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# Education in Emergencies: A Rapid Evidence Review

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# About this document


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# Rapid Evidence Reviews

This publication is one part of a series of Rapid Evidence Reviews that has been produced by EdTech Hub. The purpose of the Rapid Evidence Reviews is to provide education decision-makers with accessible, evidence-based summaries of good practice in specific areas of EdTech. They are focused on topics which are particularly relevant in the context of widespread global challenges to formal schooling as a result of Covid-19. All the Rapid Evidence Reviews are available at https://edtechhub.org/research/.

This rapid evidence review was written by EdTech Hub and Refugee Support Network. Refugee Support Network is a UK-based NGO that helps young refugees build brighter futures through education.

# Contents

# Abbreviations and acronyms

| | |
|---|---|
| **Covid-19** | Coronavirus 2019 |
| **CPD** | Continued Professional Development |
| **EdTech** | Educational technology |
| **EiE** | Education in Emergencies |
| **ELS** | eLearning Sudan |
| **HIC** | High-income country |
| **ICT** | Information and Communication Technologies |
| **IfD** | Institute for Development |
| **INGO** | International Non-Governmental Organisation |
| **LMIC** | Low and middle-income country |
| **PBEA** | 'Peacebuilding, education and advocacy in conflict-affected contexts' programme |
| **PtPT** | Pikin to Pikin Tok |
| **RER** | Rapid Evidence Review |

# Summary

This Rapid Evidence Review (RER) provides an overview of existing literature on the use of technology for education in emergencies (EiE) in low- and middle-income countries (LMICs). The RER has been produced in response to the novel 2019 coronavirus (COVID-19) and the resulting widespread global shutdown of schools. Established approaches to maintaining continuity of education for the most marginalised have particular salience during this period because of the significant increase in the number of students at risk of disruption. Research consistently shows that while education across the board is negatively affected by crisis situations, those already facing ongoing crises or disruptions can be disproportionately impacted, or neglected as attention moves on to those affected by new disruptions to their education.

This RER provides a summary of the potential benefits of using technology for EiE as well as its risks, limitations and challenges. The RER aims neither to advocate for nor discourage the use of technology in EiE in response to the present COVID-19 pandemic, but rather to provide an accessible summary of existing evidence on the topic so that educators, policy-makers and donors might make informed decisions about the potential role of technology in delivering education for those facing emergencies. Many of the same constraints and challenges faced in delivering education in emergencies are being faced around the world in response to COVID-19, resulting in greater relevance of learning from EiE to all education systems.

The RER involved a systematic search for academic and grey literature on the use of EdTech in the education of children in emergency contexts in LMICs. After a screening process, 29 papers published since 2009 were analysed. Details on the inclusion criteria, as well as the associated limitations, are explained in the Methodology section. The rapid nature of the review required a focused approach to literature discovery, and a thematically guided process of analysis, so that a timely response to COVID-19 might be provided. The search strategy was, therefore, not designed to be exhaustive.

The thematic analysis of the relevant literature on technology for EiE led to the identification of four core themes:

- **Facilitating access to education and learning:** This section presents findings on the use of technology to enable access to education and learning during and after an emergency.

- **Educational content and pedagogy:** This section discusses the importance of quality and contextualised educational content, and examines EdTech-related pedagogical approaches.
- **Supporting education actors:** This section examines how EdTech is used to support the range of education actors responding in emergency contexts.
- **Protection and psychosocial well-being:** This section examines the use of Edtech to protect vulnerable children from risks in emergency, and to support children's psychosocial well-being.

The key findings from this review are as follows:

- EdTech has the potential to help children continue to access education during periods of disruption and school closures caused by emergencies. Radio and tablets have demonstrated promise in filling in educational gaps in previous emergencies, including in conflict and post-conflict settings and the Ebola epidemic.
- Leveraging technology to convey key messages to families and communities, as well as to children themselves, can play a critical role supporting children's transitions back to school in post-crisis contexts. Limited evidence from the Ebola epidemic highlights the particular role of radio in this.
- Community participation is important for contextualised interventions. In times of conflict, conflict-sensitive and culturally appropriate EdTech is particularly critical in ensuring education supports peacebuilding, rather than exacerbating conflict.
- Blended approaches, promoting interactions and connections with teachers and peers, and self-directed approaches, allowing greater autonomy and pacing, each have the potential to promote positive learning outcomes for children in emergencies. To successfully facilitate these approaches, teachers must be willing and able to navigate and use EdTech effectively, and without the adaptation to new technologies leading to additional stress during crisis periods.
- There are positive examples of initiatives supporting teachers and educators with their continuous development and teaching, although these are mostly limited to protracted and post-conflict settings. There is very limited evidence on the transferability of such projects to acute conflict, epidemic or disaster settings.

- Technology has been widely used to support the coordination and effectiveness of EiE responses. The use of technology to support data collection is particularly significant in this context. Digital data collection can be important in informing institutional-level monitoring of students' and schools' performances, as well as shaping wider educational policy planning and identifying critical education needs during emergencies. Data protection and safeguarding must be held at the fore when considering the expansion of EdTech in emergencies.
- The selected literature demonstrates the ways in which technology can support the protection of children from risks resulting from an emergency. These include: warning teachers and students of risks around schools in conflict; mitigating against negative coping strategies imposed when children are out of school; and supporting children's learning about disaster risks in areas vulnerable to natural disasters and, thus, their disaster preparedness.
- EdTech has the potential to directly support children's psychosocial well-being, and there are notable examples of projects that embed well-being outcomes into project design. EdTech can also indirectly support well-being, with some evidence that engaging with EdTech during emergencies can have positive results, particularly if it allows children to remain connected with their peers and teachers when schools close, and enhances their self-esteem and confidence.

The review also identifies the barriers to implementing EdTech interventions in a context of disrupted education which is partly similar to the current Covid-19 scenario. Where possible, enabling environmental factors are highlighted that may be drivers of positive learning engagement. The review does not specifically encompass refugee education. This is the focus of a separate RER in this series (see ↑Ashlee, et al., 2020), which can be read alongside this review.

# 1. Introduction

The COVID-19 pandemic has resulted in widespread and unprecedented global disruption to education.[1] Physical distancing policies to suppress the spread of COVID-19, which often advise that students and teachers cannot congregate in schools in the conventional manner, has led to a global expansion of the use of technology within education.

This RER provides a summary of the potential benefits of using technology for EiE as well as its risks, limitations and challenges. Many of the same constraints and challenges faced in delivering EiE are being faced around the world in response to COVID-19, resulting in greater relevance of learning from EiE to all education systems. This RER, therefore, offers insight and evidence that can assist in the development and implementation of effective EdTech interventions across the globe and in emergency contexts within the current global global pandemic.

## 1.1. Background

### 1.1.1. The importance of education in emergencies

There is widespread recognition that education is an essential component of effective emergency response. For children in emergency situations, education provides "physical, psychosocial and cognitive protection that can sustain and save lives" (↑INEE, 2012, p.2). In addition, EiE can play a critical role in supporting other life-saving sectors during emergencies, including shelter, WASH and health (↑INEE, 2012), contributing to peacebuilding (↑Bush & Saltarelli, 2000; ↑Pherali, et al., 2016), nurturing resilience and creating a foundation for employment and economic growth (↑INEE, 2012).[2] Crucially, education is also considered a key priority by children living in emergency and conflict contexts (↑Gladwell & Tanner, 2014).

UNICEF (↑2018, p.5) estimates that, pre-Covid-19, nearly one in three of all out-of-school children aged between five and 17 years old lived in emergency-affected countries – approximately 104 million children. Educational provision is often significantly disrupted in emergency situations (↑INEE, 2012) as emergencies can weaken or break down national education

[1] See: en.unesco.org/covid19/educationresponse

[2] It is important to recognise that education can, conversely, act as a perpetrator or exacerbator of conflict (↑Pherali, et al., 2016).

systems and state services, damage or destroy schools, lead to school closures, and result in shortfalls in qualified teachers (↑Nicolai & Hine, 2015). Technology has increasingly been used in educational responses in emergency settings, in part because of the increasing role of the private sector in humanitarian responses (↑Tauson & Stannard, 2018).[3]

### 1.1.2. Categories of emergencies examined

An emergency is defined by the INEE Minimum Standards (↑INEE, 2012) as "a situation where a community has been disrupted and has yet to return to stability". A focus on EiE encompasses a cycle of preparedness for, response to and recovery from an emergency (↑Winthrop, 2020; ↑INEE, 2012). For the purposes of this RER, the term emergency is used to encompass situations of conflict, epidemics and natural disasters. This review examines the use of EdTech across three different categories of emergencies:

- Conflict settings: Conflict and violence can disrupt the delivery of education services and cause destruction or damage to education infrastructure in the short- and long-term (↑Baytiyeh, 2019; ↑Alfarah & Bosco, 2016). Safety risks for students and teachers are a particular concern in armed conflict settings: schools, students, teachers and other education personnel can become the targets of attacks, violence and kidnapping (↑GCPEA, 2020; ↑Baytiyeh, 2019; ↑Almasri, et al., 2019).
- **Epidemics:** During epidemics, extended school closures are widespread. Whilst this is often a necessary step to mitigate the risk of disease or virus spread, extending school closures can lead to children dropping out of school entirely and poor educational attainment and outcomes (↑Baytiyeh, 2019; ↑Hallgarten, 2020).
- **Natural disasters:** Natural disasters can have significant impacts on education systems, causing rapid school closures. School buildings can be particularly vulnerable in the face of earthquakes, hurricanes and floods, and the lack of risk mitigation measures can have severe consequences for schools and the delivery of education (↑Baytiyeh, 2019).

