



**HOLISTIC MULTIDIMENSIONAL GUIDELINES:**

# **IMPLEMENTING RESILIENT E-EDUCATION ECOSYSTEMS IN RURAL AREAS**

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# HOLISTIC MULTIDIMENSIONAL GUIDELINES: IMPLEMENTING RESILIENT E-EDUCATION ECOSYSTEMS IN RURAL AREAS

## ABSTRACT

As countries move towards “building forward better” from the COVID-19 pandemic, it is critical that e-education ecosystems are strengthened, enabling the continued delivery of quality education to all and achieving learning outcomes in future crises, while safeguarding the rights and well-being of all children and youth. This document presents holistic multidimensional guidelines for implementing sustainable, effective and resilient e-education ecosystems in rural areas. These guidelines are based on a series of studies conducted by the eWorldwide Group and the Institute of Electrical and Electronics Engineers—Standards Association that have been engaging with multiple stakeholders in developing a global framework to better understand and address the multitude of complex and interrelated challenges to achieve holistic-resilience in education. The guidelines build on this framework that is made up of four critical components: (i) technical; (ii) human capacity; (iii) economic; and (iv) social, cultural and traditional. Each critical component is comprised of key elements and considerations that need to be examined and addressed in an integrated manner (Table 1). Guidelines are provided for these elements and considerations.

Table 1: Overview of Guidelines

| 1. Technical Components and Considerations              |
|---------------------------------------------------------|
| ▪ Digital infrastructure and connectivity at school     |
| ▪ Digital infrastructure and connectivity in households |
| ▪ Digital content                                       |
| ▪ Digital application                                   |
| ▪ Digital platforms                                     |
| ▪ Digital pedagogy                                      |
| ▪ Digital school administration system                  |

**Table 1: Overview of Guidelines**

|                                                                           |                                              |
|---------------------------------------------------------------------------|----------------------------------------------|
| <b>2. Human Capacity Components and Considerations</b>                    |                                              |
| ▪                                                                         | Educators                                    |
| ▪                                                                         | Students                                     |
| ▪                                                                         | School administrators                        |
| ▪                                                                         | School social service providers              |
| ▪                                                                         | Parents and caregivers                       |
| ▪                                                                         | Out-of-school children                       |
| <b>3. Economic Components and Considerations</b>                          |                                              |
| ▪                                                                         | Disposable income                            |
| ▪                                                                         | Poor and marginalized communities            |
| ▪                                                                         | Affordability                                |
| ▪                                                                         | Out-of-school children                       |
| ▪                                                                         | Unemployed                                   |
| ▪                                                                         | Skills gap and the future of work            |
| <b>4. Social, Cultural, and Traditional Components and Considerations</b> |                                              |
| ▪                                                                         | Local environment and terrain                |
| ▪                                                                         | Social, cultural, and traditional components |
| ▪                                                                         | Physical and mental well-being               |

# 1. INTRODUCTION

The COVID-19 pandemic resulted in unprecedented school closures across the globe, affecting nearly 1.6 billion or over 90% of learners in more than 190 countries at its height.<sup>1</sup> Schools pursued a variety of approaches to mitigate the closures, including remote learning and hybrid models that blend in-person and remote learning using radio, television, mobile phones, and online platforms. As a result, schools generally experienced accelerated digitalization of teaching and learning. However, they faced numerous technical, human capacity, economic, and social challenges as they transitioned to remote and hybrid learning.

The United Nations Children’s Fund (UNICEF) found at least a third of the world’s children are left without the technology they need for remote learning via radio, television, and the internet during the pandemic, many of them living in rural areas (**technical** challenge).<sup>2</sup> In addition, there are **human capacity** challenges related to the lack of digital skills among both educators and learners that prevent participation in online teaching and learning, even when the technologies are available.<sup>3</sup> Other challenges are **economic**, related to the high cost of digital devices and internet connection and their continued lack of affordability for millions worldwide.<sup>4</sup> Traditional **social** norms and concerns related to personal security and privacy are also keeping millions offline. For instance, socio-cultural norms that restrict the role of women and girls in society serve to hinder their access to and use of digital technologies—globally, women are 20% less likely to use mobile internet than men.<sup>5</sup> To date, there is little research on gender differences in digital access for children under the age of 18, but the limited data available shows similar trends where girls tend to have less access to digital devices than boys. Roughly, 46% of boys use the internet on their phones, compared to 27% of girls.<sup>6</sup>

Crises and shocks like the COVID-19 pandemic will continue to disrupt their lives due to future infectious disease outbreaks, extreme climate events, increasing trade tensions, and complex geopolitics, which is why resilience building is more crucial than ever. If countries address each new crisis as it arises, the authors will again have a similar disjointed response and face similar disruptions, undermining development gains, with severe implications on children’s learning outcomes, mental and physical health, and future employability.

