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INDUSTRY CONNECTIONS REPORT

COMPARATIVE ANALYSIS:

E-EDUCATION STANDARDS, GUIDELINES, AND TOOLKITS

Authored by

Salma Abbasi

Chairperson and CEO, eWorldwide Group &
Vice-chair, Digital Resilience Initiative, IEEE

Ashirwad Tripathy

Cofounder/President, Educating Nepal (EN)
Chair, Internet for Education Special Interest Group, Internet Society

◆IEEE

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ACKNOWLEDGMENTS

Special thanks are given to the following reviewers of this paper:

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ABSTRACT

The use of information and communications technology (ICT) in education immediately garnered importance with the inception of the millennium development goals (MDGs) outlined by the United Nations (UNs) in 2000 and carried forward with Sustainable Development Goal 4 (SDG 4) in 2015. The outbreak of COVID-19 disrupted the entire education system where schools around the world were compelled to adopt e-education (online education or remote education) as an alternative means for continued learning. This document examines the existing standards, policy guidelines, and toolkits to determine their efficiency and sufficiency for a new imagined modality of teaching and learning. Apart from those of the UNs Educational, Scientific, and Cultural Organization (UNESCO), standards, guidelines, and toolkits from Nepal, Nigeria, and the United Kingdom (U.K.) are compared against ten of the most essential operations for effective e-education. The ten most essential components of e-education are broadly divided among six priority areas as follows:

- Digital literacy frameworks and standards.
- Effective teaching, learning, and administration for e-education.
- Digital infrastructure and connectivity.
- Remote learning quality, outreach, and affordability.
- Localization of digital content and delivery.
- Inclusive technology, solutions, tools, and resources.

The comparison between low-income and high-income economies in their implementation of remote learning has provided important insights for contemplation in redesigning the education of the future. Using a comparative analysis, this document provides useful recommendations for the effective implantation of inclusive and equitable e-education. They are as follows:

1. There is a dire need to improve national digital skills, digital competency, and the digital literacy rate.

2. The development of all human resources is necessary for the effective implementation of ICT in education, including the ICT industry, which can help develop local digital content and platforms.

3. There is a huge need for governments to invest in digital infrastructure and connectivity. Support from the International Telecommunication Union (ITU) and UNESCO must focus on disadvantaged and vulnerable communities.

4. National governments and other stakeholders must find strategies to alleviate digital poverty. E-education and remote learning can barely be effective if the students do not have access to learning devices. All forms of the digital divide must be bridged.

5. E-education provides flexibility in learning; a wide range of contents available freely on web portals can be used for teaching and learning. But it is also necessary that e-education fully incorporates national curricular guidelines for the long-term goal.

6. Monitoring and evaluation of the effectiveness of e-education at every stage must be carried out with special attention given to learning outcomes, meaningful engagement, and participation of students.

7. Inclusive e-education policies, tools, and platforms must be developed. No one—especially, marginalized and vulnerable children, internally displaced persons (IDPs), refugees, and children with special needs—should be left out of e-education. The policies and platforms must cater to the needs of all children to accommodate personalized learning.

8. More awareness of the importance of ICT in education is needed for people in low-income economies so that they are motivated toward the modern approach of digital pedagogy.

ABBREVIATIONS

3G	third generation
4G	fourth generation
5G	fifth generation
AI	artificial intelligence
BBC	British Broadcasting Company
BCG	Boston Consulting Group
CAL	computer-assisted learning
CDC	Curriculum Development Center
CDI	Coalition for Digital Intelligence
CEHRD	Center for Education and Human Resource Development
CFT	Competency Framework for Teachers
CML	Computer-Managed Learning
COP	child online protection
COVID	Coronavirus disease
CRPD	Convention on the Rights of Persons with Disabilities
CSO	Civil Society Organization
CST	Competency Standards for Teachers
DQ	digital intelligence
DfE	Department for Education (U.K.)
ECED	Early Childhood Education Development
EDTech	Education Technology
EFA	Education for All
EiEWG	Education in Emergencies Working Group (Nigeria)
ETF	Education and Training Foundation
FM	frequency modulation
FMoE	Federal Ministry of Education (Nigeria)
G7	Group of Seven
GBP	British pound (pound sterling)
GDP	gross domestic product
GEC	Global Education Coalition

GEI	Global Education Institute
GEM	Global Education Monitoring
GNI	gross national income
ICT	Information and Communications Technology
IDP	internally displaced person
IEEE	Institute of Electrical and Electronics Engineers
IITE	Institute for Information Technologies in Education
IOCT	Indoor Obstacle Course Test
IOE	Institute of Education
ISTE	International Society for Technology in Education
IT	information technology
ITU	International Telecommunication Union
LDC	least developed country
LMC	Last Mile Connectivity
MDG	Millennium Development Goal
MDRU	Moveable and Deployable ICT Resource Unit
MoE	Ministry of Education (Nepal)
MoCIT	Ministry of Communication Information and Technology
MoEST	Ministry of Education, Science and Technology
MOOC	Massive Open Online Course
nced	National Center for Education Development
NCELP	National Centre for Excellence for Language Pedagogy
NITDA	National IT Development Agency
NTP	National Tutoring Program
ODL	open distance learning
OECD	Organisation for Economic Co-operation and Development
OER	Open Education Resource
Ofcom	Office of Communications
PC	personal computer
PWD	Person with Disabilities
SBMC	School-Based Management Committee
SDG	Sustainable Development Goal

SENCo	Special Education Needs Coordinator
SSDP	School Sector Development Plan
TV	television
UCL	University College London
U.K.	United Kingdom
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNICEF	United Nations Children's Fund
UNPRPD	United Nations Partnership on the Rights of PWD
U.S.	United States
VLE	Virtual Learning Environment
W3C	World Wide Web Consortium

1. INTRODUCTION

In the United Nations (UN) 2030 Agenda for sustainable development, SDG 4 aims to ensure inclusive and equitable quality education and promote lifelong learning for all. Target 4.4 of SDG 4 plans to substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs, and entrepreneurship by 2030. Furthermore, the global target concept for indicator 4.4.1[1] provides for the global measurement of ICT skills for youths and adults. This is where the integration of ICT in education has become a prioritized area of intervention for most developing nations around the world. A clearer justification regarding the importance of digital literacy was discovered when education was disrupted by COVID-19 and the solution to continued learning was e-education. The global pandemic brought about far-reaching consequences by having millions of children out of school at the same time and with the uncertainty of how many would never return to school again. In the present context, the importance of e-resilience in education has been desperately felt like never before. E-education (distance learning, remote learning, or online learning) has been embedded strongly in the reimagination of education post-COVID-19; therefore, now it is imperative to lay a strong foundation for the effective implementation of e-education.

This document is a comparative analysis of e-education standards, policies/policy guidelines, and toolkits that are

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[1] UNESCO, "Quick Guide to Education Indicators for SDG 4," 2018, http://uis.unesco.org/sites/default/files/documents/quick-guide-education-indicators-sdg4-2018-en.pdf.

available at the national, regional, and global levels for educators, learners, and administrators. At the national level, standards, guidelines, and toolkits available in three countries—Nepal, Nigeria, and the U.K.—have been analyzed to understand the unique challenges each country faces with an e-education system. This comparative analysis also incorporates policy briefs, guidelines, sectorial notes, toolkits, frameworks, and standards in e-education developed by UNESCO and directed toward the fulfillment of the Education 2030 Agenda. Wherever available, resources from the GEI and IOE at UCL have also been taken into consideration for this study.

This document will assist in developing a high-level framework for e-resilience in education systems along with ten selected operations in e-learning. The purpose of this document is to collect and compare existing standards, guidelines, and toolkits available for e-education and to identify gaps and make recommendations to bolster education systems during the COVID-19 response and beyond. This study further explores issues relating to educational service delivery, accessibility, and affordability by being sensitive to the inclusion of women, PWDs, IDPs, refugees, and marginalized communities. This document can be useful for developing new standards, guidelines, and toolkits to address existing gaps to "bounce back better" and accomplish SDG 4 for inclusive and equitable EFA.