It is important to note, however, that many emergency contexts have intersecting risks and vulnerabilities, and span more than one category of

[3] Beyond the scope of this RER, there are important issues to consider regarding the potential implications of private sector engagement with EdTech in EiE settings (see, for example, ↑Novelli, 2016).

emergency. For example, Dahya (↑2016, p.10) highlighted how civil war had already "depleted" the education system in Sierra Leone leading up to the Ebola crisis. Similarly, after the onset of the conflict and civil war in South Sudan in 2013, the country has also experienced a severe cholera outbreak and malaria epidemic (↑UNICEF, 2019).

Refugee crises are often examined as a category of EiE. Another RER in this series focuses exclusively on the use of technology to support the education of refugees in LMICs (see ↑Ashlee, et al., 2020). There is a degree of overlap between the two RERs because much of the literature on EiE includes refugee contexts. Thus, this RER focuses specifically on challenges facing the education of children who have lived in emergency and crisis contexts in their countries of origin, rather than those who have been forcibly displaced by them.

## 1.2. Purpose

Lessons learnt from the use of technology for EiE are salient in the current global context. There are, to an extent, similarities that can be observed between the widespread disruption caused to education resulting from the COVID-19 crisis and the disruption resulting from other emergencies – including armed conflict, natural hazards and epidemics. In a wide range of emergency settings, schools and non-formal education programmes may close and there may be gaps in learning that contribute to educational inequities, delay educational progress, and threaten children's safety (↑Morris & Farrell, 2020).

This RER, alongside others, contributes to an emerging evidence base on the use of technology for education during the COVID-19 pandemic. It organises the most relevant literature into coherent themes for the consideration of key stakeholders.

## 1.3. Application

The RER aims neither to advocate for nor discourage the use of technology in EiE in response to the present COVID-19 pandemic. Rather, it aims to provide an accessible summary of existing evidence on the topic so that educators, policy-makers and donors might make informed decisions about the potential role of technology in delivering education for those facing emergencies.

The insights presented in this RER are expected to be viewed as principles for the planning and implementation process of technology for the education of

children living in emergency settings. The expectation is that readers will take their own expertise from their local context to apply the findings of the review. Patterns of good practice have emerged from the evidence on how, when and why technology can be used for EiE, and it can be reasonably expected that many of the insights are applicable in the context of widespread educational disruption caused by the COVID-19. The evidence can also inform how EiE interventions in LMICs can be adapted during this time.

## 1.4. Research questions

Two research questions guide the study:

1. What are the key emergent themes in the available literature on the use of technology for EiE in LMICs?
2. What are the key findings that can be drawn from the available literature to inform effective responses to the COVID-19 pandemic?

## 1.5. Theme identification

After conducting a scoping review to compile a list of relevant keywords, a systematic search was conducted for evidence on EiE. More detail on that process, including the inclusion and exclusion criteria, can be found in the Methodology section that follows. After screening was completed, 29 papers were selected for analysis. A thematic analysis of these papers led to classification into four themes, all of which have sub-themes, which are discussed in more depth in the Findings section.

- **Facilitating access to education and learning:** This section presents findings on the use of technology to enable access to education and learning during and after an emergency.
- **Educational content and pedagogy:** This section discusses the importance of quality and contextualised educational content, and examines EdTech-related pedagogical approaches.
- **Supporting education actors:** This section examines how EdTech is used to support the range of education actors responding in emergency contexts.
- **Protection and psychosocial well-being:** This section examines the use of Edtech to protect vulnerable children from risks in emergency, and to support children's psychosocial well-being.

## 1.6. Structure of the RER

Following this introduction, the methodological approach is discussed, including details of the scoping review, the literature search, eligibility criteria and possible limitations of the methodology. Detailed findings are then presented under the four themes that emerged from a thematic analysis of identified literature. This report concludes by providing a synthesis of the findings from the literature.

# 2. Methodology

The methodological approach is informed by the Cochrane Collaboration Rapid Reviews Methods Group interim guidance on producing rapid reviews (↑Garritty, et al., 2020). This permits a rigorous and systematic approach, while defining the scope narrowly enough that it can be completed within a short span of time.

While the intention was to model this RER on a systematic, thematic review of primary studies, it quickly became apparent that there are significant evidence gaps on the use of technology for EiE, particularly in terms of rigorous, quality evaluations or impact studies (see, for example, ↑Tauson & Stannard, 2018). Consequently, a decision was made to include reviews of other literature or systematic reviews.

The research process comprised a systematic sequence of scoping, searching and screening. First, in the scoping phase, the research questions and eligibility criteria were defined and a brief scoping review was conducted to help elicit relevant search terms for the search queries. Then a focused set of searches was run, alongside a snowball sampling approach to searching, the results of which were then screened according to the inclusion criteria (see Table 1).

## 2.1. Scoping review

Unlike systematic reviews, the criteria for scoping reviews are not yet well-defined. However, these reviews are widely considered as representing a stage prior to a systematic review where the key concepts and ideas that define a field are explored and discovered in an iterative process (↑Daudt, et al., 2013; ↑Levac, et al., 2010). Notably, the scoping review of this study did not aim to map out all the concepts, theoretical and otherwise, included in the scope of technology and EiE. Instead, it had a more pointed focus: to identify keywords and terms that had been used in studies that discuss the use of technology in EiE responses.

The scoping review process began by noting relevant keywords and terms that were already known to the authors to search for additional literature. The process was iterative, with the terms found in one article leading to searches for other articles that then revealed different, or the same, terms. Using this method, a list of over 30 search strings was compiled (for search terms used, see Annex B). It is important to note that when a search term brought up an article with a relevant title, those articles were saved to be screened later

alongside those that were found during the main literature search that is explained below.

## 2.2. Literature search

The literature search began after establishing the search terms at the end of the scoping review. Google Scholar constituted the primary source of literature, with a small number of unique search results returned from the EdTech Hub SPUD database and Scopus, confirming that search results had not been missed through this approach. Figure 1 below details the process used to arrive at the articles that were ultimately thematically analysed in this review.

Differing from other RERs in this series, this RER adopted a targeted approach after initial searches returned very few relevant results. Searches by countries impacted by conflict, epidemics and natural disasters or names of specific emergencies were also conducted. Additionally, a snowball sampling approach was also used to identify relevant literature. While the main thrust of the literature review involved a systematic approach, it was recognised that there might be influential literature that might not be captured through those searches alone. The decision was therefore made to search the reference lists of the most relevant papers found through the systematic literature review, for additional literature, and to explore programmes and literature recommended by expert reviewers.

It is important to highlight that unlike a conventional systematic review process, which may screen all search results, the rapid review methodology used herein relied on a system of quotas. As such, only the top most relevant results (up to a maximum of the top 500 results), as ranked by Google Scholar, were selected for the first round of screening. In addition, the results were not screened and ranked for quality or limited to peer-reviewed/academic publications. Relying solely on peer-reviewed academic articles would have resulted in a narrower, less generalisable review. This would also have excluded a larger number of voices from LMICs due to systemic factors excluding many academic researchers in LMICs from mainstream peer-reviewed journals.

## 2.3. Screening and eligibility criteria

The title and abstract screening, as well as all other subsequent screenings, were conducted according to the eligibility criteria laid out in Table 1. A total of 73 articles were initially captured for further screening which resulted in 29

papers being selected for analysis. It should be emphasised though that the screening criteria was not absolute. For example, when search terms returned a large number of studies, the date parameters were re-adjusted to return only literature from 2009 onwards.

Moreover, while the majority of selected literature met the eligibility criteria, a small, complementary collection of literature that was deemed especially informative, but did not meet all criteria, was referenced. However, these exceptions were only made when an article met all except one of the eligibility criteria. For example, a study that focused on LMICs in general, rather than solely on emergency settings, may have been included if one of the countries studied or referenced could be categorised as an 'emergency context' (see, for example, ↑Moon, et al., 2016 and ↑Unwin, et al., 2017).

One limitation of relying on Google Scholar as the primary source of literature was the number of low quality papers collected, and the level of duplication in search results returned. Many of these were eliminated in the initial stages based on duplicate content, and lack of relevance. As a result the search and screening process reflects an unusually high number of irrelevant and duplicate results at the initial stages.

**Figure 1:** *Literature search and screening process.*

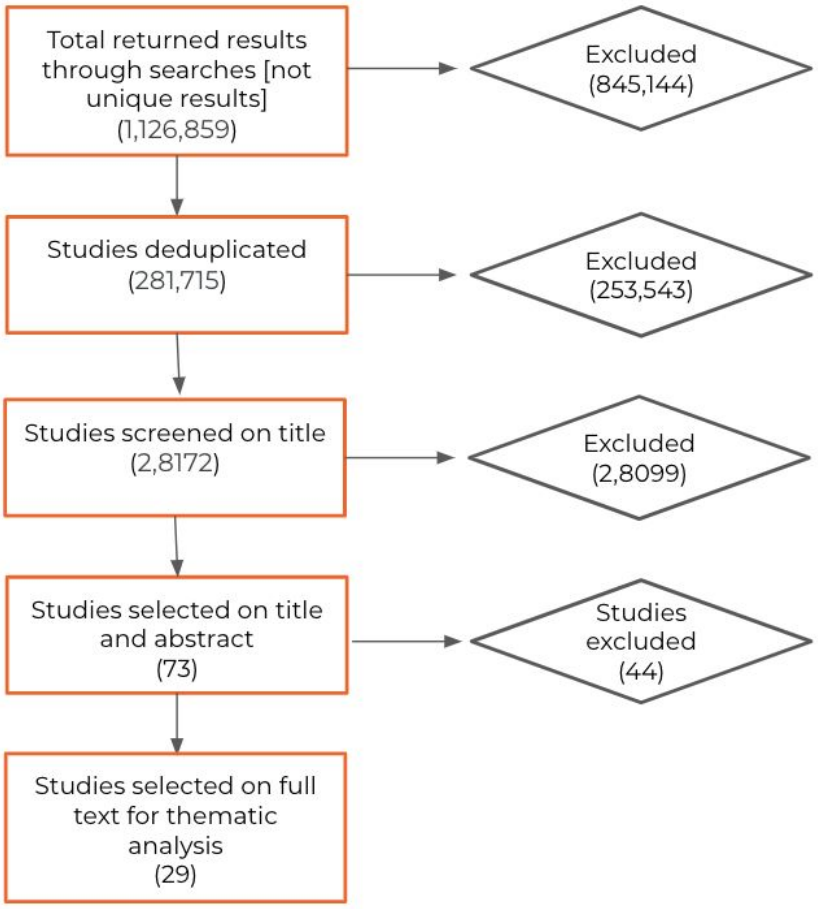


***Table 1:*** *Eligibility criteria for literature searches and screening.*

| Criterion Type | Inclusion Criteria |
|---|---|
| Setting | Emergency or post-crisis |
| Education | Primary and/or secondary |
| Geography | LMICs |
| Literature type | All |
| Date | 2009–2020 |

