What Works Hub for Global Education

Synthesis brief

Education system resilience: An evidence synthesis on supporting foundational learning amid disruptions

Heather Leigh Kayton and Michelle Kaffenberger

November 2026

BLAVATNIK SCHOOL OF GOVERNMENT
UNIVERSITY OF OXFORD

UK International Development
Partnership | Progress | Prosperity

Education system resilience:
An evidence synthesis on supporting foundational learning amid disruptions

Heather Leigh Kayton
What Works Hub for Global Education
heather.kayton@bsg.ox.ac.uk

Michelle Kaffenberger
What Works Hub for Global Education
michelle.kaffenberger@bsg.ox.ac.uk

Acknowledgements

Madhuri Agarwal for contributions to earlier versions of this brief and for support with the review of the literature.

Disclosure

AI tools (Claude Opus 4.8, Anthropic) were used to assist with the preparation of figures and tables; all outputs were refined, validated and checked for accuracy by the authors.

Citation

Kayton, H.L. & Kaffenberger, M. (2026). *Education system resilience: An evidence synthesis on supporting foundational learning amid disruptions*. What Works Hub for Global Education. https://doi.org/10.35489/BSG-WhatWorksHubforGlobalEducation-RP_2026/003

What Works Hub for Global Education

The What Works Hub for Global Education is an international partnership, funded by the UK government's Foreign, Commonwealth & Development Office and the Gates Foundation, working out how to effectively implement education reforms at scale.

This work is available under the Creative Commons Attribution 4.0 International Public License.

The findings, interpretations, and conclusions expressed in this document are those of the authors and do not necessarily represent those of the What Works Hub for Global Education, its funders or the authors' respective organisations.

Contents

Introduction 4

Scope and evidence base 7

Summary of sources of evidence on learning drawn on in this synthesis 9

Supporting foundational learning during school closures 10

Key findings 10

Remote tutoring maintains children's learning when it is targeted to children's learning levels and includes regular two-way interaction between tutors and students 12

Government teachers can provide remote tutoring with effectiveness similar to that demonstrated by NGO facilitators 14

Targeted instruction and two-way interaction can be provided through messaging platforms like WhatsApp 15

In-person interaction is often needed for supporting children in the poorest households and in rural areas 17

Materials or content delivered without targeting to children's learning level typically do not improve learning, even when paired with teacher phone calls 19

While distributing materials that are aligned to the curriculum seems like a practical solution during school closures, it typically does not improve learning outcomes 21

Box 1: Ensuring equity in learning during disruptions to schooling 22

Recovering foundational learning after schools reopen 23

Key findings 24

Remediation programmes support learning recovery when they provide additional time focused on foundational skills, and use structured content targeted to children's learning levels 24

Supplementing classroom instruction with technology-based tutoring can support learning recovery 28

Learning recovery programmes only benefit children who participate, and high participation rates require deliberate strategies to address barriers to attendance 29

Social-emotional learning interventions can strengthen the conditions that support learning for children in crisis-affected contexts 30

Prioritising foundational learning as a basis for building education system resilience 32

Appendix 35

Summary of studies reviewed in this synthesis 35

References 44

Introduction

In low- and middle-income countries, decades of progress in expanding access to schooling has not yet translated into consistent progress in foundational learning for all children. In many countries, the majority of children are not acquiring foundational reading and mathematics skills, even when they are in school (UNICEF, 2025; World Bank & UIS, 2022). Disruptions to schooling compound this problem: evidence from recent shocks demonstrates not only that children learn little during school closures, but also that for many their learning regresses. Skills children had previously acquired are often lost when their schooling is disrupted, and these losses can persist long after schools reopen if they are not addressed deliberately.

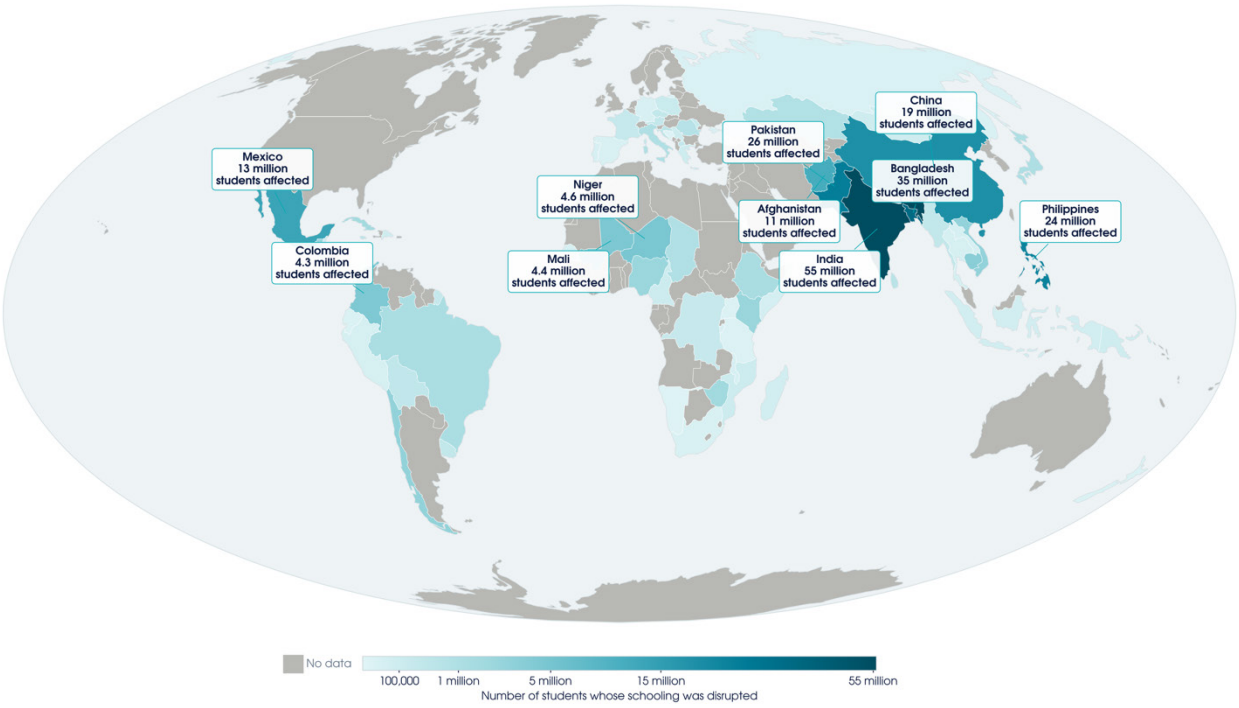
In Pakistan, the 2005 earthquake significantly reduced the reading and mathematics scores of children in affected areas relative to unaffected children, with losses still detectable years later (Andrabi et al., 2023). Evidence from the COVID-19 pandemic demonstrated this across a wide range of contexts: across countries, learning losses were closely tied to the duration of school closures, with evidence suggesting that for every week schools remained closed, learning declined measurably (Patrinos et al., 2023).

Added to this, schools in developing countries closed for twice as long in response to the COVID-19 pandemic as those in developed countries on average, meaning the burden of these losses fell disproportionately on the children and systems least equipped to recover (Dela Cruz et al., 2025). In South Africa, grade 2 students lost 50–70% of a year's learning in reading during school closures, even though schools were only closed for half of the school year (Ardington et al., 2021). Modelling of the cumulative effects of such losses suggests that even modest annual disruptions to learning, when unaddressed, translate into substantial deficits in foundational skills by the time children reach the end of primary school (Kaffenberger, 2021).

Climate change is increasing the frequency and severity of disruptions to schooling, and many of the consequences of these disruptions fall hardest on the countries where learning is already most at risk. Floods, cyclones, storms, wildfires and heatwaves are forcing sudden school closures that remove children from learning for days, weeks or longer with increasing regularity. The population affected by climate shocks has more than doubled over the past 40 years (Sabarwal et al., 2024); and data across 29 countries shows that most countries experienced more climate-related school closures every year between 2005 and 2023 (Angrist, Ainomugisha, et al., 2026).

In 2024 alone, climate-related events disrupted the schooling of at least 242 million students across 85 countries (UNICEF, 2025).[1] As Figure 1 shows, this disruption was not evenly distributed across countries, with a small number of countries accounting for the vast majority of students affected.

Figure 1: Number of students whose schooling was disrupted by climate-related events in 2024 by country



Source: (UNICEF, 2025)

Notes: 1. Data are shown for 85 countries, covering a total of 242 million students whose schooling was disrupted by climate-related events in 2024. 2. The ten countries with the highest number of affected students are labelled directly on the map.

The impact of these disruptions fell disproportionately on low- and lower-middle-income countries, which accounted for 74% of affected students**.** These are typically the same countries where the majority of children have not yet acquired foundational learning skills, and where the learning losses that disruptions cause are hardest to recover.

1 These figures capture only disruptions directly attributed to climate events and reported through official channels, which means the true scale of the impact is likely larger. Moreover, these figures are likely to understate the true scale of disruption, as the data systems needed to monitor and report climate-related school closures are still developing across many low- and middle-income countries (Yao et al., 2025).

The duration of climate-related disruptions compounds this disparity: between 2022 and 2024, schools in low-income countries lost an average of 45 instructional days as a result of extreme weather events, compared to 6 days in high-income countries (Sabarwal et al., 2024). For children whose foundational learning was already fragile, disruptions cause lost instructional time and lost learning that is unlikely to be recovered without deliberate effort.

Acute shocks that force sudden school closures are only one dimension of the problem. Chronic stressors from rising temperatures, drought, food insecurity, forced migration, disruptions to agricultural calendars, as well as ongoing conflict and insecurity affect children's learning, even when schools are open and no formal emergency has been declared. Rising temperatures reduce children's capacity to concentrate and to retain information, with effects that accumulate across months of heat exposure and are reflected in learning outcomes over time (Vasilakopoulou & Santamouris, 2025). In India, ten additional days above 29°C in the previous year were associated with measurable reductions in children's foundational reading and mathematics scores the following year (Garg et al., 2020). In Brazil, the cumulative effect of rising temperatures is estimated to cost students in the poorest municipalities up to half a year of learning (Sabarwal et al., 2024).

Drought can compound these effects: disruptions to agriculture and income make it harder for families to keep children in school, while food insecurity and household stress undermine the ability of children who do attend to meaningfully engage with learning (Ameer & Ghannam, 2025). In conflict-affected contexts, forced migration and ongoing insecurity layer further disruption onto already strained systems, constraining the conditions for learning even when schools remain open (UNICEF, 2025). Moreover, these ongoing and often chronic stressors are less likely to trigger coordinated responses than acute shocks, and their effects on foundational learning are correspondingly less likely to be addressed.

Internationally, a substantial architecture has developed to support education through crises. Global structures dedicated to education in emergencies, such as the Education Cannot Wait fund and the Inter-agency Network for Education in Emergencies, help to coordinate action, mobilise resources and support the continuity of learning across a range of crisis-affected contexts. Increasingly, this includes attention not only to responding when disruption strikes, but to strengthening the capacity of education systems to withstand it.

The scale and nature of schooling disruptions make the question of how education systems can support and recover foundational learning more urgent than ever. Disruptions do not arrive in a vacuum: they often land on systems where most children are already not acquiring foundational skills effectively. Building education system resilience to disruptions is therefore critical for addressing the broader learning crisis as well. Foundational learning and climate resilience are therefore not parallel agendas: progress on one depends increasingly on progress on the other (Gremley, 2025). This synthesis draws on evidence on how to maintain foundational learning during school closures and how to support learning recovery after schools reopen, and considers how education systems can be better prepared for supporting learning amid disruptions.

Scope and evidence base

This synthesis focuses on foundational reading and mathematics outcomes for primary-aged children in low- and middle-income countries. The synthesis addresses two related challenges that education systems face when disruptions occur. The first is maintaining foundational learning progress while schools are closed, preventing losses from accumulating during the closure period. The second is supporting children to recover lost learning once schools reopen, ensuring that gaps do not widen further as grade-level instruction moves on.

The synthesis focuses primarily on evidence from low- and middle-income countries[2] and prioritises studies that measured learning outcomes, with a focus on foundational reading and mathematics. Where available, experimental and quasi-experimental evidence, including randomised controlled trials and robust quasi-experimental designs, is prioritised for assessing the effectiveness of interventions for supporting or recovering foundational learning. Descriptive studies, programme evaluations, and organisational reports are drawn on to illustrate implementation approaches and adaptations made during disruptions, particularly in contexts or situations where experimental evidence on learning outcomes was limited.