2. RATIONALE FOR SELECTION OF OPERATIONS

The selected operations for analysis are the output of a series of webinars hosted by eWorldwide Group and IEEE Standards Association (SA). Since April 2020, continuous dialogue and discussions have been carried out with various stakeholders—for example, universities, international development agencies, governments, academia, and technical experts—which led to the launch of the IEEE Industry Connections program on digital resilience "Holistic Digital Resilience Ecosystem for Disaster and Emergency Preparedness, Mitigation, and Response: Frameworks, Toolkits, and Guidelines" in October 2020. A separate subcommittee under this program was formed for e-resilience in education systems, and ten key operations were recognized to ensure e-resilience in education systems:

1. National digital literacy frameworks for distance/online learning for educators, learners, and administrators.

2. National framework for administration, monitoring, and evaluation for online, remote classrooms, and distance learning systems.

3. National framework for digital literacy and skills for educators, learners, and administrators, including reference to gender sensitivity, marginalized communities, IDPs, and refugees.

4. Digital infrastructure for education institutions.

5. Digital connectivity for education institutions.

6. Holistic regulation for e-education systems (quality of service, affordability, and accessibility).

7. Digital content for educators, learners, and administrators.

8. Technology solutions for online education delivery across diverse geographical areas.

9. Localization of digital content in local languages.

10. Digital educational tools and resources for learners with disabilities.

The disruption of education systems caused by COVID-19 demands a more inclusive and people-centric approach to the re-establishment of continued learning. According to ITU, the broadband internet penetration rate in Nepal was 21.4% (2017) and in Nigeria was 34% (2019). This creates a huge challenge for digital learning infrastructure. It is necessary to ensure that the existing gaps do not increase further. Even developed countries like the U.K. are facing their own challenges in becoming digitally resilient. Analyzing standards, guidelines, and toolkits with reference to these ten operations can give a clear understanding of what has been done and what needs to be done. For this purpose, along with national structures and frameworks, various other key components must be analyzed with a special focus on marginalized and underprivileged populations.

3. RATIONALE FOR SELECTION OF COUNTRIES

A holistic approach is necessary to understand the multidimensional challenges and complexities prevalent in the education ecosystem. Digital literacy is not the mere transfer of information from one point to another but the transformation of knowledge from one generation to another. So, e-resilience in education systems comes embedded with various socio-technological factors. Various cultural and political environments also have a deep-rooted effect on the education system of the county. Each country faces challenges that are unique in nature. So, to broaden the understanding of e-resilience in education systems, the standards, policy guidelines, and toolkits available in three countries—Nepal, Nigeria, and the U.K.—have been analyzed in this document. These countries are at different stages of economic development and have varying socioeconomic backgrounds. They also give a contrasting overview between developing and developed countries while representing South Asia, sub-Saharan Africa, and Europe in terms of geography.

Nepal is a landlocked developing nation in South Asia with 80% of its population living in rural areas. According to national statistics, the overall literacy rate stands at 68%, and the country has recently been qualified to graduate from LDC to a developing nation. Nigeria is a sub-Saharan African nation with 49% of its population living in rural areas. It has an adult literacy rate of 62.02%. The U.K., on the other hand, is one of the G7 countries and the world's fifth-largest economy in terms of nominal GDP. The country has 17.1% of its population living in rural areas; 99% of the population is literate, with 94% connected to superfast broadband internet. These contrasts in respective demography and economy are helpful for making good recommendations for low-income countries to develop e-resiliency in education systems. The frameworks, recommendations, and standards from UNESCO have also been included for the purpose of comparative analysis because it is the standard-bearer for the UN Education 2030 Agenda.

4. COMPARATIVE ANALYSIS

As the authors reimagine innovation in teaching and learning, remote education cannot be regarded as a light bulb moment occurring during the COVID response period. For over a decade, e-learning has been pushing its way into mainstream educational approaches in the form of distance learning and as an alternate or hybrid approach to teaching and learning. CML and computer-assisted learning (CAL) have been around longer as foundational tools for e-learning. Since widespread internet connectivity, e-learning has been synonymous with online learning through technological aid.

The building blocks of e-education can be attributed to progress made in digital literacy programs across all nations. The current pandemic has conspicuously revealed the importance and relevance of e-education, which is likely to be on the continuum of a blended education system for many years to come. With constant improvements in technology, blended education is being practiced throughout many countries. An effective blended learning environment requires pupils who have sound digital literacy. A large amount of other research has provided evidence for a positive correlation between digital literacy and effective learning for students.

There has been an obligatory paradigm shift in the global education system since the outbreak of COVID-19. As the pandemic imposed social distancing and lockdown, an alternative approach to imparting education became imperative. School closures across 190 countries reportedly affected 1.6 billion children, accounting for 91% of children enrolled in school worldwide and a staggering 24 million learners from preschool to university at risk of not returning to school following COVID-19's disruption of physical classes. This is when the adoption of technology in education in the form of virtual classes, online learning, or remote education seemed obviously

justifiable. As the impact of COVID-19 was felt, UNESCO reacted with global and regional responses. The global responses included the following:

- High-level ministerial meetings for policy dialogue for a new form of education.

- GEC to scale up the best distance learning practices.

- Global monitoring to evaluate learning loss due to school closures across the globe.

- Technical assistance to prepare and deploy inclusive distant learning solutions with webinars, issue notes, digital learning resources, national learning platforms, and surveys.

Regional responses are carried out in Africa, the Arab states, Asia Pacific, Latin America, and the Caribbean, respectively.

It is important to note that UNESCO launched the GEC with 175 members to focus on three central concerns: connectivity, teachers, and gender. The main objective of GEC was to build a resilient education system with regard to an indispensable shift of education toward online learning. The GEC's goals are supported by the following three pillars: country-level engagement; cross-country interventions at scale; and monitoring, knowledge building, and advocacy. [2]

As COVID-19 broke out in Nepal, the initial response plan for education was to shut down schools to protect 8.1 million children from ECED to grade 12. The first lockdown did not entail an effective form of learning continuation; therefore, the government of Nepal released a framework for the reopening of schools in November 2020. The framework had guidelines for physical classes following safety norms for mitigating transmission of the COVID. The need for online or remote classes was seriously evident following the shutdown of schools in the second and third waves of COVID-19.

In Nigeria, as the FMoE approved school closures in the March of 2020, 50 million students throughout the country and the BAY states (i.e., Borno, Adamawa, and Yobe) were affected. A response plan by Nigeria's education in emergency was launched with the goal of ensuring an effective, inclusive, and safe return to quality learning for learners, teachers, and SBMCs.

In the U.K., the restrictions were announced by the education secretary in March 2020. Except for children of

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[2] UNESCO, GEC, "Responding to COVID-19 and beyond, the Global Education Coalition in action," United Nations Educational, Scientific and Cultural Organization, 2020, https://unesdoc.unesco.org/ark:/48223/pf0000374364.

key workers and vulnerable pupils, most children started taking classes from home. Students attended virtual classes at home. An online learning delivery platform—Oak National Academy, launched with financial support from the DfE—provided sequential learning materials for students in line with the national curriculum. The government response strategy was to bring back students safely to school and make strategic investments to mitigate learning loss incurred during the shutdown of schools.

