatest risk of exclusion.

Institutional, Educator, and Community Resilience

Despite extensive disruption, participants described several institutional, professional, community-based, and individual responses that helped preserve limited educational opportunities. Educational resilience emerged through the interaction of institutional flexibility, educator agency, community support, and student adaptation. However, these responses were unevenly distributed and frequently depended on locally available resources. They enabled partial continuity but rarely reproduced the stability, quality, or inclusiveness of regular education.

Table 3. Educational Resilience Strategies, Contributions, and Limitations

Resilience strategy	Principal contribution	Main limitation
Institutional relocation	Allowed some educational activities to resume in safer locations	Reduced facilities, resources, and institutional stability
Flexible schedules and additional shifts	Accommodated displaced learners and limited available space	Overcrowding and increased staff workloads
Temporary and shared learning spaces	Preserved access where regular institutions were unavailable	Inadequate facilities and uncertain continuity
Teacher-led adaptation	Maintained teaching, communication, and student engagement	Limited resources, insufficient support, and educator exhaustion
Community and family initiatives	Provided spaces, transportation, materials, and local assistance	Unequal community capacity and dependence on voluntary contributions
Student peer networks	Supported communication, resource sharing, and independent study	Unequal ability to engage in self-directed learning
Institutional and humanitarian partnerships	Mobilized facilities, expertise, and emergency assistance	Fragmented coordination and dependence on temporary support

Institutional relocation was one of the most visible responses. Some schools and universities transferred educational activities to relatively safe areas, used available buildings, or cooperated with other institutions. Moreover, flexible calendars, combined classes, and additional shifts allowed institutions to accommodate learners when regular facilities could not be used. These arrangements demonstrated organizational adaptability because they prevented the complete suspension of some educational activities. Nevertheless, relocation frequently separated institutions from their laboratories, libraries, administrative systems, and specialized resources (Smirnov & Okseniuk, 2023; Abouzied, 2026).

Temporary and shared learning spaces served a similar purpose at the local level. Participants reported that available community facilities and functioning educational buildings were used to maintain basic teaching or accommodate displaced learners. Additional classes and shifts enabled receiving institutions to increase access despite limited space. However, these arrangements produced overcrowding, shortened instructional time, and pressure on teachers and resources.

Educators played a particularly important role in translating institutional arrangements into actual learning opportunities. Teachers and lecturers reorganized learning materials, modified instructional expectations, maintained communication with students, and used whatever resources remained accessible. One lecturer explained that *“teachers themselves became part of the emergency response because they tried to continue education with whatever resources were available”* (UL6). This account illustrates educator agency, but it also exposes the danger of shifting institutional responsibility onto individual teachers. Their adaptability occurred while many were themselves experiencing displacement, insecurity, financial pressure, and increased workloads.

Research on education in violent situations similarly demonstrates that educators often become central actors in sustaining educational relationships when formal systems are weakened (Alakhdar et al., 2026). Moreover, studies of teacher competence indicate that pedagogical adaptation requires professional capacity and institutional support rather than goodwill alone (Samsuddin et al., 2026). Research on teacher–student relationships in rural schools also emphasizes the importance of relational and emotional dimensions of teaching Sudan (Kasheem et al., 2025). Thus, teacher-led adaptation preserved connection with learners, but its sustainability depended on training, manageable workloads, financial security, and organizational recognition.

Community and family initiatives provided another layer of resilience. Participants described local contributions involving spaces, educational materials, transportation, communication, and practical assistance. Such responses helped educational activities continue where formal provision was limited. They also demonstrated that education remained a collective priority despite insecurity and economic pressure. Research on education and peace-building supports the importance of community participation and locally grounded responses in conflict-affected settings (Smith, 2014; Aladi & Barkah, 2026).

Students also demonstrated agency through peer communication, informal study groups, resource sharing, and independent learning. These practices helped maintain academic connection during institutional interruption. Nevertheless, self-directed learning depended on access to materials, suitable study conditions, family support, and previous academic skills (Roberson & Merriam, 2005; Murniati et al., 2023). It should not be assumed that every learner could adapt independently. Students experiencing displacement, financial hardship, family responsibilities, or prolonged disconnection faced much greater difficulty sustaining their education without structured assistance (Barkah et al., 2026; Alezabi et al., 2026).

Partnerships with other institutions and humanitarian organizations offered opportunities to mobilize facilities, expertise, and emergency resources beyond local capacity. However, participants indicated that large-scale recovery could not depend solely on fragmented or temporary initiatives. Coordination among educational authorities, institutions, communities, and humanitarian partners remained essential. Similarly, faculty engagement can

contribute to institutional responsibility and sustainable educational development, but it must be embedded in supportive policies and structures (Maati et al., 2025; Krwad et al., 2026; Azzahra et al., 2026).