## 2.4. Limitations

There are several limitations to this review, stemming from the rapid timeframe and the nature of available evidence. These are:

- **Limited availability of evidence:** There is an acknowledged gap in the evidence base on EdTech in emergency settings, particularly in terms of rigorous evaluations, impact studies and the perspectives of children and their communities (↑Tauson & Stannard, 2018; ↑Lewis & Thacker, 2016; ↑Dahya, 2016). While the literature reviewed for this report references a range of projects and programmes, there is limited evidence on their effectiveness, impact or other learnings from their implementation.
- **Quality of the evidence:** The evidence identified within the literature varies in terms of quality and robustness. While some projects have been well-evaluated and frequently cited across the literature, evidence on others is only briefly referenced or studied as part of a smaller evaluation or research project.
- **Weighting of evidence to conflict settings:** The majority of evidence on the use of technology in education is centred around conflict and post-conflict settings (↑Dahya, 2016; ↑Hallgarten, et al., 2020). There are notable gaps in other settings, particularly those affected by disasters and epidemics.

# 3. Systematic review and thematic analysis

This section presents findings from thematic analysis of available evidence in the literature selected. Four key themes emerged:

- facilitating access to education and learning
- educational content and pedagogy
- supporting educators
- protection and well-being.

## 3.1. Facilitating access to education and learning

A significant theme that emerged from the literature is the use of technology to facilitate access to education and learning during and after emergencies. The ability of technology to help overcome safety and security risks and reach marginalised children is highlighted (↑Barry & Newby, 2012), as is its potential for providing access to education when institutional capacity is weakened by, or recovering from, an emergency (↑War Child Holland, et al., 2016; ↑Alfarah and Bosco, 2016).

### 3.1.1. Continuing education during periods of disruption

Analysis of the literature supports the finding of a landscape review of EdTech in crisis and conflict settings (↑Dahya, 2016), that the majority of EdTech initiatives focus on longer-term educational goals and are implemented in post-crisis settings. Some literature, however, highlights the way in which technology can help children to continue their learning in the midst of an emergency, helping to "fill-in the gaps during disruption" (↑Tauson & Stannard, 2018, p.37). The literature focuses on children's learning when they are out of the classroom, unable to attend because of the risks resulting from the emergency.[4]

[4] There is more literature on the use of technology to support learning within educational environments (schools or education centres) in refugee and displacement contexts. See Ashlee et al. (↑2020 pp. 12-13).

### 3.1.2. Leveraging radio

The use of radio to provide educational access at a distance, particularly during conflict, is particularly prominent in the literature. But while many examples of programmes are referenced, there is limited evidence on their effectiveness or impact. One noteworthy exception is the Somali Interactive Radio Instruction Programme (SIRIP). SIRIP was implemented between 2005 and 2011 in Somalia, during a protracted, complex crisis marked by civil war and drought which, as described by Carlson (↑2013, p.23), created a "perfect storm" for education. SIRIP leveraged radio technology to provide children with access to education otherwise not available through traditional education methods (↑Burde, et al., 2015; ↑Dahya, 2016; ↑Carlson, 2013). This educational access was provided in formal and non-formal education spaces and home environments.

Several studies assessed SIRIP as effective. Carlson (↑2013, p.23) highlighted the successful choice of radio technology given the "security situation, available internet connectivity, unreliable electricity supply, limited local expertise to develop contextually relevant videos, weak institutional capacity and other factors". A quasi-experimental study of SIRIP found that children in the project achieved higher scores in literacy and maths tests than non-SIRIP students (cited by ↑Burde, et al., 2015), and enrolment in schools also increased (cited by ↑Dahya, 2016).

In addition to the use of radio in conflict settings, there is evidence on its use during the Ebola outbreak of 2014-2015 – the only epidemic context identified by this review with evidence on EdTech initiatives. According to UNICEF (cited in ↑Hallgarten, 2020, p.7), one million children were reached through radio education during the Ebola outbreak across all West African countries responding to the epidemic. There is some evidence on the effectiveness of such radio programmes in Sierra Leone. The Emergency Radio Education Programme, commissioned by the Ministry of Education, Science and Technology, provided education on core academic subjects for children across a range of age groups. A qualitative evaluation report cited by Hallgarten (↑2020) found that the programme helped to sustain a connection to education during a time of severe disruption. However, the evaluation report also found that the programme did not adequately compensate for the loss of access to schools and teachers (cited by ↑Hallgarten, 2020).

It is worth noting that while radio was used to broadcast education programmes in two other countries during the Ebola outbreak, Guinea and

Liberia (↑Hallgarten, 2020), this review did not identify any evidence on their impact (↑Damani & Mitchell, 2020).

### 3.1.3. Leveraging other forms of technology

Other forms of technology, including mobiles, TVs, tablets, laptops and computers, are not as common as radio during emergencies. When reviewing the strengths and weaknesses of different forms of technology in conflict and crisis in 2013, Carlson (↑ 2013, p.17) concluded that there was no large-scale implementation of mobile-based EdTech, leaving the concept largely "unproven". While Carlson (↑2013) continued to discuss the use of computers in crisis settings, the examples provided were limited to refugee camps. A paper by Rush et al. (↑2014) supported this, finding no available evidence to suggest progress is being made towards implementing an 'emergency online school' system in marginalised and extremely poor communities prone to natural disasters.

More recent literature has referenced a range of EdTech initiatives leveraging technology other than radio during emergencies (see, for example, ↑Dahya, 2016 and ↑Morris & Farrell, 2020). However, the evidence on these initiatives is largely limited to how they are implemented, with little insight into their success, impact or effectiveness. For example, while Carlson (↑2013) identified Ustad Mobile as leveraging mobile technology to enable students to engage with learning in Afghanistan, the author noted that there was no available evidence on student learning.

Some exceptions emerged, and there is evidence available from evaluations of two tablet-based EdTech initiatives: the Rumie Tablet and eLearning Sudan (ELS). The Rumie Tablet – a low-cost tablet with preloaded digital educational content for students in severely under-resourced areas – was used during the Ebola outbreak to encourage children's engagement in education when confined to their homes (↑Hallgarten, 2020; ↑Moon, et al., 2016). First trialled with refugee children from Syria, the Rumie Tablet was adapted for use in other contexts, including in Liberia to provide educational access during the Ebola outbreak. A small, mixed-methods evaluation of the Rumie Tablet showed positive results in terms of increased participation of children and their parents in education, with no significant differences in results between Liberia and other participating countries (↑Moon, et al., 2016).

ELS used tablets to provide basic education in Sudan during a protracted crisis where "formally trained teachers or schools [were] not present" (↑War

Child Holland, et al., 2016, p.15). ELS comprised a serious educational game[5] version of the out-of-school maths curriculum. An evaluation of the programme, which collected data from over 600 children, found that ELS was an effective learning approach for disadvantaged children in Sudan (↑War Child Holland, et al., 2016). The evaluation concluded that "compared to traditional education approaches in Sudan and selected countries, ELS is more effective for learning outcomes than traditional education, when measured using EGMA as the standardised assessment" (↑War Child Holland, et al., 2016, p.57.

### 3.1.4. Encouraging children's return to school

In their literature review on EdTech in crisis and displacement contexts, Tauson and Stannard (↑2018, p.37) identified a role for technology in "increasing the speed with which learners can return to full time education". However, this RER has not identified any evidence on the use of technology in alternative learning programmes in emergency contexts.[6] More broadly, there is limited evidence on the use of technology to encourage children's return to school.

However, evidence emerged from a well-evaluated project which used radio to support children's learning in the aftermath of the Ebola outbreak once schools had reopened in Sierra Leone: Pikin to Pikin Tok (↑Barnett, et al., 2018; ↑Dyson & Amara, 2017; ↑Walker, et al., 2015).[7] Alongside educational content for children delivered through radio[8], parents were targeted with "messages about… the importance of ECE [Early Childhood Education] for young children and continuing education for older children" (↑Dyson & Amara, 2017, p.4). In short, Pikin to Pikin Tok sought to supplement and highlight the importance

[5] War Child Holland et al. (↑2016, p.17) defines a serious game as "the result of collaborative efforts by experts in game design, pedagogy, and learning design to develop a game to achieve explicit learning outcomes that are measurable.

[6] A forthcoming, separate RER focuses on alternative learning programmes (Damani, 2020b).

[7] Pikin to Pikin was a local NGO that, in partnership with the UK-based NGO Child to Child, was already running the project "Increasing Access, Retention, and Performance in Primary Education" in the Kailahun District. This programme launched in 2011 and was operational across twenty-one schools. When the Ebola outbreak occurred and schools closed between July 2014 and April 2015, the programme could no longer continue in its current form. In response the NGOs reconfigured their programme (↑Dyson & Amara, 2017, p.v).