Studies were identified through searches of Google Scholar using key terms related to learning continuity, learning recovery and foundational learning in crisis and emergency contexts, and through backward and forward citation tracing. Initial searches for evidence on learning during and after school closures returned evidence predominantly from COVID-19 contexts, reflecting where most published research has been conducted. Targeted searches were subsequently conducted to identify interventions specifically implemented during climate-related school closures, including searches of grey literature and programme documentation for evidence from identified climate-related events. These searches yielded limited evidence, indicating that very few rigorous evaluations of foundational learning interventions specifically triggered by climate-related events are available in the published literature.

2 A small number of studies from higher-income contexts are included where they provide relevant evidence on equity dimensions of remote learning interventions that is not available from the low- and middle-income evidence base; these are noted where they appear.

A rigorous review of education interventions in crisis-affected contexts conducted by Burde et al. (2015) found almost no experimental or quasi-experimental research from climate-related disaster settings. A more recent review by Pacitto et al. (2026) of remote teaching and learning in emergencies confirms that this picture has not substantially changed: of 50 sources reviewed, 82% focused on the COVID-19 pandemic and only two related to climate or natural disasters. Even within these 50 sources, evidence directly relevant to foundational learning in low- and middle-income countries is sparse: just seven focused on primary education and many studies came from high- or upper-middle-income countries with widespread digital infrastructure.

This synthesis therefore draws primarily on evidence from COVID-19 school closures and conflict-affected settings as the most relevant available evidence base on how learning can be supported during periods of disruption in low- and middle-income countries. The scale of the COVID-19 pandemic mobilised global research attention and resources that localised climate events rarely receive. Evidence from pandemic-related closures is nonetheless instructive for climate preparedness because these closures share core features with acute climate disruptions: schools close unexpectedly, systems need to rapidly shift to alternative delivery mechanisms, and children and families must adapt to learning at home or returning to school after extended absence. Evidence from conflict-affected settings provides relevant insights into what is possible when disruption is prolonged or repeated and when children face compounding, and sometimes chronic, stressors.

Summary of sources of evidence on learning drawn on in this synthesis

This synthesis draws on evidence across two dimensions of disruption: the nature of the disruption (acute shocks that force school closures or chronic stressors that affect learning even when schools remain open) and the cause (climate-related events, epidemics or conflict). Table 1 shows a summary of the strength of evidence across these dimensions which is strongest for acute epidemic-driven closures and moderate for conflict-affected settings, with climate-related and chronic disruptions supported mainly by observational or incidental findings rather than intervention evaluations.

Table 1: Strength of evidence on learning across the two dimensions of disruption (nature and cause)

	Climate-related events	Epidemic	Conflict
Acute Sudden shock or event-triggered school closure	Floods, cyclones, storms, wildfires, earthquakes, tsunamis, heatwave-triggered closures	Disease outbreaks causing school closures (eg COVID-19, Ebola)	School destruction, sudden insecurity, rapid forced displacement
	Limited evidence Evidence on learning from climate-triggered acute events is limited to incidental findings rather than studies specifically designed around climate events: learning losses following natural disasters (earthquake) (Andrabi et al., 2023); phone-based tutoring for typhoon-affected students as part of a wider COVID-19 study (Angrist, Ainomugisha, et al., 2026).	**Strong evidence** Primary evidence base for this synthesis. RCTs and quasi-experimental studies on learning during and after COVID-19 across multiple low- and middle-income countries: Angrist, Ainomugisha, et al. (2026); Singh et al. (2024); Adil et al. (2022); Crawfurd et al. (2023); Chemin & Schneider (2025).	**Very limited evidence** Evidence on learning specifically from acute conflict-triggered closures is limited; available studies draw primarily from contexts of prolonged disruption rather than sudden event-triggered closures.
Chronic Ongoing, accumulating stressor affecting learning	Rising temperatures, heat stress, drought and related food insecurity	Prolonged household stress, bereavement, economic disruption during pandemics	Ongoing insecurity, displacement, refugee situations, inaccessible schooling
	Limited evidence Evidence on learning from chronic climate stressors is limited to observational studies of outcomes rather than evaluations of learning interventions: panel data from India link temperature exposure to reduced learning outcomes (Garg et al., 2020); a systematic review finds that cumulative heat exposure reduces learning (Vasilakopoulou & Santamouris, 2025).	**Very limited evidence** Evidence on learning during prolonged epidemic stress is limited; available studies do not isolate this dimension from the effects of acute school closures.	**Moderate evidence** Secondary evidence base for this synthesis. RCTs and programme evaluations of learning interventions in conflict-affected contexts: Arlini et al. (2023); Brown et al. (2023); International Rescue Committee (2018); Ho & Thukral (2009); Tobin & Hieker (2021).

Supporting foundational learning during school closures

When schools close, due to climate shocks or other crises, continuity of learning is critical. Effective strategies to support continuity of learning must reach children at home. This often occurs through caregivers, who may have limited education themselves, or through technology or infrastructure such as mobile phones. While evidence of education system responses to disruptions is growing, rigorous evaluations of what maintains foundational learning remain sparse. The evidence examined here clusters around two main approaches. Effective approaches typically involve some form of remote tutoring that targets instruction to students' current learning levels. Ineffective approaches typically involve grade-level content delivered through mechanisms such as radio broadcasts, printed materials and digital platforms. The evidence also points to the limitations of remote approaches for the most marginalised learners, and to in-person alternatives that have reached them during closures.

Key findings

- Remote tutoring which is targeted to students' learning levels and includes two-way interaction between tutors and students is often effective at supporting learning during school closures.
- Grade-level content delivered without adaptive support, whether passively through materials children work through at home or interactively through phone-based teacher support, typically has no impact on learning during school closures.
- The strongest approaches utilise staff, community relationships, and operational systems and structures that were already in place before the crisis occurred.
- Reaching the most marginalised learners during closures may require in-person alternatives to remote delivery, such as teacher home visits or community-based learning groups.

Despite differences in context, delivery modality, and the nature of the disruption, approaches that were effective during closures and approaches that accelerated recovery afterwards shared two consistent features. Instruction was targeted to children's current learning levels, and it included regular two-way interaction between children and those teaching them. The matrix in Table 2 below maps this pattern against the evidence reviewed in this synthesis.

Table 2: Features of approaches associated with progress in foundational learning during and after school closures

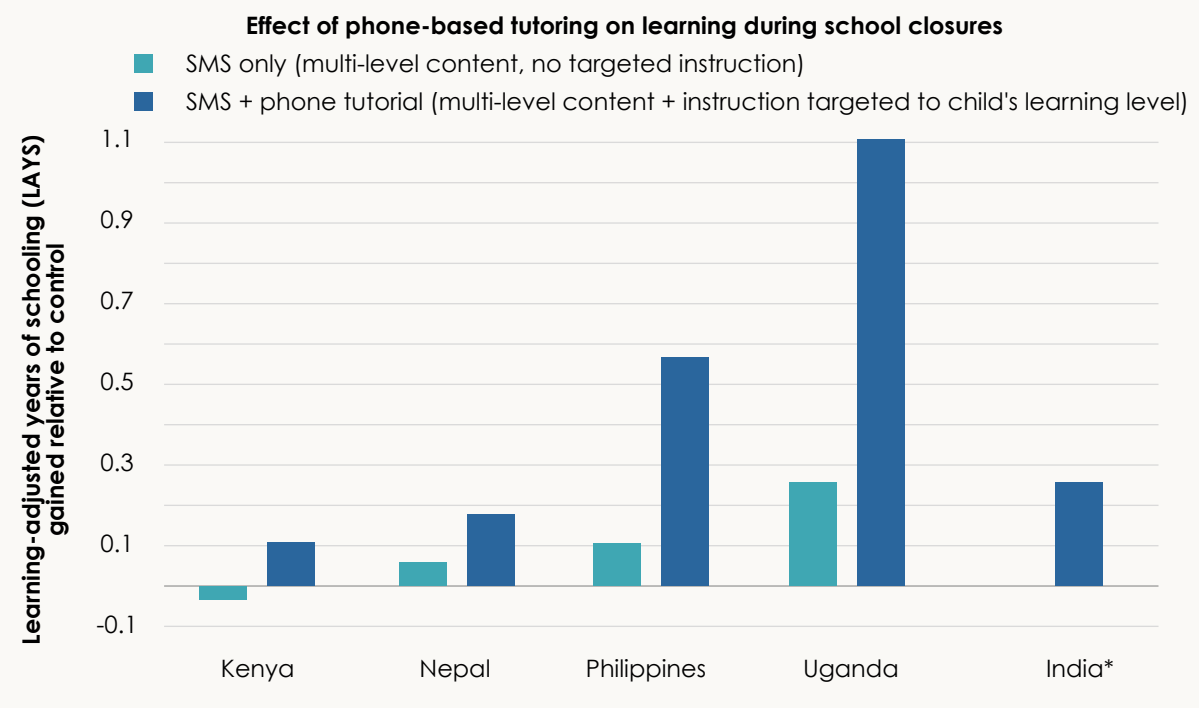
	WITHOUT INSTRUCTION TARGETED TO CHILDREN'S LEVELS	WITH INSTRUCTION TARGETED TO CHILDREN'S LEVELS
WITHOUT TWO-WAY INTERACTION	**No consistent improvement in foundational learning** Examples of content delivered without targeted instruction and without two-way interaction between tutors and students: · Radio broadcasts to homes, Sierra Leone (Crawfurd et al., 2023) · Printed curriculum materials distributed to households, Zambia (De Hoop et al., 2025) · Digital content accessed without instructor contact via SMS in Kenya, Nepal, Philippines, Uganda (Angrist, Ainomugisha, et al., 2026)	**No evidence available** Available evidence did not include approaches that targeted instruction to children's learning levels without also incorporating two-way interaction between students and teachers.
WITH TWO-WAY INTERACTION	**No improvement in foundational learning** Examples of interventions that included two-way interaction between tutors and students, but did not target content to children's learning levels: · Phone calls reviewing broadcast radio content, Sierra Leone (Crawfurd et al., 2023) · Accountability check-in calls on grade-level content, Kenya (Schueler & Rodriguez-Segura, 2023) · Tutoring calls on grade-level content, Kenya (Schueler & Rodriguez-Segura, 2023)	**Consistent improvements in foundational learning** Examples of interventions that combined targeted instruction with regular two-way interaction: · Remote tutoring adapted to each child's learning level, via phone or video call, India, Kenya, Nepal, Philippines, Uganda (Angrist, Ainomugisha, et al., 2026); Kenya (Chemin & Schneider, 2025) · Interactive radio with facilitator present, Nigeria (Verlumun Celestine et al., 2022) · Targeted support for low-performing learners via WhatsApp groups, Pakistan (Adil et al., 2022); teaching assistants, South Africa (Makaluza & Mpeta, 2022); in small-groups, Niger (Brown et al., 2023)

Remote tutoring maintains children's learning when it is targeted to children's learning levels and includes regular two-way interaction between tutors and students

Remote tutoring has been one of the most widely tested approaches to maintaining learning during school closures. Interventions typically make use of existing technological services like mobile phone calls, SMS messaging, and video calls, with the aim of maintaining some form of contact between teachers or tutors and students during closures. A rapid evidence review of remote teaching practices across emergency contexts found that interactive engagement between teachers and students was the feature most consistently associated with improved learning outcomes in low- and middle-income countries (Pacitto et al., 2026). The evidence reviewed here points in the same direction and also reveals that it is not interaction alone that supports foundational learning during closures, but interaction combined with instruction targeted to the learning levels of each child.

The most extensive multi-country evidence on supporting foundational learning during closures comes from a five-country randomised trial that tested phone-based tutoring across India, Kenya, Nepal, Philippines and Uganda during pandemic-related closures (Angrist, Ainomugisha, et al., 2026). This trial was based on an efficacy trial of low-tech support implemented during early school closures in Botswana, which was found to be both effective in raising mathematics outcomes and highly cost-effective (Angrist et al., 2022). Building on the promising results seen in Botswana, the five-country trial tested two similar intervention arms against a control group. The first delivered weekly SMS messages containing multi-level mathematics problems to participating students, with no adaptation to individual children. The second delivered the same SMS messages and supplemented them with weekly 20-minute phone tutorials, during which tutors first assessed each child's current learning level, then worked through problems with them at that level. Across all five countries, these phone tutorials consistently supported learning, with gains of 0.30–0.35 standard deviations relative to the control group. SMS messages alone, without phone calls, assessment or targeted engagement, showed mixed results, producing learning gains only in Uganda and the Philippines where school closures lasted almost two years. Figure 2 illustrates this contrast across all five countries, expressing the effects of each arm in learning-adjusted years of schooling (LAYS).