To conclude, the findings demonstrate that resilience in Sudan was relational and multi-level. Institutions created flexible arrangements, educators adapted teaching, communities mobilized support, and students developed coping strategies. However, these actions should not be romanticized as evidence that affected communities can manage without formal intervention. Teachers' sacrifice, family contributions, and student coping cannot substitute for public responsibility. Sustainable educational resilience requires coordinated governance, protected and supported educators, equitable resource distribution, and formal mechanisms that transform local adaptation into reliable educational provision (Padang & Kasheem, 2025; Ayad et al., 2026; Abraham et al., 2026).

Digital and Alternative Learning under Constrained Conditions

Digital and alternative learning emerged as important but incomplete responses to educational disruption in Sudan. Participants reported that online platforms, smartphones, messaging applications, recorded lectures, and shared digital materials helped maintain communication when regular attendance was impossible. However, these technologies did not provide universally accessible alternatives to schools and universities.

Table 4. Digital Learning Opportunities, Barriers, and Context-Appropriate Responses

Digital area	Educational opportunity	Main barrier	Context-appropriate response
Smartphones and messaging applications	Communication and rapid sharing of materials	Data costs, shared devices, and limited storage	Mobile-compatible and compressed materials
Online and distance learning	Continuation of selected lessons and activities	Unstable electricity and connectivity	Low-bandwidth platforms and flexible access
Recorded lectures and audio	Asynchronous participation	Download costs and limited device capacity	Short downloadable recordings and audio lessons
Digital learning resources	Independent study and revision	Unequal digital competence	Simple interfaces and user guidance
Offline alternatives	Learning without continuous internet access	Limited preparation and distribution systems	Preloaded or downloadable content
Community-based technologies	Shared access to educational content	Location, equipment, and management constraints	Radio instruction and solar-powered learning facilities
AI-supported learning	Possible future tutoring, feedback, and language support	Infrastructure, access, reliability, and preparedness	Limited, carefully governed future integration

Mobile communication was the most accessible form of technology described by participants. Smartphones and messaging applications allowed teachers and students to

exchange documents, assignments, recorded materials, announcements, and educational messages. Because smartphones were generally more portable than computers, they were especially useful for students who had been displaced or separated from their original institutions. Moreover, mobile communication enabled educational relationships to continue even when structured online classes were unavailable (Hilman et al., 2024; Masuwd et al., 2025).

Nevertheless, participants did not regard digital communication as equivalent to regular institutional learning. One university student explained that “*online communication did not replace the university, but it helped us remain connected to our courses and teachers*” (US6). This distinction captures the principal contribution and limitation of digital education during the conflict. Technology supported communication, access to selected materials, and limited remote activities, but it could not fully replace laboratories, libraries, practical instruction, direct classroom interaction, or stable assessment systems.

Electricity and internet connectivity were major constraints. Participants reported that unstable power supplies and weak networks interrupted access to online activities and communication. Furthermore, displacement could place learners in locations with limited digital coverage or few opportunities to charge devices. These difficulties meant that the availability of an online lesson did not necessarily make it accessible. Digital continuity depended on the wider technological environment supporting participation.

Device ownership and data costs produced additional inequalities. Some households could provide suitable devices and regular internet access, whereas others relied on shared smartphones or could not afford continuous data use. Completing extended assignments, reading large documents, or participating in live classes was also difficult on small screens. Therefore, the digital divide involved more than whether learners possessed a device. It included the quality of the device, the affordability and reliability of access, the availability of an appropriate study environment, and the ability to use technology for meaningful educational tasks (Mohamed et al., 2026; Yahya et al., 2025; Ramdhan et al., 2025).

Differences in digital competence further shaped participation. Some educators were able to reorganize materials and communicate effectively through available platforms, while others had limited experience designing remote activities or supporting students digitally. Similarly, students varied in their ability to access platforms, download resources, organize independent study, and submit assignments. These findings indicate that investment in equipment alone would be insufficient. Teacher professional development should address mobile pedagogy, low-bandwidth course design, asynchronous communication, flexible assessment, and the preparation of accessible digital materials (Barkah & Aladi, 2026; Sodikin et al., 2026).

For Sudan, realistic alternatives should prioritize technologies that can function under unstable conditions. Mobile-compatible documents, compressed files, short audio recordings, downloadable lessons, and offline materials would reduce dependence on continuous high-speed connectivity. Moreover, radio or community-based instruction could broaden access where individual internet participation is impractical.