5. DIGITAL LITERACY FRAMEWORKS AND STANDARDS

Digital literacy covers a wide scope: education, creating an efficient workforce, public transparency, and bridging all forms of the digital divide. Digital literacy for children refers to knowledge, skills, and attitudes that allow children to thrive in the digital world by being safe and empowered in ways that are appropriate to their age and local cultures and contexts.[3] The competency areas adopted by UNESCO's digital literacy framework cover data literacy, communication, digital content creation, safety, and problem-solving[4]—all of which have high significance for e-education. In addition to the UNESCO global framework, there are other international frameworks such as the DigComp framework from the European Commission,[5] the DQ framework,[6] and the digital kids Asia-Pacific framework.[7] At a regional and national level, for instance in Canada, the British Columbia digital literacy curriculum is provided by the government while the Microsoft digital literacy standard curriculum is offered by the private sector. These frameworks are likely to have major contributions in the formation of policies and standards relating to e-education, remote learning, or distance learning.

The 2011 policy brief by UNESCO[8] explains the content and structure of digital literacy as an integral component of a life skill. The document provides impetus for a new digital literacy framework through the perspective of learners, teachers, and policy makers. The document underpins an ICT-enabled development model by keeping collaborative knowledge construction and creativity at its core. It further emphasizes that the 21st-century digital literacy frameworks were developed to improve the social skills of students, learners, adults, and teachers with the ability to

[3] Nascimbeni, Fabio, and Steven Vosloo, "Digital literacy for children: exploring definitions and frameworks," UNICEF Office of Global Insight and Policy, Aug. 2019, https://www.unicef.org/globalinsight/media/1271/file/%20UNICEF-Global-Insight-digital-literacy-scoping-paper-2020.pdf.

[4] Law, Nancy, David Woo, Jimmy de la Torre, and Gary Wong, "A Global Framework of Reference on Digital Literacy Skills for Indicator 4.4.2," Information Paper no. 51, UNESCO, Jun. 2018, http://uis.unesco.org/sites/default/files/documents/ip51-global-framework-reference-digital-literacy-skills-2018-en.pdf.

[5] Carretero, Stephanie, Riina Vuorikari, and Yves Punie, DigComp 2.1, The digital competence framework for citizens with eight proficiency levels and examples of use, Luxembourg: European Union, 2018, https://op.europa.eu/en/publication-detail/-/publication/3c5e7879-308f-11e7-9412-01aa75ed71a1/language-en.

[6] DQ Institute, "DQ Global Standards Report 2019, Common Framework for Digital Literacy, Skills and Readiness," 2019, https://www.dqinstitute.org/wp-content/uploads/2019/03/DQGlobalStandardsReport2019.pdf.

[7] Shin, Tae Seob, Hyeyoung Hwang, Jonghwi Park, Jian Xi Teng, and Toan Dang, "Digital Kids Asia-Pacific, Insights into Children's Digital Citizenship," United Nations Educational, Scientific and Cultural Organization, 2019, https://www.gcedclearinghouse.org/sites/default/files/resources/190165eng.pdf.

[8] Karpati, Andrea, "Digital Literacy In Education," Policy Brief, UNESCO Institute for Information Technologies in Education, May 2011, https://iite.unesco.org/files/policy_briefs/pdf/en/digital_literacy.pdf.

create digital content taking center stage. Furthermore, teachers' digital literacy has been pivotal for teaching and learning, including the development of innovative digital pedagogy. UNESCO has therefore initiated ICT-CSTs[9] and the ICT-CFTs[10] with three versions from 2008 to 2018. This document addresses six aspects of teachers' professional practice along three competency stages of knowledge acquisition, knowledge deepening, and knowledge creation. The six aspects are as follows:

1. Understanding ICT in education.

2. Curriculum and assessment.

3. Pedagogy.

4. Application of digital skills.

5. Organization and administration.

6. Teacher professional learning (see Annex A: ICT Competency Framework).

UNESCO has designated the ISTE[11] as a reference for standards in digital literacy. The ISTE provides standards for learners, educators, and administrators in the form of competencies necessary for teaching and learning in the digital age. The standards are aligned with SDGs and have been adopted primarily by the U.S. and many other countries as a comprehensive roadmap for the effective use of technology in education. Annex B shows how the ISTE Standards categories for students, educators, and education leaders correspond to each other in facilitating digital-age learning.

Alternatively, the CDI—an association of the World Economic Forum, the OECD, the IEEE SA, and the DQ Institute—has developed DQ global standards report[12] with a vision to be the first global standard for digital literacy, skills, and readiness across the education and technology sectors. The CDI aims to establish a global framework for DQ, including a common set of definitions, language, and understanding of comprehensive digital literacy, skills, and readiness that can be adopted worldwide by all stakeholders (governments, educators, technology companies, etc.). The major highlight of this report is its comprehensive set of technical, cognitive, metacognitive, and socioemotional competencies necessary for a sustainable digital life. The framework

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[9] UNESCO, "ICT competency standards for teachers: policy framework," United Nations Educational, Scientific and Cultural Organization, 2008, https://unesdoc.unesco.org/ark:/48223/pf000015.
[10] UNESCO. "UNESCO ICT Competency Framework for Teachers," United Nations Educational, Scientific and Cultural Organization, 2018, https://www.open.edu/openlearncreate/pluginfile.php/306820/mod_resource/content/2/UNESCO%20ICT%20Competency%20Framework%20V3.pdf#:~:text=The%20ICT%20CFT%20is%20intended,and%20other%20professional%20development%20providers.
[11] International Society for Technology in Education, https://www.iste.org/.
[12] DQ Institute, "DQ Global Standards Report 2019, Common Framework for Digital Literacy, Skills and Readiness," 2019, https://www.dqinstitute.org/wp-content/uploads/2019/03/DQGlobalStandardsReport2019.pdf.

encompasses three levels, eight areas, and 24 competencies (see Annex C).

In Nepal, the National ICT Policy[13] of 2015 was a major contributor to ICT in education. The policy provided for instigating e-school initiatives, digital pedagogies, and the startup of Open University in Nepal. The MoE in Nepal launched the SSDP[14] in alignment with the ICT master plan, which was committed to improving teaching and learning by introducing interactive online modules of classes along with a repository for a digital library. It also made compulsory the usage of ICT in all schools. However, there still was no proper digital education framework. Eventually, the 2019 Digital Nepal Framework[15] was launched, providing a comprehensive structure of policies and targets to be achieved in e-education and digital literacy.

In Nigeria, the National Policy on Education (2014)[16] envisioned open and distance learning with the use of a variety of technologies and media to provide quality education in which teachers and learners need not be physically together. The FMoE released the National Policy on ICT in Education[17] in 2019, with initiatives for the development and effective implementation of a national information technology education framework along with standards for IT education. The policy has been further supplemented with national implementation guidelines for ICT in education.[18] The guidelines facilitate the actualization of the aforementioned national policy in terms of implementation, financing, and governance as well as monitoring and evaluation. However, the NITDA is at the forefront of facilitating digital literacy skills in Nigeria through national digital economy policies for digital Nigeria.

In the U.K., digital literacy and digital skills are needed for adults to safely benefit, participate, and contribute to the digital world. To this purpose, the U.K. government developed the essential digital skills framework,[19] which has five essential digital skills for life and work. The skills include communicating, handling information and content, transacting, problem-solving, and being safe and legal online. National standards for essential digital skills[20] have also been published in line with the framework. The U.K. manifesto for a networked nation plans to have every person online by 2012 and for no individuals to retire without web skills. The sustainable approach

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[13] Ministry of Information and Communication, Nepal, "National Information and Communication Technology Policy," 2015, https://dhulikhelmun.gov.np/sites/dhulikhelmun.gov.np/files/documents/ICT%20policy%20Nepal.pdf.

[14] Ministry of Education, Nepal, "School Sector Development Plan 2016/17-2022/23,"2016, https://planipolis.iiep.unesco.org/en/2016/school-sector-development-plan-201617-202223-bs-207374-207980-6283.

[15] Ministry of Communication and Information Technology, Nepal, "2019 Digital Nepal Framework,"2019, https://mocit.gov.np/application/resources/admin/uploads/source/EConsultation/EN%20Digital%20Nepal%20Framework%20V8.4%2015%20July%20%202019.pdf.