Figure 2: Learning gains from phone-based tutoring during school closures across five countries, expressed in learning-adjusted years of schooling (LAYS)



*India arm did not include an SMS-only comparison condition

Sources: (Angrist, Ainomugisha, et al., 2026); LAYS metric data from Angrist et al. (2025)

Notes: 1. Uganda and the Philippines experienced school closures of approximately two years; other countries had shorter closure periods; 2. Effects reflect the full intervention period in each country; 3. LAYS expresses programme effects in terms of learning produced relative to a year of high-quality schooling.

This contrast between consistently positive outcomes with phone call tutorials targeting children's learning levels and mixed results with standardised, SMS-only delivery helps to isolate what drove learning gains for students in these contexts. Both approaches provided the same mathematics content by SMS. The phone tutorials added features the SMS-only arm did not: a tutor who could interact with each child, assess their learning level, and work through the mathematics problems at that level. This pattern suggests that two-way interaction and targeted instruction, not content delivery alone, were the features that helped to maintain learning during the closures.

Government teachers can provide remote tutoring with effectiveness similar to that demonstrated by NGO facilitators

Within the same five-country trial, the Nepal and the Philippines arms included an additional experimental comparison of who delivered the tutoring calls: government teachers or NGO facilitators. Comparisons such as these are important for scale-up considerations, as programmes that are effective in small, tightly controlled trials often fail to achieve similar impacts when implemented at scale and by governments (Angrist, Andrabi, et al., 2026). Both groups attended a five-day virtual training in the phone-based 'teaching at the right level' approach[3] (Radhakrishnan et al., 2021). Across Nepal and the Philippines combined, government teachers and NGO facilitators performed comparably, with learning gains of 0.31 and 0.26 standard deviations respectively, and no statistically significant difference between them (Angrist, Ainomugisha, et al., 2026). For education systems considering how to scale up remote tutoring, this suggests that delivery via existing government teachers is viable with appropriate training.

The Philippines arm of this trial offers particularly relevant evidence for climate preparedness. Typhoon Rai struck the Philippines midway through this study, causing widespread damage to both home and school infrastructure, further disrupting learning for an estimated 2 million students (OCHA, 2022). The destruction of over 4,000 classrooms prevented planned school reopenings, meaning children who had already experienced long-lasting pandemic-related closures could not return to school as expected. Among typhoon-affected students in the control group, who received no intervention, the typhoon was associated with learning losses of 0.12–0.20 standard deviations. However, typhoon-affected students who received phone tutorials showed learning gains of 0.20–0.26 standard deviations relative to the control group, largely mitigating the losses associated with the typhoon (Angrist, Ainomugisha, et al., 2026). Engagement with the programme remained consistent for all households affected by the typhoon: affected families participated in nearly as many sessions and spent comparable time on each call as those unaffected by the typhoon. The phone-based approach proved both effective during longstanding pandemic-related closures and resilient to an additional climate shock.

3 'Teaching at the right level' programmes target instruction to students' current learning levels rather than grade-level curricula, and have demonstrated improvements in foundational learning (Banerjee et al., 2016). Effects vary across contexts and implementation conditions, and have been strongest when delivered during in-person intensives by trained facilitators with dedicated instructional time and close supervision (Ardington et al., 2026).

Targeted instruction and two-way interaction can be provided through messaging platforms like WhatsApp

Evidence from a randomised trial in Pakistan suggests that the combination of targeted instruction and two-way interaction can also work through messaging platforms. A WhatsApp-based intervention during COVID-19 closures delivered 'teaching at the right level' content to students whose baseline-scores indicated that they were struggling with grade-level content (Adil et al., 2022). Students were placed into WhatsApp groups organised by subject (mathematics, Urdu or English), with each group receiving content pitched at a level appropriate for students performing below expectations in that subject. Across the three-month intervention, instructors shared problems, videos, quizzes and activities weekly. Students then completed the activities, photographed their work and sent it back through WhatsApp. Instructors then reviewed their work and provided feedback on what they had submitted.

The WhatsApp intervention supported learning in reading, with students improving their Urdu and English scores by 0.56 standard deviations relative to the control group, who received no intervention. There was no effect on mathematics scores.

The pattern of positive effects where targeted instruction was combined with two-way interaction between students and instructors suggests that these features, rather than the specific platform, may be what matters to support learning. Across both Angrist, Ainomugisha, et al. (2026) and Adil et al. (2022), support for learning during school closures depended on combining targeted content with active two-way engagement, regardless of whether that happened through phone calls or on a messaging platform.

The trial in Pakistan also illustrates important limitations of technology-mediated instruction. The researchers initially planned to use video platforms for the intervention. They switched to WhatsApp after baseline surveys revealed the extent of the connectivity constraints in the context: most households did not have access to laptops or tablets, 90% of households relied on low-bandwidth mobile data, and only 25% of schools could deliver any form of online instruction. Even with the adaptation to WhatsApp, engagement still proved difficult to sustain over the course of the intervention, with 35% of students leaving the WhatsApp groups before or during the programme (Adil et al., 2022).

Moreover, the challenges of maintaining engagement were not distributed evenly: students from higher-income households participated more consistently and showed better performance, which suggests that even low-tech remote approaches may not reach the most disadvantaged children during closures. Survey data showed that 22% of households prioritised boys over girls for device access for educational purposes, and 29% of households did not allow their daughters to access devices needed for remote education during closures, citing cultural, religious or financial reasons (Adil et al., 2022). These barriers to equitable access are not unique to Pakistan: across 'education in emergencies' contexts,

girls, younger children, and children with disabilities consistently face the greatest restrictions on mobile phone access (Kan et al., 2022). More effort will be needed to ensure remote learning support reaches all children.

Evidence from Kenya suggests that sustained, one-to-one contact between tutors and students, with instruction adapted to students' levels, can be effective at maintaining learning, even without a formal 'teaching at the right level' methodology. This randomised trial evaluated remote video tutoring for students in a rural Kenyan school, delivered by volunteer university students from Canada via Skype/Zoom (Chemin & Schneider, 2025). Tutors were trained to teach adaptively, making sure to build on foundational skills before progressing, rather than following the textbook rigidly. Each volunteer tutor was matched with a student and maintained that relationship throughout the school term, with weekly one-hour video calls that combined relationship building with educational instruction. The programme provided tablets to students and covered data costs ($0.24 per hour session per child).[4]

The study in Kenya began in 2016, and continued through the COVID-19 pandemic, which allowed researchers to compare effects when schools were open versus when they were closed.[5] When schools were open and students were receiving both the video tutorials and regular classroom instruction, the tutoring had no measurable effect on mathematics outcomes. However, when schools closed for nine months during the pandemic, the video tutorials were able to maintain learning, producing learning gains of 0.40 standard deviations. The researchers estimated that school closures caused learning losses of approximately 0.80 standard deviations. This means that the weekly video tutorials mitigated almost half of the closure-related learning loss.

The study points to features beyond targeted instruction that may help to maintain learning during school closures. Tutors maintained relationships with the same students throughout the programme, relationships that were established before the disruption. Tutors also noted that sessions combined catching up socially with academic instruction. One-to-one tutoring of this kind is, however, resource-intensive, and group-based models may offer a more cost-efficient alternative, though the evidence on their effectiveness relative to one-to-one approaches remains limited in low- and middle-income contexts.

4 Because of the technology required, particularly tablets for each child, this approach may be difficult to scale up.

5 Throughout the study, students participated in video calls with their tutors. When schools were open as normal before the pandemic, the video tutorials took place on school premises after class. During closures, tablets were deployed directly to students' homes and data costs were covered for the weekly calls; tutors reported no significant disruption during the transition from school- to home-based video tutorials.

Evidence from higher-income contexts suggests that low-tech remote learning interventions during crises can narrow inequalities in achievement between disadvantaged and advantaged children. In Italy, one-to-one online tutoring during pandemic-related closures produced larger learning gains for children of parents without college education and those in lower-income households than for their more advantaged peers (Carlana & La Ferrara, 2021). In Ukraine, online tutoring delivered during active conflict showed greater benefits for students who were underperforming at baseline and those from households experiencing higher stress (Dinarte et al., 2025). The connectivity and device requirements of these models, however, limit their direct transferability to lower-income contexts.

In-person interaction is often needed for supporting children in the poorest households and in rural areas

In-person interaction was a feature of effective approaches across the programmes reviewed, because direct contact between teachers and students is a reliable way to deliver the two-way interaction and targeting to children's learning levels that maintain learning. For children in the poorest households and most remote areas, this direct contact matters most, because the remote alternatives that can carry that interaction and targeting elsewhere are often out of reach. A UNICEF index assessing countries' readiness to deliver remote learning that looked at factors like household technology access and system emergency preparedness, found that more than 200 million children live in countries unprepared to deploy remote learning during future school closures (UNICEF, 2021). Within these countries, children from the poorest households and rural areas were the most likely to be excluded when schools closed, even in countries with relatively high overall readiness scores.

The evidence for children in these communities is limited but points in a consistent direction: approaches that reached digitally disconnected populations during closures depended on in-person contact between teachers and students, whether through home visits or community-based learning groups.

Qualitative research with practitioners delivering programmes in refugee settings across Greece, Jordan, Kenya and Rwanda provides insights into what has worked for crisis-affected communities. The study, based on interviews with implementers and teachers working in these communities before the pandemic, found that educational technology programmes could not function as a stand-alone solution (Tobin & Hieker, 2021). Practitioners emphasised that effective intervention programmes for crisis-affected and digitally disconnected children required teachers who could provide structure, support and accountability alongside technology. The programmes that maintained engagement combined online elements with in-person learning spaces where teachers could work with students directly. Practitioners also noted that these in-person spaces were particularly important for girls, who often faced restrictions on leaving camps or households, and for learners who had been out of education for extended periods and needed the structure and social connection that physical learning spaces provided.

In Kenya, community-based reading camps for marginalised girls combined peer learning with paper-based resources during COVID-19 school closures. Camps were run by remedial teachers contracted by the programme, with trusted members of local communities supporting the organisation of camps and helping to ease caregivers' concerns about girls attending. Girls worked together in small groups of around five, and those attending reading camps gained significantly higher scores in both reading and mathematics than those who did not (Amenya et al., 2021). The camps were particularly valuable for girls without literate household members at home who could support their learning, and caregivers were more willing to allow girls to attend when camps were held close to home in locations agreed in advance.

In rural India, an NGO (ASPIRE) adapted its existing programming to better support children who were cut off from traditional schooling as a result of pandemic-related closures. ASPIRE had operated in disadvantaged communities in Odisha and Jharkhand since 2015, with its own teaching and learning materials and a network of 700 local teachers (Bhatia & Leighton, 2024). When schools closed, the NGO mapped digital access across its programme areas and found that only 14% of children had access to a smartphone or the internet at home. In response, they redesigned materials to be more suited to home-based learning and recruited an additional 2,700 volunteer teachers from local communities. These teachers visited children weekly at their homes or in small outdoor groups, introduced a weekly self-directed learning task, and returned at the end of each week to review completed work. This enabled them to provide the two-way interaction between teachers and students that remote approaches could not deliver in this context.

Over six months, more than 100,500 children across 5,555 villages participated in the programme. The participating children were predominantly from marginalised groups and were selected because they had no other access to educational opportunities when schools closed. Assessment data collected at baseline and endline showed substantial improvements in children's scores over the programme period, with larger gains among those who started at lower levels. However, the study had no control group, so it is not possible to determine the relative magnitude of the impact of the intervention. Nevertheless, given evidence that learning typically declines when children are out of school for extended periods, the observed improvements suggest the programme maintained learning for children who would otherwise have had no opportunities to learn during closures. A notable feature of the ASPIRE intervention was that the rapid scale-up enacted after school closures depended on infrastructure and monitoring systems that existed before the COVID-19 crisis. The NGO had operated in these communities for six years, with trained staff, tested materials, and relationships with local communities already in place.

Materials or content delivered without targeting to children's learning level typically do not improve learning, even when paired with teacher phone calls

During school closures, delivering grade-level content for children to work through at home is often seen as an accessible solution. This content can theoretically be prepared in advance, distributed at scale (through means such as radio broadcasts or printed materials) and follows the instructional sequence students would have encountered if schools were open. Radio broadcasts in particular are often considered the distance learning modality with the furthest reach in low-resourced contexts, as they do not require internet connectivity or smartphones (Crawfurd et al., 2023).