<sup>1</sup> United Nations, “Policy Brief: Education during COVID-19 and beyond,” August 2020, [https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg\\_policy\\_brief\\_covid-19\\_and\\_education\\_august\\_2020.pdf](https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf).

<sup>2</sup> UNICEF, “COVID-19: At least a third of the world’s schoolchildren unable to access remote learning during school closures, new report says,” Press Release, 26 August 2020, <https://www.unicef.org/press-releases/covid-19-least-third-worlds-schoolchildren-unable-access-remote-learning-during>.

<sup>3</sup> Education Development Trust, “Overview of emerging country-level response to providing continuity under COVID-19: What steps are being taken to reach the most disadvantaged students during the period of COVID-19 school closure?” May 2020, <https://edtechhub.org/wp-content/uploads/2020/09/disadvantaged-students.pdf>.

<sup>4</sup> A4AI, “Affordability Report 2021,” 2021, <https://a4ai.org/report/2021-affordability-report/>.

<sup>5</sup> GSMA, “The State of Mobile Internet Connectivity 2020,” 2020, <https://www.gsma.com/r/somic/>.

<sup>6</sup> UNICEF, “What we know about the gender digital divide for girls: A literature review,” <https://www.unicef.org/eap/media/8311/file/What%20we%20know%20about%20the%20gender%20digital%20divide%20for%20girls%20A%20literature%20review.pdf>.

The authors need to build the e-resilience of education systems as the pandemic has accelerated the digitalization of all sectors, including education, albeit in an ad hoc and unequal manner. Although UNICEF reports that 73% of countries have used internet-based remote learning for education,<sup>7</sup> adoption has been unequal due to digital rural–urban and gender divides. Globally, three out of four students who cannot be reached by countries’ remote learning policies during COVID-19 come from rural areas and/or belong to the poorest households.<sup>8</sup>

As countries move toward “building forward better” from the COVID-19 pandemic, holistic e-resilience that incorporates technical, human capacity, economic and social components, and considerations will be critical for ensuring that e-education systems are able to continue delivering quality education to all and achieving learning outcomes during crises while safeguarding the rights and well-being of all children and youth. This will in turn strengthen communities and countries against shocks and crises, and create opportunities to fully reap the benefits of digital technologies and improve lives.

In order to strengthen the e-resilience of education systems, the eWorldwide Group, in collaboration with the Institute of Electrical and Electronics Engineers—Standards Association (IEEE SA), has been engaging with multiple stakeholders in developing a global framework to better understand and address the multitude of complex and interrelated challenges to achieve holistic e-resilience in education. A key finding from the series of studies conducted by the eWorldwide Group and IEEE SA shows the lack of global standards for the realization of holistic e-resilience in education. As a step toward filling this gap, these guidelines will be piloted in a rural secondary school to inform the standards development process. These guidelines are based on the series of studies conducted, as well as on global best practices.

We are focusing on rural secondary schools for several reasons. First, they typically have more infrastructure, equipment, and funding. Second, secondary schools are critical in laying a solid academic foundation for when children eventually leave school and determine their future productivity and employability. Third, secondary schools have the potential to become community education hubs to enhance the digital literacy and skills of out-of-school children, youth not in employment, education, or training (NEET), and adults, as well as offer courses for upskilling and reskilling. Lockdowns have resulted in learning losses, which are likely to affect future academic performance and increase drop-out rates.<sup>9</sup> This can make it harder for students at secondary schools to acquire the necessary skills to pursue further education or vocational training, or even secure entry-level jobs. Entry-level jobs today require more skills than they did a decade ago, and there are fewer available because of automation.<sup>10</sup> Secondary schools’ role in promoting lifelong learning is more important than ever.

<sup>7</sup> UNICEF, “Promising practices for remote learning: Emerging lessons from COVID-19 education response in 127 countries,” October 2020, <https://www.unicef-irc.org/publications/pdf/IRB%202020-10%20CL.pdf>.

<sup>8</sup> UNICEF, “COVID-19: Are children able to continue learning during school closures?” August 2020, <https://data.unicef.org/resources/remote-learning-reachability-factsheet/>.