AI-supported learning should remain a limited, longer-term consideration. AI may eventually provide tutoring, feedback, translation, or personalized resources, and research has identified both opportunities and institutional barriers to its adoption in higher education

(Hmouma, 2025; Anwar & Abrahem, 2026; Nurhayati et al., 2026). However, it cannot resolve the foundational problems of electricity, connectivity, device access, teacher preparedness, and educational inequality. In Sudan's current circumstances, AI should therefore complement, not displace, investment in accessible infrastructure and teacher-supported learning.

In general, digital technologies provided partial continuity by preserving communication and limited access to educational materials. However, their unequal availability prevented them from functioning as comprehensive alternatives. A sustainable digital strategy for Sudan should prioritize affordability, mobile access, offline functionality, teacher development, and technologies appropriate to unstable infrastructure.

Priorities for Sustainable and Resilient Educational Reconstruction

Participants consistently indicated that educational reconstruction in Sudan should not be limited to replacing damaged buildings or restoring pre-war institutional arrangements. Instead, recovery should address the weaknesses exposed by the conflict and develop an education system capable of maintaining essential functions during future emergencies. Sustainable reconstruction therefore requires safe and adaptable infrastructure, equitable reintegration of displaced learners, supported educators, appropriate technologies, institutional preparedness, and coordinated governance. These priorities reflect a shift from physical reconstruction toward comprehensive educational transformation.

Table 5. Strategic Priorities for Sustainable Educational Reconstruction

Strategic priority	Recommended direction	Expected contribution
Safe and adaptable infrastructure	Rebuild risk-sensitive schools and universities with appropriate utilities	Safer learning and greater preparedness
Academic and administrative recovery	Restore laboratories, libraries, equipment, records, and communication systems	Recovery of educational quality and institutional capacity
Equitable learner reintegration	Introduce flexible enrolment, recognition, remedial support, and accelerated pathways	Reduced risk of permanent exclusion
Teacher support and development	Provide professional, financial, and crisis-responsive support	Improved instructional quality and educator resilience
Sustainable energy and technology	Develop renewable energy, connectivity, and low-resource digital systems	More reliable and flexible educational provision
Institutional preparedness	Establish emergency, communication, relocation, and continuity plans	Reduced disruption during future crises
Coordinated governance	Align national, local, community, humanitarian, and international contributions	Locally responsive and sustainable recovery

Safe physical infrastructure remains an immediate priority, but participants' experiences demonstrate that reconstruction must consider how educational facilities will function under unstable conditions. Schools and universities should be rebuilt in safer locations where possible and designed to support flexible use during emergencies. Moreover,

reconstruction should restore water, sanitation, electricity, communication networks, and accessible learning spaces.

Academic recovery also requires restoring laboratories, libraries, equipment, computer facilities, and research resources. These components are particularly important for universities and programs involving practical or professional training (Burka, 2023; Hmouma et al., 2026). Additionally, administrative offices, enrolment systems, academic records, and communication channels must be recovered and protected. Digital backup systems could reduce the future loss of educational records, but they would require secure infrastructure, clear responsibilities, and appropriate data governance. An education expert summarized the need for systemic change by stating that *“reconstruction should not mean returning to exactly what existed before the war; we should rebuild an education system that can survive future crises”* (EE3).

Equitable reintegration should be another central component. Reopening institutions will not automatically return displaced and interrupted learners to education. Some students may face missing records, differences between academic calendars, financial hardship, repeated relocation, or substantial gaps in learning. Therefore, educational authorities should consider flexible enrolment, recognition of partially completed study, alternative documentation procedures, remedial instruction, and accelerated learning pathways.

Teacher recovery is equally important. Educators will be required to respond to different levels of interrupted learning, support students returning after prolonged absence, use flexible teaching methods, and maintain education during possible future emergencies. However, these responsibilities should be accompanied by professional, financial, and institutional support. Relevant development could include diagnostic assessment, remedial teaching, flexible assessment, digital pedagogy, emergency communication, and psychosocial awareness. Research on sustainable higher education emphasizes that institutional transformation depends substantially on faculty participation and capacity (Dewi & Kasheem, 2026; Salem et al., 2026).