However, evidence from efforts to support learning during closures suggests that reach does not translate reliably into engagement or learning when the content is not tailored to children's learning levels. The evidence suggests that distributing or broadcasting content, even when paired with remote teacher contact, does not reliably produce learning unless children have access to sustained, responsive support that can adapt to their learning levels and needs.

Studies in both Sierra Leone and Kenya demonstrate that grade-level content delivered via radio, even when paired with phone calls from teachers, did not improve learning during closures. In Sierra Leone, a randomised trial tested the effectiveness of grade-level national radio lessons paired with phone calls from teachers during school closures (Crawfurd et al., 2023). Each student in the trial was assigned two teachers (mathematics and reading) who called them throughout the 16-week programme. During two, 15-minute weekly calls teachers reviewed the material covered in that week's radio broadcast and answered students' questions. While the phone calls increased some measures of engagement (eg student and parent participation in educational activities increased), these improvements did not translate into learning outcomes.

A similar pattern emerged in Kenya, where researchers tested whether phone calls could improve outcomes when added to an existing distance learning package (Schueler & Rodriguez-Segura, 2023). Students in Bridge Kenya schools had access to grade-level resources, including radio content, a learning website, SMS homework reminders, and WhatsApp groups for parents. The randomised trial compared the impact of two types of weekly phone calls: 5-minute accountability check-ins and 15-minute tutoring sessions. The tutoring calls involved answering questions and demonstrating skills related to grade-level mathematics problems that had been sent to all students via SMS. Despite the regular interaction between teachers and students, neither type of call improved learning outcomes at endline, and there was some evidence that the tutoring calls had negative effects at the four-month follow-up among students who returned to school. The authors also note that students' overall study time did not increase despite time spent on calls. They suggest that families may have viewed the phone calls as substituting for other

learning activities at home, with students or parents feeling they had completed their educational activities for the day after having had a call with a teacher.

When radio content is combined with facilitators who adapt content to align with children's learning levels, learning improvements have resulted. Two programmes that used interactive radio instruction, combining radio content with input from facilitators who adjusted the pace of the content delivery to children's learning, produced substantial learning gains in fragile states like Sudan and Somalia, with effect sizes ranging from 0.60 to 0.80 standard deviations (Ho & Thukral, 2009).[6] A quasi-experimental study for children displaced by conflict in Nigeria found similar results: interactive radio instruction delivered by trained facilitators improved the foundational reading skills of those participating, with gains sustained at 12-month follow-up (Verlumun Celestine et al., 2022).

These programmes required a teacher or facilitator to be present during the broadcast to facilitate responsiveness to students' needs. Rather than broadcasting content for children to engage with independently at home, the interactive radio programmes are designed for group settings (either in formal classrooms or community learning spaces) with a facilitator physically present with children. The broadcast content in these programmes was aligned to the curriculum and designed to be interactive, with frequent pauses prompting student responses and structured activities requiring active participation. Facilitators could also adapt the delivery, slow the pace when students struggled, repeat sections, and use the pauses to check understanding and provide additional support where needed. In the Nigeria programme, broadcasts were focused specifically on the foundational reading skills that children with low starting points needed to acquire, covering phonological awareness, letter knowledge, oral comprehension and vocabulary (Verlumun Celestine et al., 2022).

6 The synthesis also highlights that these learning outcomes depended on factors beyond programme design, including: the quality of local implementation, whether broadcasts could be heard clearly, and how often learners heard the broadcasts (Ho & Thukral, 2009). In an 'interactive radio instruction' programme in South Africa, for instance, improvements in learning outcomes corresponded directly with the number of such broadcasts they heard (Leigh, 1995).

Evidence from Zambia illustrates a similar pattern. A cluster-randomised trial of a structured pedagogy programme had been running for several years before pandemic-related closures began in 2020 (De Hoop et al., 2025). When schools closed, the programme adapted by having teachers visit students' homes to distribute homework packs aligned to the structured curriculum, as well as working with small groups of children to review and discuss completed work. The programme also partnered with local radio stations to broadcast educational content, but respondents noted that poor signal strength often interfered with reception. The home visits and small group support, however, provided the facilitated engagement with the learning materials that the radio broadcasts alone could not. While the study was not designed to isolate the effects of these adaptations during closures, reading gains from the programme were partially sustained after schools reopened, with effects of 0.26 standard deviations still detectable more than a year later (compared to 0.40 standard deviations from the standard programme before the pandemic). Evidence from Kenya similarly found that radio lessons alone were not associated with higher reading or mathematics scores among marginalised girls with limited access to remote learning during COVID-19 school closures, but girls who listened to radio in groups scored significantly higher than those who did not (Amenya et al., 2021).

While distributing materials that are aligned to the curriculum seems like a practical solution during school closures, it typically does not improve learning outcomes

Distributing curriculum-aligned, grade-level content offers practical advantages for emergency responses: it can be prepared in advance, circulated widely, and maintains continuity with what students would have learned in school. However, evidence from pandemic-related closures suggests that these advantages did not translate into learning. Students working through these materials at home, whether delivered via radio, print or digital platforms, did not maintain learning when they were engaging with these materials independently. Adding remote phone contact between teachers and students increased some measures of engagement but did not improve learning outcomes when that contact remained organised around grade-level content rather than being adapted to students' current learning levels. The approaches that have demonstrated effectiveness in supporting learning from curriculum-aligned content involved the physical presence of facilitators who could guide the students through the material, adjust the pace of delivery, and adapt instruction to meet students' needs.

Box 1: Ensuring equity in learning during disruptions to schooling

Equity-sensitive programmes have demonstrated that marginalised children can be reached during disruptions, but doing so requires deliberate design choices that go beyond content delivery.

How equity-sensitive programmes achieved effectiveness

They used community infrastructure that already existed. Effective programmes did not try to build community trust and access during a crisis: they drew on relationships, trained staff, and operational systems that were in place before disruption hit. In Nigeria, facilitators with established community relationships negotiated directly with families to secure girls' attendance at learning camps. In Kenya, community health volunteers who were trusted members of local communities helped to ease caregivers' concerns and support girls to attend reading camps. In India, ASPIRE's network of local teachers that had been built over six years enabled rapid scale-up to reach over 100,000 remote rural children when schools closed.

They removed specific barriers rather than assuming access. Whether through adjusted timing, community locations, cash support, in-person facilitation or direct negotiation with gatekeepers, effective programmes identified who was being excluded and acted on it. Cash transfers in Myanmar reduced economic barriers to participation for specific students. In the Democratic Republic of Congo, scholarships covering fees and uniforms were associated with significant learning gains and reduced the risk of girls being withdrawn from school entirely.

They targeted instruction to children's actual learning levels. In every context where equity gains were observed, children were grouped by where they were in their learning, not by age or grade. This mattered most for children who were already furthest behind.

Adaptations to support marginalised groups accessing remote approaches

Remote approaches that rely on technology use, even low-tech approaches, can systematically exclude the most marginalised children through cost, connectivity constraints and distance. Girls, younger children, and children with disabilities face additional restrictions on device access: in Pakistan, 29% of households did not allow daughters to use devices during closures. Economic pressures also compete with learning: in Niger, only 64% of children selected for tutoring attended regularly, owing to child labour demands, seasonal migration and insecurity. Where these barriers cannot be addressed remotely, in-person alternatives such as teacher home visits or community learning groups may be necessary to reach children who would otherwise be left out entirely.

Recovering foundational learning after schools reopen

Even when efforts to sustain learning during school closures are effective, they often mitigate loss rather than replacing what children could have learned had schools remained open. When schools reopen, learning gaps remain. Evidence from recent shocks shows that these losses, particularly in foundational learning, can persist long after schools reopen if not addressed deliberately (Andrabi et al., 2023; Bandiera et al., 2020).

Reopening schools supports some learning recovery without additional intervention. In India, for instance, evidence showed that approximately two-thirds of learning loss had been recovered within six months of schools reopening following COVID-related school closures (Singh et al., 2024). Evidence from studies in South Africa and Kenya shows that children in comparison groups who returned to school following COVID-related school closures, but did not receive additional support, showed improvement in foundational skills (Jordan et al., 2025; Makaluza & Mpeta, 2022).

However, when intentional, targeted remediation happened alongside schools reopening, learning recovery was larger, faster and in some cases more equitable. This matters because school curricula and classroom instruction will often continue to move forward; and children who have lost learning may continue to fall further behind the curricular pace if learning gaps are not addressed. Addressing learning losses when children return is therefore critical, both to restore their learning and to prevent gaps from widening as instruction moves on.

During closures, intervention programmes substitute for regular schooling; but after reopening, interventions typically supplement the regular school day. This means that remediation programmes are usually operating alongside classroom instruction. This section includes studies on children returning to school following temporary school closures due either to the COVID-19 pandemic or to conflict. The interventions studied varied in design, structure and delivery, but across all programmes the findings on what supports learning recovery point to the same key elements.

Key findings

- Targeted remediation accelerates learning recovery beyond what reopening alone achieves, with consistent positive effects across different programme models.
- Effective programmes share common features: additional focused time on foundational skills, instruction targeted to children's current learning level rather than their grade, and trained personnel delivering structured content.
- Programme effectiveness depends on participation: remediation only benefits children who attend, and high participation requires deliberate strategies to address barriers including location, timing and economic constraints.
- For children experiencing ongoing stress from conflict, displacement or other disruptions, integrating social-emotional support appears to strengthen the conditions for learning.

Remediation programmes support learning recovery when they provide additional time focused on foundational skills, and use structured content targeted to children's learning levels

Targeted remediation programmes that provide additional instruction focused on foundational skills either alongside or outside of regular class time are among the most studied and most effective ways of recovering learning losses following school closures. Although these programmes often take different forms, they typically draw on instructional principles with an established evidence base: targeting instruction to what children know and can do, rather than assuming they are ready for grade-level content.

In Tamil Nadu, India, the state government implemented a large-scale programme focused on recovering learning following approximately 18 months of school closures during the COVID-19 pandemic. The intervention programme (Illam Thedi Kalvi) recruited around 200,000 community volunteers to provide after-school instruction to approximately 3.3 million children (Singh et al., 2024). The programme was set up to be closely coordinated with, and complementary to, the public school system: the State Council of Educational Research and Training designed the curriculum and materials, and district education officials oversaw implementation. Volunteers were not trained teachers but received two days of initial training as well as monthly refresher sessions and were paid small stipends ($12 per month) by the state government. Instruction in the programme was play-based, targeted to children's learning levels and delivered in small groups (15–20 children) during evening sessions held in schools, community halls or volunteers' homes. Children were grouped by their assessed learning level rather than grade, and content was focused on foundational reading and mathematics.

A panel study tracked children from before the pandemic and through the months following reopening, documenting substantial learning losses during closures for all children (Singh et al., 2024).[7] Returning to school supported learning recovery, with two-thirds of the learning loss recovered within six months of reopening. The panel design of the study tracked children who participated in the programme alongside those who did not, allowing researchers to compare their learning recovery. Using a value-added model that controlled for prior learning levels and household characteristics, they estimated how much of the learning recovered could be attributed to the programme versus the return to regular schooling. The programme itself was estimated to account for gains of 0.17 standard deviations in mathematics and 0.09 standard deviations in Tamil language over three to four months, among children who attended. Although these are modest gains, across the population they contributed meaningfully to the total recovery, and effects were larger for children from more disadvantaged households.

Evidence from Myanmar and Madagascar suggests that the principles of targeted instruction can support learning recovery when delivered through community-led structures. In Madagascar, the government scaled up a programme that combined two components: training schools and communities to develop and implement school action plans, and training teachers in 'teaching at the right level' pedagogy and practices (Maruyama & Igei, 2023). The approach built on an efficacy trial that took place before the pandemic that had demonstrated positive effects on foundational reading (Maruyama & Igei, 2022). Comparing assessments conducted before and after the pandemic, the researchers documented substantial learning losses during school closures. Before the pandemic, 28% of children in grades 3–4 were unable to identify letters; after schools reopened, this proportion had risen to 43%. When schools reopened, the remediation programme was scaled up to reach over 1,000 schools and 89,000 students, which required adapting how it was delivered. At scale, the Ministry used cascade training rather than direct training of teachers, and teaching and learning materials were not distributed; instead, teachers were trained to produce their own using local materials.