[16] Federal Republic of Nigeria, "National Policy on Education," 2014, https://education.gov.ng/wp-content/uploads/2020/06/NATIONAL-POLICY-ON-EDUCATION.pdf.

[17] Federal Ministry of Education, Nigeria, "National Policy On Information And Communication Technologies (ICT) in Education," 2019, https://education.gov.ng/wp-content/uploads/2019/08/NATIONAL-POLICY-ON-ICT-IN-EDUCATION-2019.pdf.

[18] Federal Ministry of Education, Nigeria, "National Implementation Guidelines for ICT in Education," May 2019, https://education.gov.ng/wp-content/uploads/2019/07/NATIONAL-IMPLEMENTATION-GUIDELINES-FOR-ICT-IN-EDUCATION-2019.pdf.

[19] UK Department for Education, "Essential Digital Skills Framework," 2019, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/738922/Essential_digital_skills_framework.pdf.

[20] UK Department for Education, "National standards for essential digital skills," 2019, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/909932/National_standards_for_essential_digital_skills.pdf.

to digital literacy is to have all students equipped with digital skills. The Center for Learning and Teaching at Leeds Becket University[21] has emphasized the digital literacy attribute of information and digital technology playing a critical role in the academic, personal, and professional development of individuals. The DfE published a strategy to help educators make optimal use of technology and EdTech solutions for teaching and learning. [22]

6. EFFECTIVE TEACHING, LEARNING, AND ADMINISTRATION FOR E-EDUCATION

The guidelines for remote learning and e-education were compulsory following the shutdown of schools due to COVID-19. The education sector of UNESCO produced "Ensuring Effective Distance Learning under COVID-19 School Closures: Guidance for Teachers"[23] to facilitate an effective study-from-home mechanism. The guidance aimed to help teachers understand key issues related to home-based distance learning during the pandemic and design effective learning activities by including resources, examples, and tips for teachers/educators from the preprimary to upper secondary level. This document along with other reports from UNESCO[24] mentions that school reopenings in the future will never be the same as those in the past, and, therefore, the hybridization of teaching–learning systems is the way forward. Therefore, it is extremely important to ameliorate the existing practices of e-education in pursuit of effective learning in the days and years ahead.

In addition, UNESCO's IITE has published a series of guidelines[25] that can provide direction for people who are interested or engaged in online education practice in the aftermath of the COVID-19 pandemic. It is a comprehensive set of guidelines that incorporate all the essential elements required by immediate stakeholders to conduct an effective remote or online learning experience. The series contains five separate guidelines for:

- Teachers
- Students
- Principals and administrators
- Parents and communities

[21] Leeds Becket University, "Enabling Your Students To Develop Their Digital Literacy," Centre for Learning and Teaching, Nov. 2014, ttps://teachlearn.leedsbeckett.ac.uk/-/media/files/clt/clt_enabling_digital_literacy.pdf.

[22] UK Department for Education, "Realising the potential of technology in education: A strategy for education providers and the technology industry," 2019, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/791931/DfE-Education_Technology_Strategy.pdf.

[23] Miao, Fengchun, Ronghuai Huang, Dejian Liu, and Rongxia Zhuang, "Ensuring effective distance learning during COVID-19 disruption, Guidance for teachers," United Nations Educational, Scientific and Cultural Organization, 2020, https://unesdoc.unesco.org/ark:/48223/pf0000375116.

[24] UNESCO IESALC, "Closing now to re-open better tomorrow? Pedagogical continuity in Latin American Universities during the pandemic," UNESCO International Institute for Higher Education in Latin America and the Caribbean, Jul. 13, 2021, https://unesdoc.unesco.org/ark:/48223/pf0000378256_eng.

[25] UNESCO IITE, "Guidances for Online Education During COVID-19 Pandemic by IITE and its partners," UNESCO Institute for Information Technologies in Education, https://iite.unesco.org/publications/guidances-for-online-education-during-covid-19/.

▪ Using technologies and platforms

UNESCO IITE has recently launched the project Teacher Capacity Building with AI and Digital Technologies: E-library for Teachers, which is working on developing OERs in various languages. More than 100 000 educators across the globe are expected to benefit from the educational training and open pool of resources. In 2019, UNESCO already made recommendations for OERs to support the development and sharing of openly licensed learning and teaching materials, which is also likely to be a huge pool of resources for teachers and learners all across the globe.

In Nepal, the Open and Distance Learning Policy 2007[26] was developed in collaboration with the national curriculum framework to provide general and vocational education through radio, TV, and other electronic media. This was the first approach to considering quality e-education in Nepal. ICT in Education Master Plan (2013–2017)[27] in Nepal aimed for capacity building of all human resources associated with education for ICT in the education system. The plan included ICT teacher training centers that would train ICT teachers who, in turn, would train and support other staff and administrators of their schools. The goal would be achieved by assessing ICT needs in education, formulating ICT skill standards for teachers, and developing respective training modules. The NCED was assigned to develop and provide teachers with training for integrating ICT in classroom learning along with evaluating the competency of teachers for ICT in education.

The UNESCO ICT-CFT served as a standard for the teacher development model in effective ICT integration, following the six education system domains of policy, curriculum and assessment, pedagogy, ICT, organization, and administration, and teacher development. In compliance with the same framework, Nigeria and Tanzania drafted pilot ICT-CFTs[28] to empower students, teachers, administrators, teacher educators, and other educators for ICT-integrated learning. The same notion is reflected in the national policy on ICT in education: capacity building of teachers is managed through the National Teachers Institute,[29] where teachers are certified for their achievement for learning to use modern technology in education. The capacity building is carried out through a distance learning module for teachers and education leaders.

The European Framework for Digital Competence of Educators (DigCompEdu)[30] by the European Commission provides a scientifically sound framework describing what it means for educators to be digitally competent. It details

[26] GoN MoE. (2007). Open and distance learning policy, 2007.
[27] Ministry of Education, Nepal, "Information & Communication Technology (ICT) in Education Master Plan 2013-2017," 2013, https://en.unesco.org/icted/sites/default/files/2019-04/89_ict_in_education_masterplan_nepal_0.pdf.
[28] Hooker, Mary, Esther Mwiyeria, and Anubha Verma, "ICT Competency Framework for Teachers (ICT-CFT) Contextualization and Piloting in Nigeria and Tanzania," Synthesis Report (Draft), Teacher Development for the 21st Century (TDev 21), Jun. 2011, https://unevoc.unesco.org/e-forum/Synthesis_Report_ICT-CFT_Draft_Final_191011.pdf.
[29] Federal Ministry of Education, Nigeria, "National Policy On Information and Communication Technologies (ICT) in Education," 2019, https://education.gov.ng/wp-content/uploads/2019/08/NATIONAL-POLICY-ON-ICT-IN-EDUCATION-2019.pdf.
[30] Redecker, Christine, "European Framework for the Digital Competence of Educators: DigCompEdu," European Commission, Joint Research Centre, 2017, https://data.europa.eu/doi/10.2760/159770.

22 competencies organized in six different areas with aims for technologies to enhance innovative education and training. In the U.K., the ETF mapped the components of DigCompEdu and developed the digital teaching professional framework[31] with standards to provide training for teachers to enhance their capabilities in digital teaching platforms. In 2019, the U.K. DfE launched a strategy for education providers ("Realizing the Potential of Technology in Education"[32]) in which the role of ICT-skilled staff is considered imperative for the best practice of education. The strategy aims to build the digital capability of educators and teachers through online training, consultancy programs, guidance, and LearnED programs, which bring together teachers and the digital industry to showcase technology in education best practices. As remote lessons became obligatory, guidance to support the use of technology platforms was issued by the DfE for teachers and staff. The holistic "Guidance for Schools: Coronavirus (COVID-19)"[33] from the DfE enabled education leaders, teachers, and parents to practice effective education during the pandemic.