<sup>9</sup> Joao Pedro Azavedo et al., “Learning losses due to COVID19 could add up to \$10 trillion,” World Bank Blogs, 10 September 2020, <https://blogs.worldbank.org/education/learning-losses-due-covid19-could-add-10-trillion>.

<sup>10</sup> World Economic Forum, *Global Risks Report 2021* (2021), [http://www3.weforum.org/docs/WEF\\_The\\_Global\\_Risks\\_Report\\_2021.pdf](http://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2021.pdf).

## 2. SETTING THE STAGE

This section highlights the key technical, human capacity (of learners, educators, school administrators, parents, and caregivers), economic, and social challenges that must be addressed in order to strengthen the e-resilience of education systems.

### 2.1. TECHNICAL CHALLENGES

About half of the world's population continues to have no or low bandwidth internet access, and at least 30% of the global student population lacks the technology at home to participate in remote learning.<sup>11</sup> The digital divide between countries and regions, and within countries (even in high-income countries), prevented access to education during the pandemic as schools close to control the spread of the virus, and there was a shift to remote learning. Now, even as schools reopen, remote learning and hybrid models continue to be used, which means those poorest and most vulnerable continue to be denied access to education. COVID-19 has raised the urgency to provide broadband connectivity not only to all education institutions but all homes as well. Moreover, many rural and remote regions do not have the basic infrastructure to support the use of digital technologies due to the irregular supply of electricity.

For online learning, a dedicated digital device is required for each child (not shared), preferably a laptop or desktop—a smartphone is considered inadequate for online learning.<sup>12</sup> Moreover, connectivity should preferably be strong enough to participate in online classes, and stream or download educational video content. Other essential network equipment needed to support online learning include adequate and secure cloud storage for sharing and backup of educational content and other relevant data and information.

There is a lack of global standards for hardware and software requirements for e-education, including minimum connectivity speed and bandwidth; appropriate devices for learners, educators, and administrators; and ensuring affordability of equipment, devices, and data plans. There is also a lack of guidance on the appropriate mix of technologies for delivering education through remote learning or hybrid models. Nevertheless, some international best practices and guidelines are presented in Section 3 for consideration during pilot implementation.

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<sup>11</sup> UNICEF, "COVID-19: Are children able to continue learning during school closures?" August 2020, <https://data.unicef.org/resources/remote-learning-reachability-factsheet/>.

<sup>12</sup> Christopher H. Tienken, "The Not So Subtle Inequity of Remote Learning," Kappa Delta Pi Record, vol. 56 (2020), <https://www.kdp.org/resources/pdf/covid19/Rec-Oct20-Tienken.pdf>.

## 2.2. HUMAN CAPACITY CHALLENGES

In order to strengthen the e-resilience of education systems, the human capacity challenges of all stakeholders must be addressed. The stakeholders include learners, educators, school administrators, social service providers, parents, and caregivers, and those not in school.

For **learners**, besides the challenge of accessing digital connectivity and devices, they may still be denied access to education if they lack the digital literacy, skills, and competencies to use the range of apps and digital tools for learning. However, COVID-19 has brought to the fore the need to adopt a holistic lens to human capacity building for learners that goes beyond merely empowering them to use the technologies for learning, to encompass: digital safety, security, and privacy; socio-emotional skills such as critical thinking, problem-solving, and empathy; and job-specific skills, including digital creativity and innovation.

**Educators** have generally been poorly supported in the enhancement of their technical and pedagogical skills for digital teaching and learning. The pandemic has highlighted the broader role of educators, not only in delivering education but also in supporting the safety, health, and well-being of learners, addressing socio-cultural barriers learners face in accessing education and using digital technologies, and dealing with online and offline violence and other risks.<sup>13</sup> Careful assessment of these changing roles and new skills required of educators are needed for incorporation in their professional development.

The challenges faced by **school administrators** during COVID-19 have been wide-ranging. They include the need to: put in place systems, policies, and procedures for remote learning; find effective ways for assessments; ensure quality assurance in the digital environment; motivate and support learners and educators, as well as parents and caregivers; deal with a rise in drop-out rate; and promote educator–learner–parent/caregiver communication and engagement, among others. School administrators also need to learn how best to use, analyze, and visualize the data from digital teaching and learning to improve education quality for all and target resources.