[8] The programme had three main content strands, each with different target audiences: numeracy and literacy skills; health and hygiene measures; and the social problems that were arising because of Ebola (↑Barnett, et al., 2018).

of children re-accessing the existing school system, rather than seeking to provide a full curriculum.

An endline evaluation of the project written by the Institute for Development (IfD) (↑Dyson & Amara, 2017) found that the project was largely successful in encouraging re-enrolment in education. The evaluation argued that among the most significant achievements of the project was its increased enrolment in and preparedness for school within the project's Young Learner's category, as well as a greater self-confidence among 'Young Facilitators', which was measured in terms of active participation in both their school and community (↑Dyson & Amara, 2017). Increased parental support for and involvement in children's education was also reported (↑Dyson & Amara, 2017). Overall, the IfD report argued that, in some situations, the use of radio increased participation of children in education after the epidemic more than before: there were found "examples of children who had never been enrolled in school, became enrolled in the listening groups, and... going to school post-EVD" (↑Dyson & Amara, 2017, p.27).

## 3.2. Addressing educational inequalities

### 3.2.1. The importance of equitable access to EdTech

Educational inequalities and divides can be exacerbated by emergencies (↑Dahya, 2016). They can also be exacerbated by the use of technology, which is often out of reach for marginalised children (↑Morris & Farrell, 2020). Combined, the use of technology to facilitate education in emergency settings risks further marginalising or entrenching pre-existing educational inequalities, rendering a critical need to specifically plan for equitable access to education at each stage of an EdTech tool's development (↑Morris & Farrell, 2020).

Ensuring that EdTech programmes do not exacerbate educational inequalities is particularly critical in times of conflict. Evidence from UNICEF's Peacebuilding, Education and Advocacy in Conflict-Affected Contexts (PBEA) programme revealed how educational inequalities can be a root cause of conflict: in nine out of 14 PBEA programme, the root cause of conflict was noted as "unequal access to and/or quality of social services, including education, between regions and/or urban-rural communities as well as along ethnic/religious lines" (↑Shah, et al., 2016, p.46). However, Dahya (↑2016) argued that there is more work needed to understand how technology can be used

with specific aim of promoting access to education for marginalised groups in emergencies.[9]

### 3.2.2. Gender inequality[10]

While this RER did not identify any literature that examined the use of EdTech initiatives to support access to education for children with disabilities within EiE, there is some evidence on girls' access to EdTech programmes within EiE. A UN Girls' Education Initiative case study on the Pikin to Pikin Tok radio programme in Sierra Leone (↑Walker, et al., 2015) reported that radio contributed to balancing out gender inequalities in educational access, stating that "girls of all ages were able to participate and communicate on an equal footing with boys and they sometimes outperformed boys in their levels of confidence and in providing examples of applying knowledge", which was in "contrast to the general positioning of girls in the community" (↑Walker, et al., 2015, p.7). Similarly, an evaluation of ELS found that the serious mathematical game was "gender neutral"; that is, it "promotes a more gender balanced learning experience, which stimulates and retains boys and girls equally" ↑War Child Holland, et al., 2016, p.57).

However, there is contrasting evidence from the Pikin to Pikin Tok programme. Walker et al. (↑2015) found that, as a result of increased demands within the household economy, some children were unable to access formal and informal listening groups for radio education programmes – and that this predominantly affected girls. This reinforces the view of Tauson and Stannard (↑2018) that girls in emergencies are often unable to access technology on an equal footing to boys; the authors further stated that gender barriers should be considered before implementing EdTech initiatives that "may exacerbate inequality in society" (↑Tauson & Stannard, 2018, p.98).

## 3.3. Cost and sustainability considerations

### 3.3.1. Cost and cost-effectiveness

In order for EdTech interventions to enable continued access in a crisis context it is necessary that they are sustainable in the long-term. The

[9] The 4R framework may be a useful way to address this, by thinking through: redistribution, recognition, representation and reconciliation. For more information, see http://sro.sussex.ac.uk/id/eprint/69179/1/__smbhome.uscs.susx.ac.uk_dm50_Desktop_JEiE_V3_N1__4Rs_Framework-4.pdf

[10] More detailed information on gender and EdTech can be found in the RER on girls' education and EdTech (↑Webb, et al., 2020).

literature reviewed suggests that, in some crisis contexts, EdTech can be cost-effective, particularly when leveraging technology already in place (↑Tauson & Stannard, 2018; ↑Carlson, 2013). However, the prohibitive costs of EdTech interventions are emphasised, including the cost to provide hard-ware, particularly computers (↑Carlson, 2013), and the cost of replacing or repairing lost or broken equipment (↑Tauson & Stannard, 2018).

Dahya (↑2016) highlighted how the immediacy and unexpected onset of some emergencies can result in short-term and unpredictable forms of funding which are inadequate for implementing long-term EdTech initiatives. She further argued that there is an "expansive gap" between available and needed funding (↑Dahya, 2016, p.29).

### 3.3.2 Responding to available infrastructure

Responding to the infrastructure already in place during emergencies is key to the sustainability of an intervention. Access to education through EdTech can be undermined by disrupted or destroyed infrastructure required to support the use of technology, sometimes rendering its use for reaching marginalised children particularly challenging (↑Tauson & Stannard, 2018; ↑Barry & Newby, 2012; ↑Dahya, 2016). Some literature reported successful attempts to navigate this challenge, such as through the use of solar power and offline access to educational content (↑Barry & Newby, 2012). Barry and Newby (↑2012) highlighted the importance of the choice of EdTech tool being informed by the infrastructure in place in order to deliver education to hard-to-reach children (↑Barry & Newby, 2012).

A key consideration emphasised by Hallgarten et al. (↑2020) is that the available infrastructure documented in an emergency is likely to differ from the reality. It is, therefore, important that EdTech initiatives are based on actual existing conditions, rather than simply on the formal documentation of those conditions.

### 3.3.3 The importance adequately resourcing education

It is important that the education provided or encouraged by EdTech is adequately resourced. One learning from the implementation of the Pikin to Pikin Tok programme was that any "project that increases 'demand' for education services should simultaneously work with the education system to proportionally increase 'supply'" (↑Dyson & Amara, 2017, p.viii). Although the radio programme led to an increase in children seeking to enrol in school, the project had not sought to "train more teachers, build classrooms, provide

teaching materials, ensure school feeding programmes quantify sufficient food supplies, etc." which meant that the demand for more school places could not be met (↑Dyson & Amara, 2017, p.viii).

## 3.4. Educational content and pedagogy

Another prominent theme that emerged from this review centres on EdTech-related educational content and pedagogical considerations.

### 3.4.1. Continuity and contextualisation of education facilitated by EdTech

The importance of educational continuity during periods of disruption caused by emergencies is highlighted by the literature. The emphasis was not just in keeping children in education, but also in maintaining the learner identity through other disruptions to identity (↑Tauson & Stannard, 2018). In stating that "no distance learning modality is ideal for teaching all skills to all learners in all contexts" (↑Morris & Farrell, 2020, p.vii), Morris and Farrell reinforced the importance of tailoring and adapting EdTech initiatives to the context and culture in which they are being implemented, as emphasised by Tauson and Stannard (↑2018) and Dahya (↑2016).

### 3.4.2. Curricula

Curricula emerged as a key consideration throughout the review. Tauson and Stannard (↑2018) and Dahya (↑2016) both emphasised the importance of the curriculum being aligned and relevant to local context if children are to fully engage and progress in their education during periods of disruption caused by emergencies. A successful example of this is ELS, which was aligned to the official curriculum for 'out-of-school' children in Sudan for Grades 1, 2 and 3 and led to official certification (↑War Child Holland, et al., 2016).

However, despite the emergence of a number of nascent partnerships between national ministries of education and television and radio stations (Trucano, 2020), evidence on how EdTech can support learning outcomes linked to formal curricula in crisis contexts remains limited (↑Tauson & Stannard, 2018). Additionally, Dahya (↑2016) found that some initiatives implemented as part of a rapid response to an emergency fail to integrate into certified and accredited school programmes and education trajectories, negatively impacting on continuity.

### 3.4.3. Language

Another aspect critical to enabling continuity and meaningful participation is the language of instruction. Carlson (↑2013) suggested that one of the reasons that a radio programme implemented in South Sudan between 2004 and 2012, which focused on teaching English to children, did not meet its objectives was that the content was only available in English; the author noted that teachers' low level of English made it difficult for many to translate the radio content.

Language issues also emerged as a challenge with the Pikin to Pikin Tok radio initiative. The broadcasts were multilingual which proved to be a significant initial barrier for the listening groups where these were not implemented properly – particularly the informal groups which were not facilitated and, therefore, had no one to help the children "understand and internalize the messages from the broadcasts" (↑Walker, et al., 2015, p.7).

## 3.5. Community participation in the design of EdTech initiatives

### 3.5.1. The importance of involving local actors

The literature emphasises the importance of involving the community and education stakeholders in the development of EdTech initiatives in emergencies (↑Tauson & Stannard, 2018; ↑Dahya, 2016; ↑Burde, et al., 2015; ↑Barry & Newby, 2012; ↑War Child Holland, et al., 2016). Barry and Newby (↑2012) argued that while it may be time-consuming in the short-term, meaningful community participation yields more sustainable and cost-effective results in the longer-term (↑Barry & Newby, 2012).

The involvement of and partnership with local actors was referenced as key to the success of the Pikin to Pikin Tok radio initiative in Sierra Leone (↑Hallgarten, 2020; ↑Barnett, et al., 2018). The investment in local organisations who had already collaborated with relevant governmental bodies and community representatives, including women's leaders, religious leaders and community leaders, meant that there was pre-existing community buy-in which was transferred to the Pikin to Pikin Tok (↑Barnett, et al., 2018).