7. DIGITAL INFRASTRUCTURE AND CONNECTIVITY

Digital infrastructure and connectivity are an integral part of digital citizenship in the 21st century and beyond. It also has a paramount importance for e-education. An estimated 3.6 billion people, predominantly in lower-income economies, still do not have internet connectivity, which means that many remote education practices around the world are yet to be inclusive. The Broadband Commission was established in 2010 as a joint initiative between ITU and UNESCO to promote internet connectivity worldwide and is currently on a mission of "connecting the other half" for 2025 targets. The Broadband Commission[34] since 2019 has been studying the issues faced by governments while deploying school connectivity initiatives for quality, safe, and inclusive learning. For the same purpose, the Broadband Commission has a working group co-chaired by ITU, UNESCO, and UNICEF that aims to help the government develop holistic school connectivity plans. The working group has an objective of providing advice for the development of two global initiatives aimed at connecting schools to the internet:

1. Giga: This is a joint initiative between ITU and UNICEF to connect every school to internet and empower young learners. [35]

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[31] Education and Training Foundation, "Taking Learning to the Next Level, Digital Teaching Professional Framework," 2019, https://www.et-foundation.co.uk/wp-content/uploads/2018/11/181101-RGB-Spreads-ETF-Digital-Teaching-Professional-Framework-Short.pdf.
[32] UK Department for Education, "Realising the potential of technology in education: A strategy for education providers and the technology industry," 2019, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/791931/DfE-Education_Technology_Strategy.pdf.
[33] UK DfE. (Accessed on 20 September 2021). Guidance for schools: Coronavirus (COVID-19).
[34] Broadband Commission for Sustainable Development, "Working Group on School Connectivity," https://www.broadbandcommission.org/working-groups/school-connectivity-2020/.
[35] Giga, https://giga.global/.

2. E-school initiatives: This is a UNESCO initiative that seeks to ensure the value for learning of connectivity and align infrastructure investment with education sector plans and ICT in educational policies (see Annex D). [36]

This collaborative working group published a report in 2020 that introduced a framework for mapping and connecting primary/secondary schools to the internet. [37] The major highlights of the report were the following:

- Methodology and framework for mapping the schools.
- Methodology and ITU's LMC toolkit for connecting schools.
- Financial models for schools' connectivity.
- Quality content, effective delivery platforms, and child online protection (COP) for empowering learners.
- Priorities and a way forward for Giga and e-school initiatives.

In Nepal, there are 77 districts, and, currently, all the headquarters of those districts claim to have some type of broadband connectivity. The government has announced an optical fiber project to link all districts with the information superhighway and connect beyond all district headquarters. But this project will take some time for completion. National broadband policy (2015)[38] and ICT policy (2015) made promising targets of reducing broadband pricing to 5% of monthly GNI per capita, achieving a digital literacy of 75%, reaching broadband penetration of 90%, and increasing internet penetration to 100% by 2020. These policies aim at creating a digital Nepal, with priority areas of digital literacy and ICT in education through the expansion of connectivity and infrastructure. The 2019 Digital Nepal Framework was launched as standards to achieve the targets set by ICT and broadband policy in Nepal. However, these targets have proven to be unrealistic. According to Nepal Telecom Authority, Nepal's broadband penetration in 2019 was just over 30% and increased to approximately 36% after the pandemic.

Nigeria established its first broadband plan in 2013. The plan committed to an expansion of internet coverage with 3G internet to at least 80% of the population. In 2020, Nigeria launched the National Broadband Plan (2020–2025), [39] which aims to deliver a minimum internet speed of 25 Mb/s in urban areas and 10 Mb/s in rural areas and with effective internet coverage to 90% of the population by 2025. The target of this plan is to lower the cost of internet service by focusing on four key pillars: infrastructure, policy, demand drivers, and funding.

[36] UNESCO, "ICT in education," https://en.unesco.org/themes/ict-education
[37] Broadband Commission for Sustainable Development, ITU, UNESCO, and UNICEF, *The Digital Transformation of Education: Connecting Schools, Empowering Learners*, Geneva: Broadband Commission, 2020, https://unesdoc.unesco.org/ark:/48223/pf0000374309.
[38] MoCIT Nepal Telecommunication Authority (2015). National Broadband Policy 2015.
[39] Federal Ministry of Communications and Digital Economy, Nigeria, "Nigerian National Broadband Plan 2020–2025," 2020, https://www.ncc.gov.ng/documents/880-nigerian-national-broadband-plan-2020-2025/file.

Furthermore, Nigeria also established the National Economy Policy and Strategy (2020–2030),[40] which is committed to the development of regulations, soft/solid infrastructure, digital literacy and skills, digital service infrastructure, and development, indigenous content development and adoption, and so forth. The achievement of these goals will make a tremendous difference in remote learning approaches for Nigeria in the near future.

The U.K. National Infrastructure Delivery Plan (2016–2021) has set targets to have superfast broadband available to 95% of U.K. premises and 4G available to 98% as well as a 5G strategy by the end of 2021.[41] The 5G broadband is targeted to be available for the majority of U.K. citizens by the end of 2027. In 2017, an Ofcom report suggested that 94% of premises in the U.K. had been connected to superfast broadband internet.[42] Ofcom also estimates that 12% of rural premises do not have proper broadband internet connectivity—7% of which have internet through a mobile phone, which is likely to be an expensive option. It is estimated that 1.5 million children in the U.K. do not have access to devices for remote learning. Unlike Nepal and Nigeria, the digital divide for the U.K. in terms of connectivity is not very wide; nevertheless, its prevalence is significant for students who may be denied access to remote learning.

8. REMOTE LEARNING QUALITY, OUTREACH, AND AFFORDABILITY

As the schools were shut down to contain the spread of the coronavirus, various countries took an approach of delivering education through digital channels. Those digital solutions included TV/radio-based teaching, online classes through internet, take-home educational content, or home tuition methods. Various studies suggest that the authors were not prepared enough for remote education as an uneven distribution of technology exists, mostly in middle- and lower-income economies. A study by UNICEF suggests (see Annex E) 73% of countries were using internet-based remote learning for education but in middle- or lower-income countries, less than half the population actually had internet connection.[43] A huge digital divide also exists regarding children's access to technologies for remote learning. Such cases strongly suggest that the authors really need a resilient system in place for the proper implementation of e-education.

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[40] Federal Ministry of Communication and Digital Economy, Nigeria, "National Digital Economy Policy and Strategy (2020-2030)," 2020, https://www.ncc.gov.ng/docman-main/industry-statistics/policies-reports/883-national-digital-economy-policy-and-strategy/file.

[41] Infrastructure and Projects Authority, UK, "National Infrastructure Delivery Plan 2016–2021," 2016, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/520086/2904569_nidp_deliveryplan.pdf.

[42] Ofcom, UK "Connected Nations 2018, UK report," 2018, https://www.ofcom.org.uk/__data/assets/pdf_file/0020/130736/Connected-Nations-2018-main-report.pdf.

[43] Dreeseni, Thomas, Spogmai Akseeri, Matt Brossardi, Pragya Dewanii, Juan-Pablo Giraldoii, Akito Kameii, Suguru Mizunoyaiii, and Javier Santiago Ortizi, "Promising practices for equitable remote learning Emerging lessons from COVID-19 education responses in 127 countries," Innocenti Research Brief, UNICEF Office Of Research—Innocenti, 2020, https://www.unicef-irc.org/publications/pdf/IRB%202020-10%20CL.pdf.

Furthermore, the 2021 report by UNESCO, UNICEF, the World Bank, and OECD[44] revealed the unequal distribution of learning opportunities with remote learning access, especially for disadvantaged and marginalized children. Governments also lacked coherent policies to fund and implement effective remote learning. Geographical and infrastructural barriers mandated radio as the most common form of remote learning in low-income countries. The use of radio for education was 92% for low-income countries in contrast to 25% for high-income countries. However, 96% of high-income countries provided remote learning through online platforms, compared to 58% of low-income countries. As empirical evidence on the effectiveness of remote learning is yet to come, these data suggest that the outreach of effective forms of remote learning is out of reach for students in rural areas of low-income countries.