Since schools are hubs for social services beyond academic learning, **school social service providers** must promote the physical and mental health and psychosocial well-being of learners, educators, and other education personnel, and ensure that digital teaching and learning environments protect their privacy and security rights. An impact study that looked at international research over the last ten years showed links between whole-school approaches to promoting well-being and academic attainment as well as other educational outcomes, including mental health, motivation, and behavior.<sup>14</sup>

**Parents and caregivers** with little to no digital literacy struggled to help their children access the e-education

<sup>13</sup> UNESCO, UNICEF and World Bank, "What have we learnt? Overview of findings from a survey of ministries of education on national responses to COVID-19," October 2020, <https://openknowledge.worldbank.org/handle/10986/34700>.

<sup>14</sup> Oxford University Press, "Wellbeing Impact Study," <https://oxfordimpact.oup.com/home/wellbeing-impact-study/>.

provided by their schools during COVID-19 and school closure.<sup>15</sup> Partnership with parents and caregivers is important in ensuring the continuity of learning for children, and in building e-resilience in education.

Keeping vulnerable learners enrolled in schools is a challenge under ordinary circumstances. Crises like COVID-19 tend to increase the number of school drop-out rates. The United Nations estimates that 23.8 million children and youth may drop out or not have access to school due to the pandemic's economic impact alone.<sup>16</sup> Other causes for dropping out of school, especially for girls, include early and forced marriage, teenage pregnancies, gender-based violence, child labor, and migration. Holistic thinking and multistakeholder collaboration are necessary to address the complex barriers related to providing access to quality education and lifelong learning for **out-of-school children and youth NEET**. Proactive strategies need to be in place to, on the one hand, encourage re-enrollment and, on the other hand, provide alternative means for out-of-school children to continue learning.

## 2.3. ECONOMIC CHALLENGES

Most measurements of access focus on the availability of connectivity (fixed- and mobile-broadband) and devices (mobile phones and computers). However, another key factor limiting internet usage is the data affordability and data caps in broadband plans. A 2019 survey carried out in 11 low- and middle-income countries found that half of the respondents had difficulty paying for their mobile data usage, and over 40% frequently or occasionally restrict the amount of data they use.<sup>17</sup> Instead of purchasing large amounts of data every month, users buy it in small amounts when they have the money. This inhibits remote learning. Since operators have been able to offer extra data and unlimited data for free during the pandemic, and this shows that it is possible to provide uncapped data.

The Alliance for Affordable Internet (A4AI) established a threshold for affordable mobile data if 1 GB can be purchased for less than 2% of the country's monthly gross national income (GNI) per capita.<sup>18</sup> However, the metrics for affordability are constantly shifting, particularly in light of the development of increasingly data-intensive content and services and increasing demand for such content and services, such as video streaming and video calls. In 2019, A4AI stated that 1 GB of data per month was sufficient to benefit from the internet in a meaningful way, but later it was revised to unlimited data.

Shocks and crises disproportionately affect people with low incomes or living in or near poverty. They are more

<sup>15</sup> UNESCO, "Education for the most marginalised post-COVID-19: Guidance for governments on the use of digital technologies in education—Act Two (of Three): Full Report," November 2020, <https://edtechhub.org/wp-content/uploads/2020/09/Education-for-the-most-marginalised-Report-Act-2-v8.pdf>.

<sup>16</sup> United Nations, "Policy Brief: Education during COVID-19 and beyond," August 2020, [https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg\\_policy\\_brief\\_covid-19\\_and\\_education\\_august\\_2020.pdf](https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf).

<sup>17</sup> Laura Silver et al., "Mobile Divides in Emerging Economies," Pew Research Center, 20 November 2019, <https://www.pewresearch.org/internet/2019/11/20/mobile-divides-in-emerging-economies/>.

<sup>18</sup> A4AI, "Affordable Internet is '1 for 2'," <https://a4ai.org/affordable-internet-is-1-for-2>.

likely to lose their job or experience interruptions to incomes and remittances, depletion of savings, and diminished employment prospects. As parents lose jobs or incomes, they are less able to cover expenses they had previously afforded for their children's education and are less able to cover new expenses necessitated by e-education. Limited or no family income clearly places pressure on families who want to send their children to school. This in turn impacts children's future employability and well-being.