Another success factor of the Pikin to Pikin Tok initiative was the recruitment and mobilisation of more than 250 facilitators, many of whom were local, to coordinate listening groups for the children. These facilitators, who were often respected members of the community, were "vital in developing and maintaining both the attendance and learning of child participants" (↑Walker,

et al., 2015, p.9). Pikin to Pikin Tok also maintained a commitment to high levels of child and youth participation, and recruited thirty-six voluntary "young journalists" who they trained to capture audio content on subjects that were affecting them because of the Ebola crisis to include in the programming. As Barnett et al. (↑2018) reflected, "these children, undoubtedly among the most vulnerable in the world, were not simply beneficiaries of the project but actively participated in creating the programmes." [11]

### 3.5.2. Conflict-sensitive EdTech content

That community participation in education is key for sustainable peace in conflict settings has long been recognised (Lederach 1997). However, given the recognition that education can also exacerbate conflict (↑Bird, 2009), the importance of culturally- and conflict-sensitive EdTech content is of central importance (↑Dahya, 2016). According to Dahya (↑2016, p.27), the risk in using standardised content within digital tools is that this content, often created in high-income contexts, "may be laden with particular values, beliefs, or incomplete historical representations of both local and global issues". Moreover, the author stressed that the distribution of the content must be carefully managed: "pre-recorded content [that is] available to and shared across personal devices, like mobile phones, can have a reach beyond the individuals enrolled in the program for which it was intended" (↑Dahya, 2016, p.27). While this is not necessarily harmful, sensitive content – ranging from portrayals of historical or political events, to information about gender-based violence – "should be assessed for potential to be misunderstood if digital content is distributed outside its intended form" (Dahya, 2016, p.27).

Potential unintended impacts of community participation should also be considered, as part of a wider recognition that education has the potential to exacerbate conflict. Only one paper (↑Burde, et al., 2015) engaged with this issue. The author underlined the positive impact of community involvement, yet warned community participation can sometimes have "unintended effects on resolving or exacerbating social and political tensions" (↑Burde, et al., 2015, p.32).

## 3.6. Pedagogical considerations

[11] Discussion of this project in the context of other radio programmes can be found in the EdTech Hub rapid evidence review on radio (↑Damani and Mitchell, 2020)

### 3.6.1. Blended learning

Mirroring evidence on EdTech more broadly, the literature on EdTech in EiE points toward the importance of a focus on pedagogy and modalities over the type of tool used (↑Kumar, et al., 2017; ↑Moon, et al., 2016). Maintaining connections between students and educators, even in virtual environments, is also key (↑Dahya, 2016; ↑Tauson & Stannard, 2018). A core finding from the evaluation of the Rumie tablet was that:

> "It is not simply enough to provide hardware (tablets) and software (educational materials and games) to ensure the success of projects. Provision of such tablets needs to be integrated with existing educational provision so that effective 'blended' learning is supported" (↑Moon, et al., 2016, p.495).

Effective blended learning approaches are reliant on teachers' and educators' ability to navigate and use technology in order to deliver educational content or support children's learning. However, the literature suggests that they may not always have the requisite skills to access and meaningfully use EdTech (↑Dahya, 2016; ↑Carlson, 2013). In more structured settings where EdTech is used to complement teaching, teachers that are already dealing with stressful or traumatic events may not be willing or feel able to also adopt new technologies and different ways of teaching (↑Tauson & Stannard, 2018).

### 3.6.2. Self-directed learning

Almasari et al. (↑2019) argued that a form of self-directed learning, albeit with supervision, should be a key characteristic of a digital learning platform for children affected by the Syrian crisis, in order to overcome the negative impacts of conflict on education. Self-directed learning was a key feature of ELS in Sudan, and the evaluation of the programme suggested that it allowed for greater autonomy and pacing for learners, particularly benefiting those who were struggling (↑War Child Holland, et al., 2016). However, the evaluation also noted that, despite the self-directed nature of the mathematical game which allowed for children to take the tablet with them on the move, there were high levels of drop-outs and children leaving tablets behind. Assumptions should, therefore, not be made that autonomy and self-direction supports all marginalised children in emergency contexts.

## 3.7. Supporting education actors

Another prominent theme that emerged from the literature reviewed is the use of EdTech to support education systems during an emergency response.

### 3.7.1. Supporting educators: teacher training and development

Emergencies are known to cause shortfalls in quality teachers (↑Burde, et al., 2015). While evidence on the use of EdTech for teacher training and professional development is mostly centred on refugee contexts or LMICs,[12] several emergency context-specific examples emerged from the literature.

Available evidence mostly focuses on conflict, specifically protracted crisis contexts. IRC's Connect to Learn project, for example, was cited as a programme successfully using technology to support teacher development in Iraq (↑Dahya, 2016). Specifically, the Connect to Learn project drew on "ICT hardware and connectivity via a cloud-based server and the Internet. […] giving teachers access to resources to support teaching and learning with children affected by conflict" (↑Dahya, 2016, p.15). While evidence on this project is limited, Dahya (↑2016) suggested that Connect to Learn was viable in a context of a protracted crisis with existing institutional structures available to support education – raising a question about the possibility of similar programmes in more acute crisis settings.

Additionally, the Gender Socialization in Schools programme pilot (part of UNICEF's PBEA programme), implemented in Uganda, demonstrated how technology can support teachers upon completion of a training course in a post-conflict setting. Following a training of teachers on gender, conflict and peacebuilding, SMS was used to remind teachers on a bi-weekly basis about content covered during their training and to provide examples of good practice (↑Chinen & Elmeski, 2016). However, an evaluation of this pilot programme found that there was little evidence to confirm the positive complementary effects of the SMS text messaging component on teachers' attitudes or teaching practices (↑Chinen & Elmeski, 2016).

There is little evidence on the use of technology to support teacher training and development in other emergency contexts. A recent review of efforts to mitigate the negative impacts of past disease outbreaks (↑Hallgarten, 2020) found that there was no evidence on supporting teacher training and development during school closures and periods of disruption caused by epidemics. Furthermore, referencing Dahya (↑2016), Hallgarten (↑2020, p.10) stated that the transferability of technology-enabled teacher training

[12] There are additional, more substantive examples of remote teacher training and professional development in the RER on refugee education (see ↑Ashlee, et al., 2020).

programmes in conflict, such as IRC's Connect to Learn project, to contexts affected by epidemics is, at present, "speculative and untested".

In terms of disaster contexts, Carlson (↑2013) briefly discussed the example of continued professional development (CPD) course that was trialled in Haiti, a country frequently affected by disasters including earthquakes and hurricanes. The CPD course targeted school teachers in rural areas and each of the 32 participating schools received a Nokia phone provided with the open-source software, 'Nokia Education Delivery' (↑Carlson, 2013). A key point highlighted by Carlson (↑2013) was that prior knowledge or experience of technology can be a significant advantage for learners if EdTech is being used, and should be taken into account when developing CPD courses.

### 3.7.2. Practical support for teachers

The literature reviewed also provides examples of technology for practical support for educators. Morpeth et al. (↑2009, p.28), in their report on distance learning in settings affected by crisis and disasters, suggested that EdTech can support teaching in such contexts by providing "ready made educational resources [that] can be deployed in emergency areas or to untrained or under-trained teachers/mentors/carers working in severely under-resourced circumstances". A small mixed methods evaluation of the Rumie Tablet which showed how the use of the tablet with pre-loaded digital educational content led to positive outcomes for teachers in terms of their planning, range of teaching activities, and an improvement in their ability to "teach effectively" (↑Moon, et al., 2016, p.493).

Additionally, there are examples of mobiles being used to ensure teachers are paid during a time where they may be deterred from visiting banks or school offices as a result of hazards or safety and security risks (↑Dahya, 2016). Mobile technology – particularly SMS and Whatsapp – is also reportedly used by teachers to communicate with students and parents about homework, the content of lessons and other school matters (↑Alfarah & Bosco, 2016; ↑Morris & Farrell, 2020).

## 3.8. Supporting education actors and EiE responses

### 3.8.1. Coordination and support of EiE responses

The coordination of an EiE response is complex (↑Sommers & IIEP, 2004). The proliferation of different actors and the challenging and often volatile environments within which they must respond, are key challenges to the EiE sector. In conflict, there are often particular challenges and tensions between

different education actors, with Novelli et al. (↑2014, p.5) drawing attention to a "disconnect between actors in the humanitarian, development and security sectors, all of which have different approaches to the role of education".

While the literature does not specifically address the latter consideration in relation to technology, a prominent theme in the literature is the way in which technology can be used to support the coordination of education actors – including UN bodies, INGOs and state actors – in their education responses (↑Barry & Newby, 2012; ↑Dahya, 2016; ↑Alfarah & Bosco, 2016). Barry and Newby (↑2012) outlined various ways in which technology can help facilitate coordination of humanitarian actors, including: creating and updating stakeholders contact lists; developing capacity-building training; creating communities of practices that are held online; and improving the effectiveness of meetings and training of actors.

### 3.8.2. Data collection and planning

The way that technology can be used to support data collection and information management is particularly highlighted by the literature reviewed. This can happen at the individual institutional level, with schools using technology to collect data on and monitor students' performance (↑War Child Holland, et al., 2016; ↑Carlson, 2013; ↑Bird, 2009). Menendez et al. (↑2016) also emphasised the role of technology to support the monitoring of students participating in alternative education programmes in conflict-affected settings.