In 2020, UNESCO also made recommendations for national policy-level interventions to ensure effective distance learning for students.[45] The recommendation suggests that distance learning practice around the world is in an experimental stage and, therefore, must be implemented with due care by taking into account the following principles:

- Adjust curricular objectives and prioritize humanitarian social caring.

- Examine the readiness and choose the most relevant and context-sensitive technological solutions.

- Increase technological and content preparedness to ensure the continuity of education and learning.

- Ensure equity and inclusion.

- Protect learners' privacy and data security.

- Support teachers to plan and facilitate distance learning and engage parents and caregivers.

- Blend student-centered teaching, monitoring, and assessment methodologies to ensure the effectiveness of distance learning.

- Plan for sustainability and long-term goals.

In developing the distance learning strategy, UNESCO strongly urges nations to monitor distance learning processes to track access to courses and student engagement and to assess learning outcomes. The monitoring and evaluation of the readiness of students is aimed at achieving long-term goals in education through distance learning response. Another key component of this document is a recommendation for policy intervention to support disadvantaged groups with online learning. Learners with no access to digital devices, students with

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[44] UNESCO, UNICEF, World Bank, OECD, "What's Next? Lessons on Education Recovery: Findings from a Survey of Ministries of Education amid the COVID-19 Pandemic," United Nations Educational, Scientific and Cultural Organization, Jun. 2021, http://uis.unesco.org/sites/default/files/documents/lessons_on_education_recovery.pdf.
[45] UNESCO, "Distance learning strategies in response to COVID-19 school closures," Education Sector Issue Notes, no. 2.1, Apr. 2020, https://unesdoc.unesco.org/ark:/48223/pf0000373305.

disabilities, students (usually girls) from marginalized communities, and children in humanitarian crises, including children in refugee camps, are included in this group. Assistive tools, grants, gender-based norms, and a distribution mechanism for offline content are recommended in the same education response document.

A holistic plan for ICT uses in education in Nepal was envisioned by Nepal's MoE's master plan introduced in 2013. [46] The plan included investment in infrastructure for ICT in schools, development of ICT-accustomed human resources, mass development of digital learning materials, and an overall enhancement of the ICT-friendly education system. As schools shut down due to the COVID-19 pandemic, it was evident that the country was not sufficiently prepared to continue learning through digital media. The government introduced an emergency action plan for schools (which has now been withdrawn) because the shutdown of schools was longer than anticipated. The plan categorized students into five groups based on the availability of resources: students with no resources, students with access to radio/FM, students with access to TV, students with access to computers but without internet, and, finally, students with access to internet and computers. The dissemination of learning for students without any resources was to be accomplished by distributing books and self-learning materials at home, while the rest of the students would receive their education through radio, TV, digital content, and virtual classes, respectively. As the emergency plan was vague, the government issued student learning facilitation guidelines (which have now been withdrawn) to support education leaders, teachers, and students in providing inclusive remote learning with respect to the curriculum framework.

E-education in Nigeria has been facilitated by the "National Implementation Guidelines for ICT in Education" but there has been disruption in education for various reasons. Nigeria has had schools closed due to existing conflicts other than COVID-19. As conflicts erupted in 2009, the Nigeria EiEWG was formed to ensure children in conflicted regions continued receiving a quality education. The recent strategy of EiEWG 2021–2023 is to work on providing inclusive learning to children in humanitarian crises and with special consideration to the current pandemic situation. [47] A response strategy by the FMoE was disseminated and included a framework in which an alternative learning approach for students was provided as a contingency plan.

The emergency in education strategy included guidelines for states to produce a remote curriculum and to pilot radio teaching and a teaching strategy through smartphones, computers, and tablets, with special consideration

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[46] Ministry of Education, Nepal, "Information & Communication Technology (ICT) in Education Master Plan 2013-2017," 2013, https://en.unesco.org/icted/sites/default/files/2019-04/89_ict_in_education_masterplan_nepal_0.pdf.
[47] Nigeria Education in Emergencies Working Group, "EiE Working Group Strategy, NE Nigeria 2021–2023," (2020, https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/eiewg_strategy_document.pdf.

for vulnerable children, girls, and students with special needs.[48] Nigeria's FMoE also outlined a holistic response plan for the continuation of education during COVID-19.[49]

In the U.K., as the students started taking online classes from home, schools started teaching their regular curriculum through various online platforms. The DfE guided schools to use a uniform platform in line with the U.K. curriculum to maintain uniformity for students across the country. The DfE also set out the guidance "Remote Education Good Practice" for educators and leaders[50] (which has now been withdrawn). The guidance had support for schools to ensure access to remote provisions, replicate the classroom remotely, use remote teaching provisions effectively, and maintain all aspects of school online, including provisions for school assembly and physical education. The department also launched the National Tutoring Programme (NTP) to provide one-to-one or small group-based tuition to students in order to boost progress by three to five months, after the progress lost during the pandemic.[51] It was a catch-up opportunity for students most impacted by the pandemic. The department also distributed over 1 million devices (e.g., laptops and tablets) to students so that they could have uninterrupted lessons for remote learning. The DfE has declared education to be a national priority, and it has made huge investments of over £3 billion to recover learning loss for students.

9. LOCALIZATION OF DIGITAL CONTENT AND DELIVERY

The learning outcome has a huge correlation to the medium of language, context, and culture that is readily comprehended by the learners and that they use on day-to-day basis. The thirtieth session of UNESCO's General Conference adopted a resolution in 1999 establishing the notion of multilingual education, which refers to the use of at least three languages in education, namely, the mother tongue, regional/national language, and an international language in education. The GEM report said that 40% of the global population does not access education in a language they understand.[52] The same is true for e-education—and perhaps even more so—as

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[48] Nigeria Education in Emergencies Working Group, "Nigeria Education Sector COVID-19, Response Strategy in North East," 2020, https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/nigeria_education_sector_covid-19_response_strategy_north_east_20200415.pdf.

[49] Federal Ministry of Education, Nigeria, "Education: A Coordinated Covid-19 Response Strategy," https://education.gov.ng/education-coordinated-covid-19-response-strategy/.

[50] UK Department for Education, "Remote education good practice," Guidance (Withdrawn). Updated Mar. 24, 2021, https://www.gov.uk/government/publications/remote-education-good-practice/remote-education-good-practice.

[51] UK Department for Education, "National Tutoring programme (NTP)," Policy Paper, Updated Jul 8, 2022, https://www.gov.uk/government/publications/national-tutoring-programme-ntp/national-tutoring-programme-ntp.

[52] Global Education Monitoring Report, "If you don't understand, how can you learn?" Policy Paper 24, Feb. 2016, https://unesdoc.unesco.org/ark:/48223/pf0000243713.

the practice of remote learning has revealed a huge gap when it comes to the localization of content and delivery. UNICEF's call to action for the education of indigenous communities after COVID-19 reinforces the idea that native content and delivery are as critical to learning as connectivity and infrastructure.[53] It also strongly recommended intensifying investment in digital content with indigenous cultural relevance for effective education. However, UNESCO's 2020 global education meeting on education post-COVID-19 firmly recommended the adoption of innovative and transformative pedagogies that make full use of local resources and teaching materials to bolster learners' motivation in learning.[54] There seems to be more to be done for creating locally accessible digital platforms, content, and delivery systems.