7 The study used assessments linked via Item Response Theory. Population-level test score distributions were observed at four time points (2019, December 2021, February 2022, and April–May 2022); individual children were tracked twice, at baseline in 2019 and once during 2021–22.

The programme components were rolled out progressively across regions, which created a quasi-experimental opportunity to evaluate the effects of different components of the programme. Researchers compared schools near the border of two neighbouring regions with similar characteristics: both regions had received training on developing and running school action plans, but only one region had received the teacher training on targeted instruction. In the region where teachers had been trained, the proportion of children reading at word level increased by 15.9 percentage points, and the proportion reading at story level increased by 3.1 percentage points. The positive effects of the programme were larger for girls and for children whose families had engaged in reading activities in Malagasy at home during closures.

In Myanmar, a similar community-led approach was implemented in contexts of prolonged disruption where schools had faced extended closures from both the COVID-19 closures and political instability following the 2021 coup. In Rakhine and Kayin states, where educational services had been severely disrupted and provision was limited or absent in many communities, community volunteers delivered after-school reading instruction targeting children's current learning levels and using play-based methods (Arlini et al., 2023). As in other recovery programmes, children were grouped by their assessed reading level rather than their grade and were reassessed every two to three weeks to track progress and adjust groupings. Children who participated in the after-school classes were nearly eight times more likely to progress by at least one reading level than those who did not.

Rather than grouping all children by their assessed level, some programmes provided targeted additional support specifically for the lowest-performing students. In the Democratic Republic of Congo, ongoing instability had disrupted children's schooling and contributed to extremely low learning levels. To support learning recovery, the programme (VAS-Y Fille!) provided after-school tutoring to in-school girls in grades 3–6 whose performance put them in the bottom half of their class (International Rescue Committee, 2018).[8] Identified girls received tutoring two to three times per week after their regular school classes. Tutors were recruited from the local community and received training, materials and a stipend to deliver the sessions. Tutoring raised girls' reading and mathematics scores significantly, with qualitative data suggesting that this reflected both the additional instruction time and the improved relationships between students and teachers, which reduced students' anxiety.

8 The VAS-Y Fille! programme implemented multiple interventions as well as after-school tutoring, including scholarships, teacher training, school grants and an accelerated learning programme for out-of-school girls. Multi-level models comparing the different components found that tutoring was associated with the largest learning gains (though the girls were assigned to tutoring based on academic need rather than randomisation).

A similar approach was used in the conflict-affected Diffa region in Niger, with tutoring sessions specifically targeting children with low foundational skills (Brown et al., 2023). The region had faced ongoing disruption from armed conflict over many years that resulted in high rates of displacement and instability. These disruptions had taken a toll on learning: at baseline, 88% of children in grades 2–4 could not read beyond recognising single words. The programme (Tutoring in a Healing Classroom) provided four hours of small-group instruction per week for 22 weeks for students performing below basic proficiency in reading and mathematics. The sessions were delivered by government teachers who had received additional training. Children who participated showed gains of 0.22–0.27 standard deviations in reading and mathematics, and effects were equitable across gender, grade level, refugee status and baseline ability.

In South Africa, rather than after-school recovery lessons, a programme placed trained teaching assistants directly into classrooms to support the delivery of a structured pedagogy approach. The Funda Wande programme implemented in Limpopo province had four components: rigorous recruitment and selection of teaching assistants, high-quality structured curricula and materials provided to teachers and learners, comprehensive training for teaching assistants aligned to those materials, and continuous monitoring and support (Makaluza & Mpeta, 2022). Teaching assistants worked within regular classrooms alongside teachers, following the structured curriculum and supporting the teachers with classroom tasks as necessary. They also helped to identify struggling learners and provided targeted support, either individually or in small groups of five to six children.

The structured pedagogy programme was not designed specifically as a post-pandemic learning recovery intervention, but it was implemented and evaluated during 2021 as schools reopened following COVID-19 closures, a period of substantial learning loss and ongoing disruption from rotational timetabling (Ardington, 2023). A randomised controlled trial compared three conditions: classrooms receiving teaching assistants and materials, classrooms receiving materials only, and control classrooms. By the end of grade 2, children in classrooms with teaching assistants showed gains of 0.50 standard deviations in reading and 0.51 standard deviations in mathematics compared to control classrooms. Classrooms that only received materials showed smaller but still meaningful gains of 0.22–0.26 standard deviations, suggesting the teaching assistants roughly doubled the impact of materials alone. The intervention did not fully reverse learning loss from the pandemic, but it prevented children from falling further behind.

Supplementing classroom instruction with technology-based tutoring can support learning recovery

Phone-based and technology-enabled approaches can also support learning recovery when they supplement rather than replace classroom instruction. In Karnataka, India, the state government scaled up a phone-based targeted tutoring approach for foundational mathematics that had been tested during school closures as remote support to maintain learning (see Angrist, Ainomugisha, et al., 2026). After schools reopened, the government adapted the approach to support learning recovery, with teachers providing tutoring alongside regular schooling rather than as a substitute for it. Teachers were assigned small numbers of students to tutor via weekly phone calls alongside their regular teaching duties. A difference-in-difference analysis found that students gained roughly one full level on the ASER mathematics test. The government explicitly framed the programme as both catch-up for existing learning losses and building capacity for future disruptions.

In Kenya, the M-Shule platform delivered SMS-based reading lessons adapted from the national Tusome structured pedagogy curriculum as schools reopened following COVID-19 closures (Jordan et al., 2025). The platform adjusted content difficulty automatically based on children's quiz performance, so that children who struggled received additional practice while those who succeeded moved on. The programme served as a 'booster' course supporting children's learning alongside their return to school and produced significant gains in reading for children using the platform. These remote approaches worked as supplements to regular schooling, providing additional practice and targeted instruction while children were also attending class.

Across these studies, effective programmes share several common features. Programmes provided additional time focused on foundational skills beyond regular classroom instruction. Although the amount and type of training varied, the programmes used trained personnel to deliver instruction, whether community volunteers, teaching assistants or teachers. The programmes also used structured content, often developed or adapted from national curricula, and all included some mechanism for meeting children where they are: grouping by assessed level, targeting the lowest performers, systematically building foundational skills, or adapting content based on performance. These features are consistent with what made approaches effective during closures, suggesting that targeting instruction to children's needs is critical for both learning continuity and recovery.

Learning recovery programmes only benefit children who participate, and high participation rates require deliberate strategies to address barriers to attendance

Targeted instruction can support and accelerate the recovery of learning across a range of contexts and delivery models. However, programmes can only benefit children who engage with them, and in crisis-affected and resource-constrained settings, barriers to participation can limit the impact of even well-designed interventions. The evidence from the Tutoring in a Healing Classroom programme in Niger illustrates this constraint clearly (Brown et al., 2023). On average, only 64% of children selected for the programme participated regularly. When researchers looked at all the children assigned to the programme (regardless of how often they attended sessions), the effects were modest, with learning improving between 0.22 and 0.27 standard deviations. However, when they isolated the effects for children who attended sessions consistently, learning gains were substantially larger, ranging from 0.38 to 0.46 standard deviations. Attendance at the programme was limited by insecurity, displacement, seasonal migration, child labour demands and scheduling conflicts with religious education.

Similar barriers constrained participation in Myanmar, where 19% of children in the Catch-up Clubs reported finding it difficult to attend sessions due to transport problems and the competing demands of household chores and paid work, as well as security concerns in areas with active conflict (Arlini et al., 2023). Technology-based programmes also faced challenges with engagement: in Kenya, only 57% of M-Shule users completed even one sub-topic, with a steep drop-off seen after initial registration (Jordan et al., 2025). Even when technology removes barriers of location and timing, sustained engagement can remain a challenge.

Evidence from Tamil Nadu suggests that higher participation is possible when programmes address barriers to access directly. Around 57% of eligible households enrolled their children in the Illam Thedi Kalvi programme, and of those who enrolled, over 90% attended at least four days per week (Singh et al., 2024). Added to this, participation was higher among children from disadvantaged households (who also showed the largest gains from the programme). To achieve a high rate of participation, the state government invested in community mobilisation to publicise the programme through street plays, local media coverage, and outreach by teachers and school headteachers in communities. Sessions were also scheduled in accessible locations either at schools or in communities, and during evening hours that accommodated families' schedules.

Economic support can also help to address barriers to participation, but it requires careful design. In Myanmar, the Catch-up Club programme provided cash transfers of $45 per family to reduce economic pressures that might otherwise prevent children from attending (Arlini et al., 2023). Parents reported this as helpful for enabling their children to participate. In the Democratic Republic of Congo, the VAS-Y Fille! programme provided scholarships to help girls pay school fees and

buy uniforms and textbooks. These scholarships were associated with significant improvements in reading scores for girls, and qualitative data also suggested they helped prevent girls being sent away from school for non-payment of fees (International Rescue Committee, 2018). However, the programme also offered a free accelerated learning programme for out-of-school girls, and some families responded by withdrawing their daughters from formal schooling to enrol them in the free alternative, highlighting the importance of considering how different programme components may interact in different contexts.

Social-emotional learning interventions can strengthen the conditions that support learning for children in crisis-affected contexts

Recovering foundational learning in crisis-affected contexts depends on more than reopening schools. For children facing ongoing conflict, displacement or instability, stress can undermine learning long after schools reopen by weakening the emotional regulation, concentration, and sense of safety that learning depends on. In displacement settings in particular, unaddressed psychosocial needs have been identified as one of the fundamental disruptions to children's education (Burde et al., 2023). Academic instruction alone is therefore unlikely to recover learning effectively without also developing the social-emotional capacities that ongoing stress erodes.

A recent meta-analysis found that education interventions in conflict and crisis settings led to moderate overall improvements in children's social-emotional learning (Diazgranados Ferráns et al., 2026). Effects varied widely across programmes, but the most consistent effects came from programmes that integrated social-emotional learning into everyday academic instruction rather than delivering it separately.

The Tutoring in a Healing Classroom model combines targeted remedial tutoring with practices like mindfulness exercises and games to help children regulate their responses to chronic stress. Across multiple crisis-affected contexts, the programme has been found to produce reliable gains in children's social-emotional skills. For example, the programme helped to improve Syrian refugees' perceptions of school in Lebanon (Tubbs Dolan et al., 2022), and reduce aggression and improve emotional regulation in Niger, where the strongest effects were seen among girls and refugees (Kim et al., 2026). The effects of adding social-emotional activities on foundational learning outcomes, however, were less consistent across settings. In Lebanon, the programme improved some basic academic skills, but did not consistently raise children's overall reading and mathematics scores (Tubbs Dolan et al., 2022). In Niger, the remedial tutoring programme itself had positive effects on reading and mathematics scores, but the additional social-emotional activities did not further improve children's scores on the ASER tests used in the evaluation (Brown et al., 2023). Children who received the social-emotional activities did show greater improvement in their school grades (teacher-assigned marks) than those who

received tutoring alone, which the authors suggest may reflect improvements in the engagement, behaviour and focus skills that teachers valued.

Social-emotional support can also be integrated into teaching through play-based approaches. A review of play-based learning in conflict and crisis settings found reliable improvements in classroom climate and children's wellbeing across a range of programmes, alongside promising but less consistent effects on foundational learning (Kwok et al., 2026). A randomised controlled trial of the PlayMatters programme in Ethiopia's Somali region – which trained teachers to deliver a play-based, child-centred approach focused on improving foundational learning – produced large improvements in social-emotional skills and mathematics outcomes, as well as positive but modest gains in reading (PlayMatters, 2026). Catch-up Clubs in Myanmar similarly integrated social-emotional support into play-based remedial teaching. Children with higher social-emotional competency at the end of the intervention also had higher reading scores (Arlini et al., 2023). In Kayin state where armed conflict was active both before and during the study, this pattern was particularly marked.

Across these settings, the direct effect of social-emotional activities on foundational learning is inconsistent. Wider evidence from conflict and crisis settings finds that the highest-impact interventions personalise instruction to children's current skill levels and strengthen the quality and consistency of teaching, while social-emotional learning programmes show limited effects on reading and mathematics outcomes (Diazgranados Ferráns & Thuo, 2026). For children experiencing ongoing stress from conflict and displacement, attending to social-emotional wellbeing is therefore likely to be valuable not as an alternative to targeted instruction but as a complement to it, supporting the conditions that enable effective teaching and learning.