Technology supported data collection can also be used to inform wider policy-level educational planning (↑Bird, 2009; ↑Dahya, 2016; ↑Barry & Newby, 2012). For example, Barry and Newby (↑2012) highlighted how education actors can use SMS to collect data remotely to ascertain education needs in an emergency, or use mobiles to support in-person data collection. Technology can also be used to map education capacity and resources in specific emergency situations (↑Barry & Newby, 2012) and support the integration of national, regional and local information and data (↑Bird, 2009).

Importantly, Dahya (↑2016) cautioned that, as with any data stored online, there should be careful consideration as to how it is secured and protected. Safeguarding should be of paramount importance when designing data collection tools that store individual or institutional data given that, for example, there could be harmful unintended consequences of geo-mapping schools in situations where schools are a target of conflict (↑Dahya, 2016). Data on children could be misused "in politics, for capitalist economic gain, or outright exploited to pernicious ends" (↑Dahya, 2016, p.27). Data protection

and safeguarding must be held at the fore when considering the expansion of EdTech in emergencies.

### 3.8.3. Monitoring children's rights violations

A further use of monitoring specific to conflict settings is demonstrated by the Souktel programme in Palestine and Syria (↑Al Hamaydah, et al., 2015). This initiative involved an SMS alert system and trained teachers to recognise and report violations of children's rights, including the right to education, through a Monitoring and Reporting Mechanism. The system kept a record of violations that were then reported to the UN Security Council and can work as an advocacy and legal tool (↑Al Hamaydah, et al., 2015).

## 3.9. Child protection and psychosocial well-being

The final theme that emerged from this review is the use of EdTech to protect children from harm and support their psychosocial well-being.

### 3.9.1. Supporting the protection of children

One of the documented uses of EdTech in emergencies is mitigating the child protection risks associated with emergencies.

### 3.9.2. Mitigating risks during conflict

During the acute phase of a conflict, safety is the predominant concern and timely, accurate information can be lifesaving. In conflict settings more broadly, authorities use messaging systems to warn the population when an attack is taking place (↑Alfarah & Bosco, 2016). A similar SMS alert system at the school-level has been developed by Souktel and UNESCO. The project, first piloted in Gaza and then implemented in Syria, enabled predetermined school personnel to warn parents and students via SMS about dangers occurring in the vicinity of the school, as well as alerting the authorities and emergency services (↑Al Hamaydah, et al., 2015; ↑Burde, et al., 2015). In a review of the programme in Gaza, Al Hamaydah et al. (↑2015, p.30) noted that the SMS alert system had led to three successful school evacuations in situations of armed conflict.

There are, however, several documented challenges related to this SMS alert system. Firstly, the use of encryption, while necessary in order to protect the system from being hijacked (↑Dahya, 2016), meant schools needed trained personnel who could use the system. High staff turnover was, therefore, found to be a challenge to the effective functioning of the project (↑Al Hamaydah, et

al., 2015). Another underlying challenge reported was unreliable electricity and fuel shortages which resulted in difficulties using the internet and computers necessary to access parents' telephone numbers (↑Al Hamaydah, et al., 2015).

Barry and Newby (↑2012) referenced Frontline SMS – an open source system – as an alternative to UNESCO and Souktel's SMS alert system which can be accessed offline. Other benefits of Frontline SMS tentatively highlighted by Barry and Newby (↑2012) included the ease of setting up the initiative, as well as its cost-effectiveness (↑Barry & Newby, 2012). However, the authors noted that without robust data, the benefits of this system to communities remain unclear.

### 3.9.3. Disaster preparedness

Literature on the use of EdTech in disaster-prone areas identified by this RER centres on supporting children's understanding of risks in their community or country, with several studies in Indonesia (↑Sejati, et al., 2019; ↑Winarni, et al., 2018; ↑Robiansyah, et al., 2019; ↑Winarni & Purwandari, 2018). The literature suggests that schools provide a critical opportunity to encourage children's participation and learning about disaster risks, and that technology-enhanced education about disaster risk is an effective participatory and student-centred learning method (↑Sejati, et al., 2019; ↑Winarni, et al., 2018; ↑Robiansyah, et al., 2019). The projects reviewed in this literature used games, mobile applications, animations and videos to educate children about risks of disasters.

A particular benefit of using EdTech for disaster preparedness noted in the literature is its ability to clearly and visually illustrate to children, through the use of multimedia and animations, what they should do if a disaster hits. This was found to be beneficial for students' understanding of disaster risks (↑Sejati, et al., 2019). The use of digital games was discussed as particularly promising by Winarni et al. (↑2018), although detail behind why this modality is promising was limited.

One paper also suggested that using EdTech can have particular learning benefits for children with disabilities who may need adapted educational content. Robiansyah et al. (↑2019) presented findings of research on the use of a video game on flood risks with children with hearing impairments in Indonesia. The authors concluded that children responded well to this form of learning and were able to grasp core concepts on flood risks perhaps not available through some other teaching methods. However, Winarni and Purwandari (↑2018) identified key challenges with using EdTech for disaster preparedness. These included the costly and time-consuming nature of

developing mobile applications and visuals that are realistic enough to enable meaningful learning about disaster risks and response.

### 3.9.4. Protecting from negative coping strategies

Technology, through keeping children engaged in education and learning, can also play a role in mitigating against negative coping strategies that children or their families employ in times of emergency and crisis when out of school – including early marriage, child labour, illegal activities or being recruited by armed actors and militias (↑Tauson & Stannard, 2018; ↑Kumar, et al., 2017; ↑Gladwell & Tanner, 2014). However, according to Tauson and Stannard (↑2018), in order for this to be effective and for children to fully engage with education, emergency-affected communities must feel EdTech is a viable modality for delivering education.

## 3.10. Psychosocial well-being

### 3.10.1. EdTech with psychosocial well-being goals

Supporting the long term psychosocial well-being of children and young people affected by emergencies is important, and is often a key priority of EiE interventions (↑Burde, et al., 2015). Tauson and Stannard (↑2018) argued that it should also be a core focus of EdTech. Unwin et al. (↑2017) found that digital trauma counselling for children living in war zones or disaster-affected areas is becoming increasingly prevalent. However, this RER did not identify any additional evidence of this, and the wider evidence base on EdTech use supporting children's psychosocial well-being is scarce.

However, an Arabic-language version of the Sesame Street television show, 'Ahlan Simsin', has been especially adapted for children affected by the Syrian conflict and crisis and intentionally seeks to support children's socio-emotional learning and psychosocial well-being. ↑Kohn, et al.,(2020) presented findings of research on the socio-emotional needs of Syrian children in their article, which were noted to have directly informed the design of Sesame Workshop and International Rescue Committee's 'Ahlan Simsim' television show. However, lessons learnt from the implementation of this television show are not yet available as it only started to air in February 2020.[13]

[13] A separate RER on TV, however, shows that television does have potential for positive impact, although the focus of this RER is broader than emergency contexts (↑Watson & McIntyre, 2020).

### 3.10.2. Indirect support to psychosocial well-being

There is also limited evidence that EdTech can indirectly support psychosocial well-being. Carlson (↑2013) argued that engaging with EdTech in and of itself can be a "positive and worthy experience, particularly if it promotes human connections and community-building" (↑Carlson, 2013, p.i). Supporting this, Morris and Farrell (↑2020) found that SMS and Whatsapp are often used as a way for students to remain connected with their peers when schools close.

Evidence on ELS illustrates how EdTech can lead to positive psychosocial well-being outcomes. The evaluation of ELS found that children who engaged with the mathematical game experienced a significant positive effect on their self-esteem (↑War Child Holland, et al., 2016). The authors of the evaluation noted that the causes of this improved self-esteem were unclear; while linked to improved learning outcomes in mathematics, they were unable to denote causality.

## 3.11. Synthesis

### 3.11.1. Facilitating access to education and learning

Available evidence examined by this RER suggests that EdTech may have the potential to enhance access education for students unable to attend school during emergencies, including as a result of school closures and safety and security risks. Radio has been particularly leveraged during emergencies and is often regarded as a suitable modality to respond to the severe disruption caused by the onset of a conflict, disease outbreak or disaster. Other forms of technology, including mobiles, computers, TVs and laptops, are reportedly used in emergencies but there is less evidence on their impact. Tablets, however, with preloaded educational content and materials, have been used in a protracted crisis setting (Sudan) and in an epidemic setting (Liberia), with evidence suggesting they did enable access to education otherwise not available to children at the time.

Evidence from the use of EdTech in Sierra Leone after the Ebola outbreak demonstrates how EdTech can support children's return to school once schools reopen in the aftermath of an emergency. Providing communication with families, parents and students about the importance of returning to school when it is safe to do so is recognised as a key benefit of technology in this regard.

In some cases, EdTech facilitates greater gender equity in access to education, counteracting embedded inequalities in society. However, it should not be

assumed that this occurs in all cases: evidence from an educational radio programme in Sierra Leone found that, when faced with increased household responsibilities in the aftermath of the Ebola epidemic, girls particularly experienced inequitable access to technology and education in times of crisis, widening existing educational divides.

In order for EdTech to allow sustained access to education in times of emergency, it is critical that interventions consider longer-term cost implications and are based on the reality of existing infrastructure. It is also important that adequate resources are provided to support educators to meet a potentially increased demand in enrolment in education enabled by technology.

### 3.11.2. Educational content and pedagogy

In order to facilitate positive learning outcomes and education experiences for children affected by emergencies, the content and pedagogical approaches of technology-enabled education is critical. Several reports emphasised the importance of ensuring that content is aligned to local curricula and delivered in local languages for educational continuity. However, this RER identified limited evidence on EdTech initiatives successfully achieving this.

Community participation, namely from community leaders, local organisations and children, in the design and delivery of EdTech initiatives is recognised as a critical factor for ensuring positive learning outcomes for children. This becomes particularly important in times of conflict: contextualised and sensitive education is key in ensuring that education acts as a peacebuilder rather than an exacerbator of conflict. However, one study also warns that community participation has, in the past, had the unintended effect of exacerbating political and social tensions.