UNESCO has made available third-party educational platforms, applications, and resources with the aim of helping parents, teachers, schools, and administrators facilitate remote learning.[55] Most of the solutions are free and cater to multiple languages and are categorized based on the functionalities below:

- Digital learning management system.
- Systems built for use on basic mobile phones.
- Systems with strong offline functionalities.
- MOOC platforms.
- Self-directed learning content.
- Mobile reading applications.
- Collaboration platforms that support live video communication.
- Tools for teachers to create digital learning content.
- External repositories of distance learning solutions.

The 2015 Constitution of Nepal provides that every Nepali shall have the right to acquire education in their mother tongue. Nepal is a linguistically diverse country with over 123 languages and dialects spoken across various regions. The community and private schools of Nepal dominantly use Nepali (the national language) and English as modes of instruction. The course contents are also in those same two languages. According to the SSDP, MoE has made a policy for supporting mother-tongue-based multilingual education up to grade three, and with the recent federal structure, local languages are likely to be used in the development of curricula.[56] Also,

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[53] UNICEF, "Indigenous communities and the right to education in times of COVID-19," Call to Action, United Nations Children's Fund, 2020, https://www.unicef.org/lac/media/14566/file/UNICEF%20Call%20to%20Action.pdf.
[54] UNESCO Education Sector "2020 Global Education Meeting, Extraordinary session on Education post-COVID-19," Background document, 2020, https://en.unesco.org/sites/default/files/gem2020-extraordinary-session-background-document-en.pdf.
[55] UNESCO, "Distance Learning Solutions," https://en.unesco.org/covid19/educationresponse/solutions.
[56] Ministry of Education, Nepal, "School Sector Development Plan 2016/17-2022/23," 2016, https://planipolis.iiep.unesco.org/sites/default/files/ressources/nepal_ssdp_final_document_oct_2016_0.pdf.

MoE has been working on the language of education strategic framework. The framework will develop teaching and learning materials in the mother tongue through the CDC and will work closely with all provinces and their local-language communities. Remote learning during COVID-19, however, only used English and Nepali as instructional modes or for course content.

Nigeria also is immensely diverse linguistically. The 1999 Constitution of Nigeria also promotes the use of local language. The National Policy on Education[57] stipulates the use of the mother tongue in early childhood development with a gradual transition to English instruction, which is the official language for education in Nigeria. Despite the multiple languages spoken in Nigeria, Nigerian Pidgin is perceived as a neutral language by numerous ethnic groups. Remote learning after the pandemic also used contents and instructional modes in English or Pidgin.

In the U.K., languages and cultures across the country are generally uniform compared to Nepal and Nigeria. However, the NCELP works with educators, researchers, and expert practitioners to improve language curriculum and pedagogy for many languages. It also supports professional development tools and teaching resources along with various workshops.

10. INCLUSIVE TECHNOLOGY SOLUTIONS, TOOLS, AND RESOURCES

The SDG 4 on education and the education 2030 framework for action has highly prioritized inclusion and equity as foundational for quality education. Inclusion of vulnerable groups, marginalized communities, and PWDs for quality education calls for effective implementation of policies. The CRPD[58] in articles 5 and 9 has provided PWDs with equity, nondiscrimination, and accessibility rights for all aspects of life, including education. This ought to be carried forward even while the authors reimagine a new way of education for the future where they keep eliminating the barriers that limit the participation and achievement of all learners.

After the outbreak of COVID-19 and as schools suspended physical classes, UNESCO and UNPRPD launched a policy brief[59] to address the issues of PWD for distance learning. The document claims that the digital divide for learners with a disability has widened with the implementation of online classes. The new e-education model

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[57] Federal Republic of Nigeria, "National Policy on Education," 2014, https://education.gov.ng/wp-content/uploads/2020/06/NATIONAL-POLICY-ON-EDUCATION.pdf.
[58] United Nations, "Convention on the Rights of Persons with Disabilities and Optional Protocol," 2006, https://www.un.org/disabilities/documents/convention/convoptprot-e.pdf.
[59] UNESCO, UNPRPD, "Understanding the impact of COVID-19 on the education of persons with disabilities: challenges and opportunities of distance education: policy brief," UNESCO Institute for Information Technologies in Education," Policy Brief, 2021, https://unesdoc.unesco.org/ark:/48223/pf0000378404.

was completely unsupportive for 40% of disadvantaged students in lower- and middle-income countries. The policy brief provides a matrix of barriers to distance education (see Annex F) faced by students with disabilities and emphasizes four essential elements to facilitate the effective use of inclusive digital and assistive technology in education:

- Technology suited to the needs of learners with disabilities.

- Teachers and students trained in the appropriate use of technology.

- Affordable assistive technology.

- Local-language content in accessible formats.

The document also recommends free assistive and open initiatives to promote the inclusion of students with disabilities (see Annex G). Furthermore, the role of governments, civil society, and the educational community has been prioritized with implementation guidelines for ODL and blended education upon the reopening of schools.

The real test for the application of e-education was seen in the aftermath of the school shutdowns due to COVID-19. Open learning systems, distance learning, or remote learning had been pivotal in all educational and ICT-related policies. The government of Nepal issued Student Learning Facilitation Guidelines 2020 (which has now been withdrawn) in which schools were instructed to use an alternative mode of learning for the continuation of education. The guidelines provided instruction on the use of radio/FM, TV, and other ICT devices to carry out education with the alignment of the curriculum. MoE, MoCIT, and the CEHRD—Nepali government web portals—added learning portals for students, which featured digital content, interactive learning games, video classroom lessons on YouTube, audiobooks, e-books, and so forth. The contents were categorized according to different grades and subjects for easier navigation. Video lessons were broadcast on national TV. Audio classes were held through national radio and local FM stations. In rural areas, local teachers carried learning materials to students' homes. Most private schools and community schools in city areas use EdTech platforms for virtual classes; the most common were Zoom and Google Classroom. Nepal Telecom provided a limited free data package service to teachers and students so that it could be used for educational purposes. A few rural areas reported using mobile phone communication to teach students individually. Despite inclusive education being a high priority in all education policies, its implementation for children with disabilities and for vulnerable and marginalized groups was scarce.

In Nigeria, FMoE[60] developed a platform of information, resources, and guidance for teachers and students for tailored learning for children at home. FMoE also developed a mobile classroom with a pool of video learning materials for students that can be accessed through web or mobile applications. The other platforms were TV and radio programs, which were used by various states with educational programs. The students who did not have access to these technologies were provided learning materials at home. Recently, UNICEF and HITCH Tech[61] collaborated to provide dynamic online/offline education video content designed especially for Nigeria. According to UNICEF, HITCH's e-learning tool has been customized for the Nigerian national curricula and has the potential to transform teaching and learning to make classroom learning a dynamic experience at home. Although Nigeria's policy on ICT in education provides for inclusive and equitable learning for marginalized groups and children with special needs, many barriers still exist in achieving the goal of inclusivity.

In the U.K., a collaboration of teachers and nonprofits came together to launch Oak National Academy[62] along with BBC Bitesize[63] for teachers and students for sequential and uniform learning as per the U.K. curriculum guidelines. Furthermore, DfE allowed for government-funded support for Google Classroom and Microsoft Teams to be used for virtual classes. DfE further set guidelines for adapting teaching practices for remote education[64] for designing activities that are accessible to all students. Using platforms and content that are more mobile-friendly has been recommended as students have easier access to smartphones. Off-line content is also recommended for students without internet access along with formative feedback of assignments provided through phone calls. Teachers are guided to use accessibility features provided by technology platforms, such as text-to-speech or font enlargement or other features that are helpful for students with learning disabilities. It is advised that such features must be considered during the planning and designing of a course, depending upon the tailored needs of students. SENCos made calls twice a week to students with special needs to identify their difficulties with learning and to help each with their education by allocating a learning support assistant. In order to make all these processes flawless, training for teachers and students or peer-to-peer support on using technology for remote learning has been recommended.