Prioritising foundational learning as a basis for building education system resilience

Across the interventions reviewed in this synthesis, a consistent pattern emerges. The measures that maintained foundational learning during school closures, and those that supported the recovery of foundational learning after schools reopened, were typically not introduced in response to a crisis. Effective approaches depended on instruction targeted to children's current learning levels, regular two-way interaction between students and those teaching them, and delivery through structures already embedded in systems or communities. These are the same features that drive effective foundational learning in ordinary classrooms.

This has direct implications for how education systems approach building resilience for disruptions. Many of the interventions that responded effectively to disruptions were those that build on existing systems, relationships and a trained workforce. The phone-based tutoring deployed in Karnataka during school closures drew on teachers already trained in 'teaching at the right level' methodology. The ASPIRE programme in India could be scaled up rapidly following disruptions because it had operated in those communities for six years, with trained staff, existing monitoring systems and structures, established relationships, and an understanding of the needs of disconnected areas and communities in which the staff worked. The Funda Wande programme in South Africa was able to support learning recovery after COVID-19 closures because its structured curriculum and teaching assistant model had been developed and refined before the pandemic, aimed at addressing the existing learning crisis. These programmes had already begun to prioritise and address the foundational learning crisis, and in most cases the capacity to respond to disruption was built before the disruption arrived.

A recurring feature of the interventions that effectively supported or recovered learning was that those delivering instruction had a means of identifying where individual children were in their learning progress, and the flexibility and capacity to adapt their instruction or support accordingly. In some programmes, baseline assessments were used to identify and select only the lowest-performing children for additional support; eg in Niger (Brown et al., 2023) and in the Democratic Republic of Congo (International Rescue Committee, 2018). In others, all children participated but the groupings were determined by their assessed level rather than grade; eg in Myanmar (Arlini et al., 2023) and in India (Singh et al., 2024). In the phone-based tutoring programmes implemented in five countries, tutors assessed each child's current learning level at the start of each call and worked through content at that level (Angrist, Ainomugisha, et al., 2026). Within regular classrooms, teaching assistants in the Funda Wande programme identified children who were struggling and provided targeted support accordingly, using ongoing observation

and interaction with children to inform which students needed additional attention and at what level. Similar ongoing strategies were used by facilitators in interactive radio instruction lessons to slow the pace and adjust their instruction to support students' learning at their level.

Across these programmes, assessment and two-way interaction were not separate features of an intervention, rather they worked together to ensure support for children was at the appropriate level. Regular, structured assessments could identify where to pitch instruction, or which children needed extra support, while regular contact and interaction allowed teachers to gauge whether children were following and adjust when they were not. Investing in these practices before disruptions occur means equipping teachers with simple, usable tools to identify which specific foundational skills children have and have not yet acquired, alongside interactive teaching practices that build in ongoing responsiveness to what children demonstrate they know. Well-designed assessments can give teachers actionable information about where individual children are in their skill development, and frameworks that define the progression of foundational skills children need to acquire, such as the Global Proficiency Framework, can help connect simple assessment results to meaningful learning goals.

Much of the evidence reviewed here was generated by discrete events, pandemic-related closures or emergencies that prompted coordinated responses. Climate-related changes are also producing slower-moving pressures that are less likely to trigger such responses without deliberate planning to recognise and respond to them. Unlike acute shocks, chronic stressors such as rising temperatures, drought, displacement and ongoing insecurity do not produce a moment of crisis that forces an immediate response. Evidence from studies of weather-related income shocks shows that climate disruptions also reduce household investment in children's education, study time and long-term cognitive development (Foster & Gehrke, 2017; Jensen, 2000; Webb, 2024).

Supporting household resilience requires complementary responses that sit alongside the direct effects on learning that this synthesis addresses. The effects of chronic stressors on foundational learning accumulate gradually, compounding existing gaps without triggering the coordinated responses that discrete emergencies prompt. This also means their effects on foundational learning are correspondingly less likely to be addressed. The evidence that rising temperatures measurably reduce learning even when schools are open means that the conditions for foundational learning are already being affected in many low- and middle-income contexts on ordinary school days (Garg et al., 2020).

Evidence from conflict-affected contexts suggests that when disruption is prolonged, focusing on targeted instruction alone may not address the full scale of the impact from disruptions. In Myanmar and Niger, attending to children's social-emotional wellbeing alongside their foundational skills helped strengthen the conditions for learning, supporting the engagement, emotional regulation and focus on which learning depends (Arlini et al., 2023; Brown et al., 2023). The uncertainty, stress and disrupted routines that ongoing climate pressures place on children and families may create similar barriers to learning, not necessarily through a single, acute event but through the steady shift of conditions in which children can concentrate, attend school or other places of learning, and engage with learning effectively. The same instructional principles and community structures that the evidence suggests can protect and recover learning during acute disruptions are also the most realistic tools available for addressing chronic pressures.

Where systems had not made these investments, disruptions compounded what was already fragile. The approaches that evidence suggests are most impactful for supporting foundational learning are also among the least consistently in place across low- and middle-income country systems. Less than half of low- and middle-income countries report nationwide implementation of structured pedagogy, and targeted instruction and catch-up programmes are even less commonly implemented (UNICEF & Hempel Foundation, 2025). When disruptions occur, it is the most vulnerable children who experience the greatest losses. Learning losses during COVID-19 school closures were largest among children who were already behind before the schools closed, who faced greater obstacles to return when schools reopened, and who returned to systems least equipped to support their recovery (Alejo et al., 2024). Disruptions do not create these inequalities, they deepen them. Sustained investment in the conditions that support foundational learning for all children is therefore also the most direct path toward building resilience: systems that have built these foundations are better placed to maintain and recover learning when disruptions occur.

Appendix

Summary of studies reviewed in this synthesis

Table 3: Summary of interventions reviewed in this synthesis, showing for each study the disruption context, delivery approach, key design features, evidence type, and effect on foundational learning

Programme / study	Context	Nature of disruption	Cause of disruption	Phase	Approach and delivery	Delivered by	Targeted to level	Two-way interaction	In-person contact	Pre-existing systems	Attendance supports	Social-emotional	Evidence type	Effect on foundational learning
WhatsApp-based teaching at the right level in groups (Adil et al., 2022)	Pakistan (Punjab)	Acute	Pandemic: COVID-19	During closures	Students struggling with grade-level content were placed in subject-based WhatsApp groups, receiving weekly problems, videos, quizzes and activities over three months.	Instructors	✓	✓					RCT	Reading improved in both Urdu and English, but there was no effect on mathematics
Community-based reading camps for marginalised girls (Amenya et al., 2021)	Kenya	Acute	Pandemic: COVID-19	During closures	Marginalised girls worked in peer groups of around five with paper-based resources, in camps run by contracted remedial teachers, held close to home in locations agreed with caregivers.	Contracted remedial teachers	~	✓	✓	✓	✓		Mixed methods	Girls who attended the camps scored significantly higher in reading and mathematics than those who did not.
Phone-based tutoring with SMS (Angrist et al., 2022)	Botswana	Acute	Pandemic: COVID-19	During closures	Families of primary children (grades 3 to 5) received weekly SMS messages with basic mathematics problems plus a weekly 15 to 20 minute live phone call in which a facilitator worked through the problems with the child. Delivered by an NGO with an existing presence in schools.	NGO facilitators	✓	✓		✓			RCT	The combined phone-and-SMS intervention raised foundational mathematics outcomes and proved highly cost-effective. SMS messages alone had no significant effect.

Programme / study	Context	Nature of disruption	Cause of disruption	Phase	Approach and delivery	Delivered by	Targeted to level	Two-way interaction	In-person contact	Pre-existing systems	Attendance supports	Social-emotional	Evidence type	Effect on foundational learning
Phone-based tutoring with SMS (Angrist, Ainomugisha, et al., 2026; delivery comparison: Radhakrishnan et al., 2021)	India, Kenya, Nepal, Philippines, Uganda	Acute	Pandemic: COVID-19 & Climate-related: Typhoon Rai, Philippines	During closures	Students received weekly SMS messages with multi-level mathematics problems plus a weekly 20-minute phone tutorial, in which tutors assessed each child's learning level and worked through problems at that level.	Government teachers; NGO facilitators	✓	✓					RCT (five countries)	The phone tutorials consistently supported learning across all five countries and largely mitigated the typhoon-associated losses in the Philippines.
SMS messages alone, same trial (Angrist, Ainomugisha, et al., 2026)	Kenya, Nepal, Philippines, Uganda	Acute	Pandemic: COVID-19	During closures	Students received the same weekly SMS messages with multi-level mathematics problems, with no phone calls and no adaptation to individual children.	Automated SMS (no instructor)							RCT (five countries)	Results were mixed, with learning gains only in Uganda and the Philippines, where closures lasted almost two years.
Phone-based tutoring scale-up, reported within Angrist, Ainomugisha, et al. (2026)	Karnataka, India	Acute	Pandemic: COVID-19	After reopening	After schools reopened, the state adapted the closure-era phone tutoring model, with teachers tutoring small numbers of assigned students through weekly calls alongside their regular duties.	Government teachers	✓	✓		✓			Difference-in-differences	Students gained roughly one full level on the ASER mathematics test.

Programme / study	Context	Nature of disruption	Cause of disruption	Phase	Approach and delivery	Delivered by	Targeted to level	Two-way interaction	In-person contact	Pre-existing systems	Attendance supports	Social-emotional	Evidence type	Effect on foundational learning
Catch-up Clubs (Arlini et al., 2023)	Myanmar (Rakhine and Kayin states)	Chronic	Pandemic: COVID-19, then Conflict: 2021 coup	After reopening (amid ongoing conflict)	Community volunteers delivered play-based after-school reading instruction, with children grouped by assessed level and reassessed every two to three weeks. Social-emotional support was integrated and families received $45 cash transfers to reduce economic barriers.	Community volunteers	✓	✓	✓		✓	✓	Quasi-natural experiment	Participants were nearly eight times more likely to progress by at least one reading level, and higher social-emotional competency was associated with higher reading scores, especially in Kayin state.
ASPIRE home-visit programme (Bhatia & Leighton, 2024)	Rural India (Odisha and Jharkhand)	Acute	Pandemic: COVID-19	During closures	The NGO recruited 2,700 additional volunteer teachers who visited children weekly at home or in small outdoor groups, set a self-directed task and reviewed completed work at the end of each week, building on six years of existing local infrastructure.	Local volunteer teachers	~	✓	✓	✓			Pre- and post-assessment, no control group	Scores improved substantially over six months, with larger gains for children starting at lower levels, though without a control group the size of the impact cannot be determined.
Tutoring in a Healing Classroom (Brown et al., 2023)	Niger (Diffa region)	Chronic	Conflict: armed conflict and displacement	Ongoing disruption	Students below basic proficiency received four hours of small-group instruction per week for 22 weeks, combined with mindfulness exercises and games. 64% of selected children attended regularly, with attendance limited by insecurity, migration and child labour.	Government teachers (additionally trained)	✓	✓	✓			✓	RCT	Reading and mathematics improved equitably across gender, grade, refugee status and baseline ability, with substantially larger gains among consistent attenders.

Programme / study	Context	Nature of disruption	Cause of disruption	Phase	Approach and delivery	Delivered by	Targeted to level	Two-way interaction	In-person contact	Pre-existing systems	Attendance supports	Social-emotional	Evidence type	Effect on foundational learning
One-to-one online tutoring (Carlana & La Ferrara, 2021)	Italy	Acute	Pandemic: COVID-19	During closures	Volunteer university students provided one-to-one online tutoring to disadvantaged students during pandemic-related closures. Included for equity evidence; connectivity and device requirements limit transferability to lower-income settings.	Volunteer university students		✓					RCT	Learning improved, gains were larger for children of parents without college education and those in lower-income households than for their more advantaged peers.
One-to-one video tutoring (Chemin & Schneider, 2025)	Kenya (rural school)	Acute	Pandemic: COVID-19	Both (study spanned open and closed periods)	Volunteer tutors held weekly one-hour video calls with the same student throughout the term, teaching adaptively and building foundational skills before progressing. Tablets were provided and data costs covered.	Volunteer university students (Canada)	✓	✓		✓	✓		RCT	Tutoring that had been ongoing before closures had no effect on learning but tutoring supported learning to some extent during the nine-month closure, mitigating almost half of the closure-related loss.
Curriculum-aligned radio lessons with teacher phone calls (Crawfurd et al., 2023)	Sierra Leone	Acute	Pandemic: COVID-19	During closures	Each student had two assigned teachers, one for mathematics and one for reading, who each made a weekly 15-minute scripted call reviewing that week's national radio broadcast, over 16 weeks.	Private and government teachers		✓		~			RCT	The calls increased some measures of engagement but did not improve learning.