Blended learning approaches that promote connections and interactions between students, their peers and teachers are widely argued to promote positive learning outcomes for children. The self-directed nature of many EdTech initiatives can also benefit learners in emergencies, allowing for greater autonomy in how they explore subjects and at what pace. To facilitate successful blended and self-directed learning, however, teachers must be willing and able to navigate and use EdTech. But this is not always possible, and the literature emphasises that EdTech should not cause additional stress for teachers already negatively impacted by an ongoing emergency.

### 3.11.3. Supporting education actors

EdTech can play a role in supporting education actors during emergencies. Firstly, technology can support teacher development during emergencies, helping them with the continual improvement of their teaching practices through providing access to digital training materials and good practice examples. Technology can also be used to provide practical support for teachers, from supporting payments to providing ready-made and adaptable educational materials that can be delivered during their lessons. However, the available evidence on supporting teachers and educators is limited to conflict contexts, particularly protracted and post-conflict settings with available infrastructure, with limited evidence on the transferability of such programmes to acute conflict, epidemic or disaster settings.

Technology can also support a broader range of education actors during emergencies and be used to help improve overall coordination. Technology-enabled data collection can also inform institutional-level monitoring of students' performance and progress, as well as shape wider educational policy planning and identification of key education needs during crises. However, it is critical to pay attention to safeguarding risks when storing data on children online, particularly in conflict settings.

### 3.11.4. Protection and well-being

Technology has the potential to play an important role in supporting the protection of children from the threats resulting from an emergency. The use of SMS to rapidly warn teachers, parents, students and authorities of conflict risks in the vicinity of a school is reported to play an important role in keeping children safe. There is also evidence to suggest that, in making education more accessible to children, technology can mitigate against negative coping strategies that families may impose when children are out of school, including early marriage and engagement in armed conflict. EdTech can also support children's preparedness for emergencies in areas prone to natural disasters, through supporting children's learning about natural hazards and their risks through online and interactive methods.

Supporting the psychosocial well-being of children affected by emergencies is also a critical function of EiE responses. EdTech can directly support well-being, with some projects embedding well-being outcomes into the project design and activities. EdTech can also indirectly support well-being,

particularly if it allows children to connect with their peers and teachers when schools are shut and enhances confidence and self-esteem.

# 4. Annex A: Bibliography

**Denotes the final studies examined as part of the RER.*


*Alfarah, M. & Bosco MA. (2016). *The Role Of Icts In Rebuilding Education In Areas Of Armed Conflicts: The Syrian Case*. Autonomous University of Barcelona. Available at: http://dx.doi.org/10.21125/edulearn.2016.0359 [Accessed 09 September 2020].

*Al Hamaydah, B, Kelcey, J, & Lloveras FJ. (2015). *Palestine: Lessons from UNESCO's crisis–disaster risk reduction programme in Gaza.* UNESCO-IIEP. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000234791 [Accessed 4 September 2020].

*Almasri, N, Tahat, L, Skaf, S, & Al Masri, A. (2019). A digital platform for supervised self-directed learning in emergencies: the case of the Syrian crisis, *Technology, Pedagogy and Education*, 28:1, pp. 91-113. Available at: https://doi.org/10.1080/1475939X.2019.1568293 [Accessed 9 September 2020].

Ashlee, A, Clericetti, G & Mitchell, J. (2020). *Rapid Evidence Review: Refugee Education*. EdTech Hub. Available at: https://edtechhub.org/rapid-evidence-review-refugee-education/ [Accessed 4 September 2020].

*Barnett, S, Amara, T, Swaray, A, van Dijk, J, & Young, P. (2018). Redesigning an education project for child friendly radio: a multisectoral collaboration to promote children's health, education, and human rights after a humanitarian crisis in Sierra Leone. *BMJ,* 363. Available at: https://doi.org/10.1136/bmj.k4667 [Accessed 4 September 2020].

*Barry, B, & Newby, L. (2012). *Use of Technology in Emergency and Post-Crisis Situations*. Global Education Cluster Working Group and IIEP-UNESCO. Available at: https://www.eccnetwork.net/sites/default/files/media/file/Technology-in-Emergencies-_-Post-Crises.pdf [Accessed 4 September 2020].

*Baytiyeh, H. (2019). *Mobile Learning Technologies as a Means of Maintaining Education Delivery In Crisis Situations.* International Journal of Information and Communication Technology Education (IJICTE). Available at: www.igi-global.com/article/mobile-learning-technologies-as-a-means-of-

maintaining-education-delivery-in-crisis-situations/229014 [Accessed 4 September 2020].

*Bird, L. (2009). *Promoting resilience: Developing capacity within education systems affected by conflict: Think piece commissioned for the EFA Global Monitoring Report 2011, The hidden crisis: Armed conflict and education.* UNESCO. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000191302 [Accessed 4 September 2020].

*Burde, D, Guven, O, Kelcey, J, Lahmann, H, & Al-Abbadi, K. (2015). *What Works to Promote Children's Educational Access, Quality of Learning, and Well-being in Crisis-Affected Contexts.* Department for International Development. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/470773/Education-emergencies-rigorous-review2.pdf [Accessed 4 September 2020].

Bush, KD, & Saltarelli, D. (2000). *The two faces of education in ethnic conflict: Towards a peacebuilding education for children.* UNICEF Innocenti Research Centre. Available at: https://www.unicef-irc.org/publications/pdf/insight4.pdf [Accessed 09 September 2020].

*Carlson, S. (2013). *Using technology to deliver educational services to children and youth in environments affected by crisis and/or conflict.* USAID. Available at: https://www.usaid.gov/sites/default/files/documents/2155/ICTs%20in%20Conflict%20Compendium%20FINAL.pdf [Accessed 4 September 2020].

*Chinen, M, & Elmeski, M. (2016). *Evaluation of the Transformative Potential of Positive Gender Socialization in Education for Peacebuilding.* American Institute for Research (AIR). Available at: https://www.air.org/sites/default/files/downloads/report/Evaluation-Transformative-Potential-Positive-Gender-Socialization-Peace-Building-May-2016.pdf [Accessed 4 September 2020].

*Dahya, N. (2016). *Landscape Review: Education in Conflict and Crisis: How Can Technology Make a Difference?* INEE. Available at:

https://educationinnovations.org/sites/default/files/20160315_landscape_review_ict4e_in_conflict_and_crisis.pdf [Accessed 4 September 2020]

Damani, K, & Mitchell, J. (2020). *Radio: Rapid Evidence Review.* EdTechHub. 10.5281/zenodo.3948149

Damani, K. (2020). *Alternative Learning Programmes: Rapid Evidence Review.* EdTech Hub. [Forthcoming].

Daudt, HML, van Mossel, C, & Scott, SJ. (2013). Enhancing the scoping study methodology: A large, inter-professional team's experience with Arksey and O'Malley's framework. *BMC Medical Research Methodology*, 13(48). Available at: https://doi.org/10.1186/1471-2288-13-48 [Accessed 9 September 2020].

Garritty C, Gartlehner G, Kamel C, King VJ, Nussbaumer-Streit B, Stevens A, Hamel C, & Affengruber L. (2020). *Cochrane Rapid Reviews. Interim Guidance from the Cochrane Rapid Reviews Methods Group.* Cochrane. Available at: https://covidrapidreviews.cochrane.org/sites/covidrapidreviews.cochrane.org/files/public/uploads/cochrane_rr_-_guidance-23mar2020-final.pdf [Accessed 4 September 2020].

Gladwell, C, & Tanner, L. (2014). *Hear it from the Children: why education in emergencies is critical.* Save the Children UK & Norwegian Refugee Council. Available at: https://www.nrc.no/resources/reports/hear-it-from-the-children---why-education-in-emergencies-is-critical/#:~:text=Hear%20it%20from%20the%20Children%3A%20Why%20Education%20in%20Emergencies%20is%20Critical,-NRC%20and%20Save&text=The%20findings%20underline%20the%20importance,and%20hope%20for%20the%20future [Accessed 9 September 2020].

GCPEA. (2020). *Education Under Attack: A global study of attacks on schools, universities, their students and staff, 2017-2019*. Global Coalition to Protect Children from Attack. Available at: https://eua2020.protectingeducation.org/ [Accessed 9 September 2020].

*Hallgarten, J. (2020). *Evidence on Efforts to Mitigate the Negative Educational Impact of Past Disease Outbreaks: K4D Helpdesk report.* Education Development Trust. Available at: https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/15202

/793_mitigating_education_effects_of_disease_outbreaks.pdf [Accessed 9 September 2020].

*Hallgarten, J, Gorgen, K, & Sims, K. (2020). *Overview of emerging country-level response to providing educational continuity under COVID-19: What are the lessons learned from supporting education in conflicts and emergencies that could be relevant for EdTech-related responses to COVID19?* Education Development Trust. Available at: https://edtechhub.org/wp-content/uploads/2020/05/supporting-education-conflict.pdf [Accessed 10 September 2020].

INEE. (2012). Minimum Standards for Education: Preparedness, Response and Recovery. INEE. Available at: https://inee.org/system/files/resources/INEE_Minimum_Standards_Handbook_2010%28HSP%29_EN.pdf [Accessed 9 September 2020].

*Dyson, M, & Amara, PS. (2017). Final Evaluation Report: Increasing Access, Retention and Performance in Primary Education. Institute for Development. Available at: http://www.childtochild.org.uk/documents/final-evaluation-pikin-to-pikin-tok-project-sierra-leone/ [Accessed 20 September 2020].