Renewable and decentralized energy offers a practical connection between sustainability and educational continuity. Participants identified solar energy as a possible means of reducing dependence on unstable centralized electricity systems. Reliable energy could support lighting, laboratories, administration, communication, device charging, and digital learning. Nevertheless, technology investment should prioritize accessibility and local feasibility. Connectivity, mobile-compatible platforms, offline resources, shared equipment, and low-bandwidth systems may be more immediately valuable than expensive advanced technologies (Kasheem & Rusmana, 2025; Hasan et al., 2025; Alsaeh et al., 2026).

Institutional preparedness should convert lessons from the current crisis into formal continuity arrangements. Schools, universities, and educational authorities need procedures for emergency communication, temporary relocation, alternative teaching, academic-record protection, staff responsibilities, and cooperation between institutions. Furthermore, periodic review and simulation of continuity plans could help ensure that policies remain operational rather than merely documentary.

Finally, sustainable reconstruction requires coordinated national and international partnerships. Government authorities should provide policy direction and equitable resource allocation, while educational institutions, communities, civil society, humanitarian organizations, development partners, and the Sudanese diaspora can contribute expertise and

resources. However, external assistance should remain responsive to locally identified needs rather than imposing uniform solutions.

To conclude, the five themes show that educational resilience in Sudan depends on the interaction of functioning infrastructure, equitable access, supported educators, community capacity, appropriate technology, and institutional preparedness. Reconstructing any one component in isolation will be insufficient. The study's principal contribution is therefore its systemic understanding of recovery: sustainable educational reconstruction must restore not only institutions, but also the relationships, resources, capacities, and safeguards that enable education to continue during instability.

CONCLUSION

This study demonstrates that the war in Sudan produced a multidimensional educational crisis extending beyond the physical destruction of schools and universities. Damage to classrooms, laboratories, libraries, utilities, administrative systems, and digital connectivity weakened the institutional conditions required for meaningful education. Moreover, interrupted calendars, delayed examinations, displacement, and teacher mobility fragmented students' educational pathways and increased the risk of long-term exclusion, particularly among displaced, economically disadvantaged, and geographically marginalized learners.

Nevertheless, institutions, educators, communities, and students developed adaptive responses. Relocation, flexible schedules, shared learning spaces, teacher-led adjustments, community assistance, peer networks, and mobile communication preserved limited educational opportunities. However, these responses did not provide equivalent or universally accessible education. Their effectiveness depended heavily on local resources, educator commitment, family support, and technological access. Therefore, individual sacrifice and community adaptation should not replace governmental and institutional responsibility.

Sudan's educational recovery should move beyond rebuilding damaged facilities toward developing an equitable, adaptable, and crisis-prepared system. Priorities include restoring academic and administrative resources, reintegrating displaced learners, addressing reported learning gaps, supporting teachers, expanding appropriate low-bandwidth technologies, using decentralized energy where feasible, and establishing institutional continuity plans. Furthermore, national authorities, educational institutions, communities, humanitarian organizations, international partners, and the Sudanese diaspora should coordinate their contributions while ensuring that reconstruction remains responsive to local needs.

The study's principal contribution is its systemic interpretation of educational resilience. Functioning infrastructure, equitable access, supported educators, community capacity, appropriate technology, and institutional preparedness are mutually dependent. Reconstructing any component in isolation will therefore be insufficient. Although the qualitative sample does not represent every region or institution in Sudan, the findings provide stakeholder-grounded directions for transforming post-conflict reconstruction into an opportunity for more inclusive, sustainable, and resilient education.

Several limitations should, however, be acknowledged. First, the study employed a relatively small purposive sample of 40 participants from Khartoum Bahri, Khartoum State, and therefore does not represent the experiences of all educational institutions, communities, or

regions of Sudan. Second, the qualitative design captures participants' experiences and perceptions but does not quantify the scale of infrastructure damage, learning loss, digital inequality, or differences among stakeholder groups. Third, data were collected during the ongoing conflict, when security, displacement, and accessibility affected participant recruitment and data-collection conditions. The findings also reflect experiences during a specific period, from January to April 2026, while educational conditions may continue to change as the conflict develops. Despite these limitations, the findings provide stakeholder-grounded directions for transforming educational reconstruction into an opportunity to develop a more inclusive, sustainable, and resilient education system in Sudan.

Future research should address these limitations by including larger and more geographically diverse samples across Sudan, particularly participants from conflict-affected, relatively safer, rural, and displaced communities. Quantitative and mixed-methods studies could measure the extent of learning loss, educational exclusion, infrastructure damage, and inequalities in digital access. Longitudinal research is also needed to examine how educational resilience, student experiences, and institutional recovery change during and after the conflict. Comparative studies across Sudanese states and educational levels could further identify which educational continuity and reconstruction strategies are most effective under different local conditions.

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