Programme / study	Context	Nature of disruption	Cause of disruption	Phase	Approach and delivery	Delivered by	Targeted to level	Two-way interaction	In-person contact	Pre-existing systems	Attendance supports	Social-emotional	Evidence type	Effect on foundational learning
Structured pedagogy programme adapted during closures (De Hoop et al., 2025)	Zambia	Acute	Pandemic: COVID-19	Both	When schools closed, teachers in a long-running structured pedagogy programme visited homes with homework packs and reviewed completed work with small groups. Radio broadcasts were also attempted but signal was often poor.	Programme teachers		✓	✓	✓			Cluster RCT (closure adaptations not isolated by design)	Reading gains were partially sustained more than a year after reopening, though below the programme's pre-pandemic effects.
Online tutoring during conflict (Dinarte et al., 2025)	Ukraine	Chronic	Conflict: war in Ukraine	Ongoing disruption	Online small-group tutoring was delivered to students during active conflict. Tutors were recruited from Teach for Ukraine and the programme adapted based on safety and other factors as well as providing in-person and psychosocial support.	Trained teachers	✓	✓	~	✓		✓	RCT	Benefits were greater for students underperforming at baseline and those from households experiencing higher stress.
Interactive radio instruction with facilitators (Ho & Thukral, 2009)	Sudan, Somalia	Chronic	Conflict: fragile, conflict-affected states	Ongoing disruption	Curriculum-aligned, interactive radio content was broadcast to groups in classrooms or community spaces with a facilitator present, who adapted delivery by slowing the pace, repeating sections and checking understanding.	Teachers or facilitators	~	✓	✓				RCTs, reported within a multi-programme synthesis	Substantial learning gains were recorded in both contexts, depending also on implementation quality, signal clarity and exposure to broadcasts.

Programme / study	Context	Nature of disruption	Cause of disruption	Phase	Approach and delivery	Delivered by	Targeted to level	Two-way interaction	In-person contact	Pre-existing systems	Attendance supports	Social-emotional	Evidence type	Effect on foundational learning
VAS-Y Fille! after-school tutoring and scholarships (International Rescue Committee, 2018)	Democratic Republic of Congo	Chronic	Conflict: ongoing instability	Ongoing disruption	Girls in grades 3 to 6 in the bottom half of their class received after-school tutoring two to three times a week from trained community tutors. Scholarships covered fees, uniforms and textbooks.	Community tutors	✓	✓	✓		✓		Multi-level models	Tutoring significantly raised girls' reading and mathematics scores, the largest gains among the programme components.
M-Shule SMS reading platform (Jordan et al., 2025)	Kenya	Chronic	Pandemic: COVID-19	After reopening	SMS reading lessons adapted from the national Tusome structured curriculum were delivered as a booster alongside children's return to school, with difficulty adjusting automatically in line with each child's quiz performance.	Automated SMS platform	✓						RCT	The programme produced significant reading gains as a supplement to schooling, but engagement was hard to sustain and only 57% of users completed even one sub-topic.
Funda Wande teaching assistants (Makaluza & Mpeta, 2022; Ardington, 2023)	South Africa (Limpopo)	Acute	Pandemic: COVID-19	After reopening	Rigorously recruited and trained teaching assistants worked in regular classrooms alongside teachers, with structured curricula and materials, supporting struggling learners individually or in groups of five to six.	Trained teaching assistants	✓	✓	✓				RCT (three arms)	Children in classrooms with teaching assistants made large gains in reading and mathematics by the end of grade 2. The intervention prevented children falling further behind, though it did not fully reverse pandemic losses.

Programme / study	Context	Nature of disruption	Cause of disruption	Phase	Approach and delivery	Delivered by	Targeted to level	Two-way interaction	In-person contact	Pre-existing systems	Attendance supports	Social-emotional	Evidence type	Effect on foundational learning
School action plans plus teacher training in targeted instruction (Maruyama & Igei, 2022; 2023)	Madagascar	Acute	Pandemic: COVID-19	After reopening	The government scaled up school action plan training plus teacher training in 'teaching at the right level' pedagogy to over 1,000 schools, using cascade training and locally produced materials. The staggered regional rollout allowed the training component to be isolated.	Teachers (cascade-trained)	✓	✓	✓	✓			Quasi-experimental	✓ Teacher training on targeted instruction increased the share of children reading at word and story level, with larger effects for girls and for children whose families read with them in Malagasy during closures.
Play-based learning for refugees (PlayMatters, 2026)	Ethiopia (Somali region)	Chronic	Conflict: displacement & Climate-related: recurrent drought	Ongoing disruption	Teachers in government refugee and host-community schools received training and ongoing coaching in a play-based approach (Learning through Play), delivering playful, child-centred, age-appropriate instruction that integrated social-emotional support.	Trained teachers	~	✓	✓	~	✓	✓	Cluster RCT	✓ Large gains in numeracy alongside more moderate gains in reading. The programme also produced large improvements in social-emotional skills.
Phone calls added to an existing online learning package (Schueler & Rodriguez-Segura, 2023)	Kenya (Bridge Kenya schools)	Acute	Pandemic: COVID-19	During closures	Weekly 5-minute accountability check-ins or 15-minute tutoring calls on grade-level mathematics were added to an existing package of radio content, a learning website, SMS homework reminders and parent WhatsApp groups.	Teachers		✓					RCT	✗ Neither call type improved learning at endline, and there was some evidence of negative effects from the tutoring calls at four-month follow-up among students who returned to school.

Programme / study	Context	Nature of disruption	Cause of disruption	Phase	Approach and delivery	Delivered by	Targeted to level	Two-way interaction	In-person contact	Pre-existing systems	Attendance supports	Social-emotional	Evidence type	Effect on foundational learning
Illam Thedi Kalvi after-school programme (Singh et al., 2024)	Tamil Nadu, India	Acute	Pandemic: COVID-19	After reopening	Large-scale play-based after-school instruction to children in groups of 15 to 20, grouped by assessed level, in evening sessions in schools, community halls or volunteers' homes, closely coordinated with the public school system.	Community volunteers (state-coordinated)	✓	✓	✓		✓		Panel study with value-added model	✓ The programme contributed meaningfully to recovery beyond what reopening alone achieved, with modest average gains among attenders and larger effects for children from more disadvantaged households.
EdTech programmes in refugee settings (Tobin & Hieker, 2021)	Greece, Jordan, Kenya, Rwanda	Chronic	Conflict: protracted displacement	Ongoing disruption	Educational technology was combined with in-person learning spaces where teachers worked directly with students. Practitioners reported that technology could not function as a stand-alone solution.	Teachers		✓	✓	✓	~		Qualitative (practitioner and teacher interviews)	Programmes that maintained engagement combined online elements with in-person, teacher-led spaces, which were especially important for girls and for learners long out of education.

Programme / study	Context	Nature of disruption	Cause of disruption	Phase	Approach and delivery	Delivered by	Targeted to level	Two-way interaction	In-person contact	Pre-existing systems	Attendance supports	Social-emotional	Evidence type	Effect on foundational learning
Tutoring in a Healing Classroom, with skill-targeted social-emotional learning (Tubbs Dolan et al., 2022)	Lebanon	Chronic	Conflict: protracted displacement	Ongoing disruption	Syrian refugee children in Lebanese public schools were offered nonformal after-school remedial tutoring in reading and mathematics, infused with classroom climate-targeted social-emotional learning. A second arm added skill-targeted mindfulness activities.	NGO-recruited teachers		✓	✓			✓	Cluster RCT	No direct effect on children's overall reading and mathematics scores. The version adding skill-targeted social-emotional learning produced small gains on some basic academic skills and improved children's perceptions of school.
Interactive radio instruction for displaced children (Verlumun Celestine et al., 2022)	Nigeria	Chronic	Conflict: displacement in Nigeria	Ongoing disruption	Trained facilitators delivered interactive radio instruction to children displaced by conflict, with broadcasts focused on foundational reading skills: phonological awareness, letter knowledge, oral comprehension and vocabulary.	Trained facilitators	✓	✓	✓	✓	✓		Quasi-experimental	Participants' foundational reading skills improved, with gains sustained at 12-month follow-up.

References

Adil, F., Nazir, R., & Akhtar, M. (2022). Investigating the impact on learning outcomes through the use of EdTech during COVID-19: Evidence from an RCT in the Punjab province of Pakistan. *Frontiers in Education*, *7*. https://doi.org/10.3389/feduc.2022.993265

Alejo, A., Jenkins, R., & Yao, H. (2024). Learning losses during the COVID-19 pandemic: Understanding and addressing increased learning disparities. *Future in Educational Research*, *2*(1), 16–29. https://doi.org/10.1002/fer3.21

Ameer, A., & Ghannam, R. (2025). Education in a changing climate: A systematic review for low and middle-income countries (LMICs). *Sustainable Development*. https://doi.org/10.1002/sd.70490

Amenya, D., Fitzpatrick, R., Njeri Mvungu, E., Naylor, R., Page, E., & Riggall, A. (2021). *The power of girls' reading camps: Exploring the impact of radio lessons, peer learning, and targeted paper-based resources on girls' remote learning in Kenya* (EdTech Hub Working Paper No. 32). EdTech Hub. https://doi.org/10.5281/zenodo.4923094

Andrabi, T., Daniels, B., & Das, J. (2023). Human capital accumulation and disasters: Evidence from the Pakistan earthquake of 2005. *Journal of Human Resources*, *58*(4), 1057–1096. https://doi.org/10.3368/jhr.59.2.0520-10887R1

Angrist, N., Ainomugisha, M., Bathena, S. P., Bergman, P., Crossley, C., Cullen, C., Letsomo, T., Matsheng, M., Panti, R. M., Sabarwal, S., & Sullivan, T. (2026). Mobile education builds resilience during shocks in five countries. *Nature*, 1–8. https://doi.org/10.1038/s41586-026-10990-x

Angrist, N., Andrabi, T., Dercon, S., Djaker, S., Habyarimana, J., Kaffenberger, M., Leaver, C., Mangla, A., Mohohlwane, N., & Singh, A. (2026). An agenda for implementation science in education. *Science*, *393*(6816), 1084–1087. https://doi.org/10.1126/science.aee7868

Angrist, N., Bergman, P., & Matsheng, M. (2022). Experimental evidence on learning using low-tech when school is out. *Nature Human Behaviour*, *6*(7), 941–950. https://doi.org/10.1038/s41562-022-01381-z

Angrist, N., Evans, D. K., Filmer, D., Glennerster, R., Rogers, H., & Sabarwal, S. (2025). How to improve education outcomes most efficiently? A review of the evidence using a unified metric. *Journal of Development Economics*, *172*, 103382. https://doi.org/10.1016/j.jdeveco.2024.103382

Ardington, C. (2023). *Funda Wande Limpopo evaluation: Second midline report*. South African Labour and Development Research Unit, University of Cape Town. https://fundawande.org/wp-content/uploads/2025/03/Limpopo-Second-Midline-Report-2023-V03.pdf

Ardington, C., Menendez, A., & Thunde, J. (2026). The limits of a "great buy": *What rigorous evidence reveals about Teaching at the Right Level* [Critical review]. AfLearn Datahub. https://dfru.uct.ac.za/aflearn/articles/2026-01-21-paper-limits-great-buy-what-rigorous-evidence-reveals-about-teaching-right-level

Ardington, C., Wills, G., & Kotze, J. (2021). COVID-19 learning losses: Early grade reading in South Africa. *International Journal of Educational Development*, *86*, 102480. https://doi.org/10.1016/j.ijedudev.2021.102480

Arlini, S. M., Chefchaouni, N. C., Chia, J., Gordon, M., & Shrestha, N. (2023). Impact of catch-up clubs in conflict-affected Myanmar: A community-led remedial learning model. *Journal on Education in Emergencies*, 9(1), 17–63. https://doi.org/10.33682/9t2r-vc39

Bandiera, O., Buehren, N., Goldstein, M., Rasul, I., & Smurra, A. (2020). Do school closures during an epidemic have persistent effects? Evidence from Sierra Leone in the time of Ebola. *J-PAL Working Paper*. https://www.povertyactionlab.org/sites/default/files/research-paper/working-paper_720_School-Closures-During-Epidemic_Sierra-Leone_July2020.pdf