*Kohn, S, Foulds, K, Murphy, KM, & Cole, CF. (2020). Creating a sesame street for the syrian response region: How media can help address the social and emotional needs of children affected by conflict. *YC Young Children,* 75(1), pp. 32-37, 39-41. Available at: https://search.proquest.com/docview/2374115356?accountid=11862 [Accessed 28 September 2020].

*Kumar, H, Gupta, MP, Singh, MK, & Madaan, J. (2017). Education in emergencies: Smart learning solutions and role of governance to mitigate the challenges. In 2017 *3rd International Conference on Advances in Computing,Communication Automation (ICACCA) (Fall)*, pp.1–6. Available at: https://doi.org/10/ggtbq6 [Accessed 9 September 2020].

Lederach, JP. (1997). Building Peace: Sustainable Reconciliation in Divided Societies. United States Institute of Peace Press.

Levac, D, Colquhoun, H, & O'Brien, KK. (2010). Scoping studies: Advancing the methodology. *Implementation Science*, 5(69). Available at: https://doi.org/10.1186/1748-5908-5-69 [Accessed 9 September 2020].

Lewis, K, & Thacker, K. (2016). *ICT and the Education of Refugees: A Stocktaking of Innovative Approaches in the MENA Region: World Bank Education, Technology & Innovation: SABER-ICT Technical Paper Series 17.* World Bank. Available at: https://openknowledge.worldbank.org/handle/10986/26522 [Accessed 9 September 2020].

*Menendez, AS, Ramesh, A, Baxter, P, & North, L. (2016). *Accelerated Education Programs in crisis and conflict Building evidence and learning, The Pearson Institute Discussion Paper No. 36.* The Pearson Institute. Available at: https://thepearsoninstitute.org/sites/default/files/2017-02/36.%20Menendez_Accelerated%20Education%20Programs_2.pdf [Accessed 9 September 2020].

*Moon, C. J, Kavanagh, A, Jeffrey, J, Gebbels, J, & Korsgaard, K. (2016). Social enterprise and disruption innovation: evaluating the role of Rumie's free educational software in seven developing economies. *11th European Conference on Innovation and Entrepreneurship (ECIE 2016),* University of Applied Science, Jyväskylä, Finland. Available at: https://eprints.mdx.ac.uk/21786/1/ECIE2016-Proceedings_SocialEntrepreneurshipAndDisruptiveInnovation.pdf [Accessed 9 September 2020].

*Morpeth, R, Creed, C, Cullen, J, Page, E, & Raynor, J. (2009). *Open and distance learning for basic education in South Asia: its potential for hard to reach children and children in conflict and disaster areas*. UNICEF. Available at: http://oro.open.ac.uk/25572/1/ODL_for_Hard_to_Reach_Children_Main__Report_.pdf [Accessed 9 September 2020].

*Morris, E, & Farrell, A. (2020). *Delivering Distance Learning In Emergencies: A Review Of Evidence And Best Practice*. USAID. Available at: https://www.edu-links.org/resources/delivering-distance-learning-emergencies [Accessed 28 September 2020].

Nicolai, S, & Hine, S. (2015). *Investment for education in emergencies: A review of evidence*. Overseas Development Institute. Available at: https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9450.pdf [Accessed 20 September 2020].

Novelli, M, Higgins, S, Ugur, M, & Valiente, O. (2014). *The political economy of education systems in conflict-affected contexts: A rigorous literature review*. Department for International Development. Available at: https://eprints.gla.ac.uk/101648/1/101648.pdf [Accessed 9 September 2020].

Novelli, M. (2016). *Public Private Partnerships in Education in Crisis and Conflict Affected Contexts: A Framing Paper*. Prepared for the Roundtable on Public Private Partnerships in Education in Crisis and Conflict Affected Contexts. Open Society Foundations. Available at: https://s3.amazonaws.com/inee-assets/page-images/OSF-INEE_PPP-roundtable_framing-paper_Novelli_crisis-contexts.pdf [Accessed 20 September 2020].

Pherali, T. (2016). *Education: Cultural reproduction, revolution and peacebuilding in conflict-affected societies*. In The Palgrave Handbook of Disciplinary and Regional Approaches to Peace, pp. 193-205. Palgrave Macmillan.

*Robiansyah, IE, Mudjito, Yuliyati, & Atiqoh. (2019). *Developing Interactive Multimedia Flood Prevention Education (FPE) on Disaster Risk Reduction Learning for Students with Hearing Impairment in Special School*. 2019 5th International Conference on Education and Technology (ICET), pp. 135–138. Available at: https://doi.org/10.1109/ICET48172.2019.8987227 [Accessed 9 September 2020].

*Rush, Stephen C, Wheeler, JS, & Partridge, A. (2014). A Proposed Template for an Emergency Online School Professional Training Curriculum. *Contemporary School Psychology,* 18, pp. 143–156. Available at: https://doi.org/10.1007/s40688-014-0015-9 [Accessed 20 September 2020].

*Sejati, PM, Budiningsih, CA, & Pujianto. (2019). Multimedia in Disaster Risk Reduction. *Journal of Physics: Conference Series, 1233*. Available at: https://doi.org/10.1088%2F1742-6596%2F1233%2F1%2F012090 [Accessed 20 September 2020].

Shah, R, Maber, E, Cardozo, ML, & Paterson, R. (2016). *Peacebuilding, Education and Advocacy in Conflict-Affected Contexts Programme. UNICEF Programme Report 2012-2016.* UNICEF. Available at: https://eric.ed.gov/?id=ED573879 [Accessed 28 September 2020].

Sommers, M, & IIEP. (2014). *Co-ordinating education during emergencies and reconstruction: challenges and responsibilities.* UNESCO-IIEP.

Available at: https://files.eric.ed.gov/fulltext/ED495398.pdf [Accessed 28 September 2020].

*Tauson, M, & Stannard, L. (2018). *EdTech for learning in emergencies and displaced settings: a rigorous review and narrative synthesis*. Save the Children. Available at: https://www.savethechildren.org.uk/content/dam/global/reports/education-and-child-protection/edtech-learning.pdf [Accessed 9 September 2020].

Trucano, M. (2020). How ministries of education work with mobile operators, telecom providers, ISPs and others to increase access to digital resources during COVID19-driven school closures [blog]. World Bank. Available at: https://blogs.worldbank.org/education/how-ministries-education-work-mobile-operators-telecom-providers-isps-and-others-increase [Accessed 28 September 2020].

UNICEF. (2018). *A Future Stolen: Young and out of school.* UNICEF. Available at: https://data.unicef.org/resources/a-future-stolen/ [Accessed 28 September 2020].

UNICEF. (2019). *Evaluation of the UNICEF Response to the Humanitarian Crisis in South Sudan: Part 1: Child survival – WASH, health, nutrition and related issues.* UNICEF. Available at: https://www.unicef.org/evaldatabase/files/UNICEF-South_Sudan-Report_web.pdf [Accessed 28 September 2020].

*Unwin, T, Weber, M, Brugha, M and Hollow, D. (2017). *The future of learning and technology in deprived contexts*. Save the Children. Available at: https://resourcecentre.savethechildren.net/node/13074/pdf/the_future_of_learning_and_technology.pdf [Accessed 9 September 2020].

*Walker, D, Tristram, B, Pereznieto, P, & Young, T. (2015). Child-centred Educational Radio Project in Kailahun District, Sierra Leone. United Nations Girls Education Initiative. Available at: http://www.childtochild.org.uk/wp-content/uploads/2016/07/CTC_ODI-UNGEI-Final.pdf [Accessed 28 September 2020].

*War Child Holland, Ahfad University for Women & TNO, (2016) Research Report for Phases I and II e-Learning Sudan (2012 – 2015). War Child

Holland. Available at: https://www.warchildholland.org/projects/cwtl/report-e-learning-sudan/ [Accessed 9 September 2020].

Watson, J, & McIntyre, N. (2020). *Educational Television: Rapid Evidence Review.* EdTechHub. 10.5281/zenodo.3956366

Webb, D, Barringer, K, Torrance, R, & Mitchell, J. (2020). *Girls' Education Rapid Evidence Review.* EdTechHub. 10.5281/zenodo.3958002

*Winarni, EW, Purwandari, EP & Hervianti, Y. (2018). Mobile Educational Game for Earthquake Disaster Preparedness in Elementary School. *ARPN Journal of Engineering and Applied Sciences,* 13(7), pp.2612-2618. Available at: http://archive.sciendo.com/MJSS/mjss.2018.9.issue-2/mjss-2018-0040/mjss-2018-0040.pdf [Accessed 9 September 2020].

*Winarni, EW, & Purwandare, EP. (2018). Disaster Risk Reduction for Earthquake Using Mobile Learning Application to Improve the Students Understanding in Elementary School. *Mediterranean Journal of Social Sciences,* 9(2), pp.205-214. Available at: https://www.researchgate.net/publication/324818178_Mobile_educational_game_for_earthquake_disaster_preparedness_in_elementary_school [Accessed 9 September 2020].

Winthrop, R. (2020). COVID-19 and school closures: What can countries learn from past emergencies? [blog]. Brookings. Available at: https://www.brookings.edu/research/covid-19-and-school-closures-what-can-countries-learn-from-past-emergencies/ [Accessed 28 September 2020].

# 5. Annex B: Search Terms

| Search strings | Terms searched in combination with others |
|---|---|
| EdTech-related terms | EdTech, education technology, educational technology, ICT, digital learning |
| Emergency-related terms | Conflict, crisis, emergencies, war, disaster, natural disaster, natural hazard, epidemic, pandemic, earthquake, tsunami, virus |
| Education-related terms | Education, school, school closure, emergency online schools, higher education, disaster education, university |
| Specific countries searched | Syria, Yemen, DRC, Haiti, Nepal |
| Specific emergencies searched | Ebola, cyclone idai, typhoon haiyan, cholera |