## 2.4. SOCIAL CHALLENGES

For many girls, especially those from low-income countries and the poorest communities, access to education was already a challenge before COVID-19. A recent UNICEF report shows that nearly one in three adolescent girls from the poorest households around the world has never been to school, and estimates show that only 25% of the poorest girls in low-income countries complete primary school.<sup>19</sup> Emergencies exacerbate pre-existing inequalities and intensify the existing learning crisis. Generally, marginalized girls are more at risk than boys of dropping out of school following a crisis for various reasons, including the lack of finance, and early and forced marriages and pregnancies. A study estimates that approximately 20 million more secondary school-aged girls could be out of school after the COVID-19 crisis.<sup>20</sup> As part of building e-resilience in education, the protection of girls' education and promotion of girls' health and safety at school should be strengthened.

In addition, the underlying societal and cultural barriers to education need to be addressed to uproot inequalities and exclusions. They include understanding gender divides that are resulting in unequal access to education, healthcare, and technology. For instance, inside households, girls disproportionately bear the burden of household chores and may be limited by gendered attitudes and gatekeepers. Outside households, girls tend to have limited access to community internet and media facilities due to concerns for their safety. Unless these underlying social and cultural norms are changed, the increasing use of digital technologies will only exacerbate gender inequality.

To bring about change, a holistic approach is needed that ensures digital skills are taught throughout the education system in a gender-sensitive way; focuses on ways digital technologies can serve to include rather than exclude girls and women in education, and protects them from harm; and addresses the wider issues surrounding the involvement of women in the tech sector (e.g., promote science, technology, engineering, and mathematics or STEM learning and career opportunities for girls). Educational content needs to be gender-sensitive, promote female role models, and avoid the use of gender stereotypes. These gender stereotypes are being played out in

<sup>19</sup> Robert Jenkins and Rebecca Winthrop, "5 actions to help bring the most marginalized girls back to school after COVID-19," Brookings, 15 May 2020, <https://www.brookings.edu/blog/education-plus-development/2020/05/15/5-actions-to-help-bring-the-most-marginalized-girls-back-to-school-after-covid-19/>.

<sup>20</sup> Malala Fund, "Girls' Education and COVID-19," [https://downloads.ctfassets.net/0oan5gk9rgbh/6TMYLYAcUpihQpXLDgmdla/3e1c12d8d827985e2b4e815a3a6da1f/COVID19\\_GirlsEducation\\_corrected\\_071420.pdf](https://downloads.ctfassets.net/0oan5gk9rgbh/6TMYLYAcUpihQpXLDgmdla/3e1c12d8d827985e2b4e815a3a6da1f/COVID19_GirlsEducation_corrected_071420.pdf).

digital spaces through cyberbullying, online exploitation, and sexual harassment.

It is, therefore, important to ensure that learning environments are secure and safe, and promote the physical and mental health, and psychosocial well-being of learners, educators, and other education personnel. Furthermore, capacity and engagement with health and child protection personnel need to be strengthened to address complex socio-cultural issues, such as the impacts of gender-based violence.

In building the e-resilience of the school, it is important to conduct a comprehensive assessment that takes into consideration, in a holistic manner, the technical, human capacity, economic, and social components outlined below, to establish baseline data of the current situation in the school and at homes of educators and learners. Based on the assessment, a strategy and action plan for building the e-resilience of the school should be developed in collaboration with stakeholders.

### 3. TECHNICAL COMPONENTS AND CONSIDERATIONS

Based on the challenges described above, this section provides guidelines for considering the technical components required for resilient e-education. The technical components and considerations are divided into six categories: (1) digital infrastructure and connectivity (at school and in homes); (2) digital content; (3) digital applications; (4) e-learning platforms; (5) digital pedagogy; and (6) digital school administration system.

#### 3.1. DIGITAL INFRASTRUCTURE AND CONNECTIVITY

The A4AI recommends the following four minimum conditions for meaningful connectivity at school and in homes:<sup>21</sup>

1. **4G-like speed**—A 4G connection provides the technical minimum that enables a user to stream video, share content, and participate in discussions, and offers a realistic but substantial target for many low- and middle-income countries. However, 4G remains beyond the financial means of many poor and marginalized users.
2. **Access to a smartphone** (but specifically for learning, a learner's access to his or her own laptop or desktop would be ideal).<sup>22</sup>

<sup>21</sup> A4AI, "Meaningful Connectivity—unlocking the full power of internet access," <https://a4ai.org/meaningful-connectivity/>.

<sup>22</sup> Christopher H. Tienken, "The Not So Subtle Inequity of Remote Learning," Kappa Delta Pi Record, vol. 56 (2020), <https://www.kdp.org/resources/pdf/covid19/Rec-Oct20-Tienken.pdf>.