Banerjee, A., Banerji, R., Berry, J., Duflo, E., Kannan, H., Mukherji, S., Shotland, M., & Walton, M. (2016). *Mainstreaming an effective intervention: Evidence from randomized evaluations of "Teaching at the Right Level" in India* (Working Paper No. 22746). *National Bureau of Economic Research*. https://doi.org/10.3386/w22746

Bhatia, K., & Leighton, M. (2024). Teachers on the move: Evidence from a large-scale learning intervention during lockdown. *The Journal of Development Studies, 60*(7), 1002–1020. https://doi.org/10.1080/00220388.2024.2337381

Brown, L. E., Kim, H. Y., Tubbs Dolan, C., Brown, A., Sklar, J., & Aber, J. L. (2023). Remedial programming and skill-targeted SEL in low-income and crisis-affected contexts: Experimental evidence from Niger. *Journal of Research on Educational Effectiveness, 16*(4), 583–614. https://doi.org/10.1080/19345747.2022.2139785

Burde, D., Coombes, A., De Hoop, T., Guven, O., Okhido, O., Ring, H., Rothbard, V., & Udayakumar Holla, C. (2023). *Forced displacement and education: Building the evidence for what works - Evidence synthesis and intervention map* [Report]. World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099183002142332489

Burde, D., Guven, O., Kelcey, J., Lahmann, H., & Al-Abbadi, K. (2015). *What works to promote children's educational access, quality of learning, and wellbeing in crisis-affected contexts* [Education Rigorous Literature Review]. Department for International Development. https://www.gov.uk/research-for-development-outputs/what-works-to-promote-children-s-educational-access-quality-of-learning-and-wellbeing-in-crisis-affected-contexts

Carlana, M., & La Ferrara, E. (2021). *Apart but connected: Online tutoring and student outcomes during the COVID-19 pandemic* (SSRN Scholarly Paper No. 3783987). Social Science Research Network. https://papers.ssrn.com/abstract=3783987

Chemin, M., & Schneider, J. (2025). Online tutoring reduces by half the learning loss due to school closures: Evidence from a randomized experiment in Kenya. *International Journal of Educational Development, 117*, 103332. https://doi.org/10.1016/j.ijedudev.2025.103332

Crawfurd, L., Evans, D. K., Hares, S., & Sandefur, J. (2023). Live tutoring calls did not improve learning during the COVID-19 pandemic in Sierra Leone. *Journal of Development Economics, 164*, 103114. https://doi.org/10.1016/j.jdeveco.2023.103114

De Hoop, T., Ring, H., Siwach, G., Dias, P., & Tembo, G. (2025). *How sustainable are learning gains after school closures? Findings from a 5-year randomized controlled trial in Zambia*. American Institutes for Research. https://www.air.org/sites/default/files/2025-11/Learning-Gains-After-School-Closures-Zambia-September-2025.pdf

Dela Cruz, N. A., Adona, A. J., Molato-Gayares, R., & Park, A. (2025). Learning loss and recovery from the COVID-19 pandemic: A systematic review of evidence. *International Journal of Educational Development, 115*, 103271. https://doi.org/10.1016/j.ijedudev.2025.103271

Diazgranados Ferráns, S., & Thuo, B. (2026). What works and at what cost to improve foundational learning for school-aged children in conflict and protracted crisis? A meta-analysis and cost-effectiveness analysis of education interventions for school-aged children. *International Journal of Educational Development, 125*, 103569. https://doi.org/10.1016/j.ijedudev.2026.103569

Diazgranados Ferráns, S., Thuo, B., & López, I. (2026). What works to improve social-emotional skills in conflict and crisis settings: Evidence from a meta-analysis of education interventions. *Education and Conflict Review, 7*([Whole issue]). https://doi.org/10.33682/q0p3-jc1j

Dinarte, L., Gresham, J., Lemos, R., Patrinos, H., & Rodriguez-Ramirez, R. (2025). *Investing in human capital during wartime: Experimental evidence from Ukraine* (SSRN Scholarly Paper No. 5492813). Social Science Research Network. https://doi.org/10.2139/ssrn.5492813

Foster, A. D., & Gehrke, E. (2017). *Start what you finish! Ex ante risk and schooling investments in the presence of dynamic complementarities* (No. W24041). National Bureau of Economic Research. https://doi.org/10.3386/w24041

Garg, T., Jagnani, M., & Taraz, V. (2020). Temperature and human capital in India. *Journal of the Association of Environmental and Resource Economists, 7*(6), 1113–1150. https://doi.org/10.1086/710066

Gremley, E. (2025, September 5). *Foundational learning and climate resilience: Two sides of the same coin* [Blog Post: What Works Hub for Global Education]. https://www.wwhge.org/resources/foundational-learning-and-climate-resilience-two-sides-of-the-same-coin/

Ho, J., & Thukral, H. (2009). Tuned in to student success: Assessing the impact of interactive radio instruction for the hardest-to-reach. *Journal of Education for International Development, 4*(2), 34–51.

International Rescue Committee. (2018). *Improving girls' access and learning outcomes in the Democratic Republic of Congo: Evidence from a DFID-funded randomized control trial of VAS-Y Fille!* [Research Brief]. IRC.

Jensen, R. (2000). Agricultural volatility and investments in children. *American Economic Review, 90*(2), 399–404. https://doi.org/10.1257/aer.90.2.399

Jordan, K., Myers, C., Damani, K., Khagame, P., Mumbi, A., & Njuguna, L. (2025). Supporting equitable access to learning via SMS in Kenya: Impact on engagement and learning outcomes. *British Journal of Educational Technology, 56*(4), 1530–1552. https://doi.org/10.1111/bjet.13533

Kaffenberger, M. (2021). Modelling the long-run learning impact of the COVID-19 learning shock: Actions to (more than) mitigate loss. *International Journal of Educational Development, 81*, 102326. https://doi.org/10.1016/j.ijedudev.2020.102326

Kan, S., Dreesen, T., & Valenza, M. (2022). *On call: Using mobile phones to provide learning in emergencies*. UNICEF Office of Research - Innocenti. https://eric.ed.gov/?id=ED624512

Kim, H. Y., Brown, L. E., Tubbs Dolan, C., Ngoga, E., Fernandes, R. F., Wu, Z., & Aber, J. L. (2026). Skill-targeted universal social and emotional learning interventions for education in conflict and crisis: Experimental impacts in Niger. *Journal of Research on Educational Effectiveness, 19*(3), 827–859. https://doi.org/10.1080/19345747.2025.2591604

Kwok, J., Sable, A., & Smiley, A. (2026). Learning through play in conflict and crisis contexts: A review of education interventions. *Education and Conflict Review, 7*, 139–150.

Leigh, S. (1995). *Changing times in South Africa: Remodeling interactive learning* (LearnTech Case Study Series No. 8). Education Development Center. https://eric.ed.gov/?id=ED386153

Makaluza, N., & Mpeta, B. (2022). Two birds with one stone: Improving Grade 1 learning outcomes using Funda Wande teaching assistants in Limpopo 2021–2022. In N. Spaull & S. Taylor (Eds), *Early Grade Reading and Mathematics Interventions in South Africa*. Oxford University Press. https://www.calameo.com/oxford-university-press-south-africa/read/006710753e7d90d4a4755

Maruyama, T., & Igei, K. (2022). *Community-wide support for primary students to improve basic reading and math learning: Empirical evidence from Madagascar* (SSRN Scholarly Paper No. 4076787). Social Science Research Network. https://doi.org/10.2139/ssrn.4076787

Maruyama, T., & Igei, K. (2023). *Scaling up interventions to improve basic reading: Evidence from Madagascar after the COVID-19 pandemic shock on education* (Ogata Research Institute Discussion Paper No. 4). JICA Ogata Research Institute for Peace and Development. https://www.jica.go.jp/english/jica_ri/publication/discussion/dp_04.html

OCHA. (2022). *Humanitarian needs and priorities super typhoon Rai (Odette): Philippines*. UN Office for the Coordination of Humanitarian Affairs. https://reliefweb.int/report/philippines/philippines-super-typhoon-rai-odette-humanitarian-needs-and-priorities-revision

Pacitto, J., Hayat, A., Hinks, J., Parfait Emerusenge, A., Rabi, A., & Ullah, N. (2026). Remote teaching and learning in emergencies: A rapid evidence review. *Education and Conflict Review, 7*, 161–174.

Patrinos, H., Vegas, E., & Carter-Rau, R. (2023). An analysis of COVID-19 student learning loss. In *Oxford Research Encyclopedia of Economics and Finance*. https://doi.org/10.1093/acrefore/9780190625979.013.893

PlayMatters. (2026). *Learning through play to improve teaching, learning and wellbeing in conflict and crisis: Findings from a randomized control trial in Ethiopia* [Evidence Brief]. PlayMatters.

Radhakrishnan, K., Sabarwal, S., Sharma, U., Cullen, C., Crossley, C., Letsomo, T., & Angrist, N. (2021). *Remote learning: Evidence from Nepal during COVID-19* [Policy Brief]. The World Bank.

Sabarwal, S., Marin, S. V., Spivack, M., & Ambasz, D. (2024). *Choosing our future: Education for climate action*. World Bank Group. https://www.worldbank.org/en/topic/education/publication/education-for-climate-action

Schueler, B. E., & Rodriguez-Segura, D. (2023). A cautionary tale of tutoring hard-to-reach students in Kenya. *Journal of Research on Educational Effectiveness, 16*(3), 442–472. https://doi.org/10.1080/19345747.2022.2131661

Singh, A., Romero, M., & Muralidharan, K. (2024). COVID-19 learning loss and recovery: Panel data evidence from India. *Journal of Human Resources*. https://doi.org/10.3368/jhr.0723-13025R2

Tobin, E., & Hieker, C. (2021). What the EdTech experience in refugee camps can teach us in times of school closure. Blended learning, modular and mobile programs are key to keeping disadvantaged learners in education. *Challenges, 12*(2). https://doi.org/10.3390/challe12020019

Tubbs Dolan, C., Kim, H. Y., Brown, L., Gjicali, K., Borsani, S., Houchaimi, S. E., & Aber, J. L. (2022). Supporting Syrian refugee children's academic and social-emotional learning in national education systems: A cluster randomized controlled trial of nonformal remedial support and mindfulness programs in Lebanon. *American Educational Research Journal, 59*(3), 419–460. https://doi.org/10.3102/00028312211062911

UNICEF. (2021). *Ensuring equal access to education in future crises: Findings of the new remote learning readiness index*. United Nations Children's Fund. https://data.unicef.org/resources/remote-learning-readiness-index/

UNICEF. (2025). *Learning interrupted: Global snapshot of climate-related school disruptions in 2024*. UNICEF. https://www.unicef.org/reports/learning-interrupted-global-snapshot-2024

UNICEF, & Hempel Foundation. (2025). *Foundations first: Insights from the global foundational learning action tracker 2025*. UNICEF and the Hempel Foundation. https://www.unicef.org/reports/foundations-first-2025

Vasilakopoulou, K., & Santamouris, M. (2025). Cumulative exposure to urban heat can affect the learning capacity of students and penalize the vulnerable and low-income young population: A systematic review. *PLOS Climate, 4*(7), e0000618. https://doi.org/10.1371/journal.pclm.0000618

Verlumun Celestine, G., Talabi, F. O., Talabi, J. M., Adefemi, V. O., Bello, S. A., Oluyemi, A. A., & Destiny Apuke, O. (2022). Learning through interaction: Impact of interactive radio instructions in improving literacy skills of out-of-school children in IDP camps in Nigeria. *Interactive Learning Environments, 32*(3), 1058–1067. https://doi.org/10.1080/10494820.2022.2110124

Webb, D. (2024). Critical periods in cognitive and socioemotional development: Evidence from weather shocks in Indonesia. *The Economic Journal, 134*(660), 1637–1665. https://doi.org/10.1093/ej/uead105

World Bank, & UIS. (2022). *Learning poverty global database*. The World Bank and UNESCO Institute of Statistics. https://data360.worldbank.org/en/dataset/WB_LPGD

Yao, H., Angrist, N., Smith, S. L., & Ananiadou, K. (2025, June 10). *New data and evidence on climate-resilient education* [Blog Post: What Works Hub for Global Education]. https://www.wwhge.org/resources/new-data-and-evidence-on-climate-resilient-education/

What Works Hub
for Global Education

www.wwhge.org
wwhge@bsg.ox.ac.uk

BLAVATNIK SCHOOL OF GOVERNMENT
UNIVERSITY OF OXFORD
UK International Development
Partnership | Progress | Prosperity