[60] Federal Ministry of Education, Nigeria, "Education: A Coordinated Covid-19 Response Strategy," https://education.gov.ng/education-coordinated-covid-19-response-strategy/.
[61] HITCH Tech, https://hitch.video/
[62] Oak National Academy, https://www.thenational.academy/.
[63] BBC Bitesize, https://www.bbc.co.uk/bitesize.
[64] UK Department for Education, "Adapting teaching practice for remote education," Guidance, May 2020, https://www.gov.uk/guidance/adapting-teaching-practice-for-remote-education.

11. E-EDUCATION TOOLKITS

As remote education was being implemented all around the world, the GEC was formed by UNESCO to support governments in education with the COVID-19 response toolkit in education.[65] The comprehensive toolkit developed in collaboration with McKinsey & Company provides concrete steps for intervention and tactical action checklists for the effective implementation of remote learning. The strategic toolkit document is recommended for policymakers, teachers, and administrators. The strategy recommends a three-step approach, with monitoring and evaluation at all stages, and is as follows:

1. Understand and envision:

   ▪ Define a vision for remote learning.

   ▪ Ensure strategy tailored to the individual needs of students.

   ▪ Assess budget, available digital infrastructure, and digital capability of human resources.

2. Decide and design remote learning solutions:

   ▪ Create a strategy for subjects by age group.

   ▪ Determine communication medium with students and parents.

   ▪ Determine how to teach students remotely and how students can practice those skills remotely.

   ▪ Determine assessment technique remotely.

   ▪ Define the staffing model for remote learning.

3. Rollout and execution of remote learning:

   ▪ Launch remote learning solution and improvise.

   ▪ Train teachers for remote learning.

   ▪ Engage parents and train them to use devices for remote learning.

   ▪ Support students and prioritize the needs of vulnerable students and students with disabilities.

4. Monitor and adjust:

   ▪ Make policy decisions for curriculum, pedagogy, and assessment.

   ▪ Ensure access, quality, and equity by monitoring key indicators.

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[65] UNESCO, "COVID-19 response−remote learning strategy, Remote learning strategy as a key element in ensuring continued learning," United Nations Educational, Scientific and Cultural Organization, Jul. 2020, https://en.unesco.org/sites/default/files/unesco-covid-19-response-toolkit-remote-learning-strategy.pdf.

- Launch continuous improvement process.

It is also important to acknowledge the digital skills toolkit[66] by ITU, which was prepared in collaboration with multiple global organizations, including UNESCO. In consideration of all the transitions taking place in the global digital economy, the toolkit is dedicated to promoting decent jobs for youth.

In Nepal, the private education resource organization Karkhana[67] has developed a digital literacy toolkit. Karkhana's toolkit provides students, parents, and teachers with a collection of lessons and resources to become digitally literate and use that capability at home or in the classroom. The toolkit is very basic in nature and is available in both Nepali and English. It facilitates the following three areas of remote education:

- Finding and consuming digital content

- Creating digital content

- Communicating and sharing digital content

Similar to Nepal, Nigeria also does not have many toolkits developed for the purpose of digital literacy and e-education. However, the National Institute for Educational Planning and Administration is partnering with UNICEF to develop a holistic educational toolkit for a functional educational system in Nigeria after the COVID-19 outbreak. In the U.K., private initiatives offer paid toolkits; for example, e-languages in collaboration with the University of Southampton[68] offers a basic digital literacy toolkit package for students and employees. Jisc offers the digital pedagogy toolkit[69] to help embed digital literacy into the curriculum. Additionally, the DfE provided a basic toolkit[70] that assisted schools in using digital learning platforms after the shutdown of schools during the pandemic. At the local level, Norfolk schools initially developed online learning toolkits to encourage teachers and leaders to consider ways to develop online learning provisions. UCL, meanwhile, has digital education in its teaching and learning resource unit. The VLE Moodle provides for the e-assessment of students. UCL has recommended some toolkits;[71] for example, one provides baseline knowledge about connected learning, another outlines basic hybrid teaching, and others assist with designing online learning content and improving student engagement in online classes.

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[66] International Telecommunication Union, "Digital Skills Toolkit," 2018, https://www.itu.int/en/ITU-D/Digital-Inclusion/Documents/ITU%20Digital%20Skills%20Toolkit.pdf.
[67] Karkhana, "Digital Literacy Toolkit," https://www.karkhana.asia/digital-literacy-toolkit/.
[68] eLanguages, "Digital Literacies Toolkit," Modern Languages and Linguistics, University of Southampton, https://www.elanguages.ac.uk/digital_literacies_toolkit.php.
[69] Jisc, "Digital pedagogy toolkit," Guide, last modified, Aug. 16, 2021, https://www.jisc.ac.uk/full-guide/digital-pedagogy-toolkit.
[70] UK Department for Education, "Digital Education Platforms for Schools—Toolkit," Jun. 2020, https://www.thenorthbank.london/wp-content/uploads/2020/07/DfE-Remote-Learning-Toolkit-1.pdf.
[71] UCL, "Teaching toolkits," https://www.ucl.ac.uk/teaching-learning/teaching-resources/teaching-toolkits?collection=drupal-teaching-learning-publications&meta_UclOrgUnit=%22VP%3A+Education%22&meta_UclCommunicationType_not=%22Digital+engagement+activity+publication%22&start_rank=1.

12. FINDINGS AND DISCUSSION

The tenth strategy of the Dakar framework for action[72] aims to harness new information and technology to help achieve the EFA goals in the early 2000s. The strategy is to use ICT in education in developing nations for effective learning and the development of efficient education services along with training for teachers to embed ICT over traditional teaching styles. Since then, low- and middle-income economies like Nepal and Nigeria have incorporated the use of ICT in education in policies related to education, ICT, and the economy. ICT in education has been a challenge to developing nations because it had to start first with ICT education rather than learning through ICT and the pace of digital literacy is positively correlated to the degree of infrastructural development of ICT in the nation. After 20 years of effort in integrating ICT into education, the digital literacy rate of Nepal stands at 31%, and only slightly more than 4% of the population in Nigeria has access to a PC (according to both countries' respective national statistics agencies). In comparison, only 8% of the population in the U.K. is estimated to have zero digital skills. There is a huge gap in digital competency between developing nations and developed nations. The digital literacy improvement intervention for Nepal and Nigeria resonates through an amalgamation of various policy guidelines in the education, industry, economy, and ICT sectors. The multisectoral approach seems to be the right way to move forward, and it also may be advantageous to have a separate strategic guideline to rapidly improve national digital literacy skills and competencies. The improvement in indicators for developing nations in UNESCO's global digital literacy framework may need a fast-track intervention modality to build and deliver resilient e-education solutions.

The development of human capital for ICT in education is an integrated aspect of improving national digital literacy. Teachers with proficient digital skills can use digital platforms and interactive ICT tools effectively in their teaching and learning process. The educational leadership with digital skills would know how to effectively implement and monitor digital learning management systems. The ICT policies in education for Nepal and Nigeria have prioritized human capability development by training and certifying them based on their acquired proficiency with regard to the national teachers' competency framework. Off-line and online training to help teachers integrate ICT in the classroom are available in both nations. The important question remains: How—or, rather, how often—do teachers and administrators implement those digital skills in the classroom? The implementation of what they learned may have been scarce during COVID-19, as many teachers/administrators in Nigeria and Nepal struggled to adapt to using virtual class platforms. In some cases, it was students who were guiding teachers to effectively use Zoom for online classes in Nepal. In the U.K. as well, teachers needed training

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[72] "The Dakar Framework for Action, Education for All: Meeting our Collective Commitments," adopted at World Education Forum, Dakar, Senegal, Apr. 26–28 2000, https://sustainabledevelopment.un.org/content/documents/1681Dakar%20Framework%20for%20Action.pdf.

to adapt to the online modality of the classroom. But teachers have a greater role to play even in remote education. Beyond communication or being able to use teaching platforms, it is important that teachers can: create digital content in line with the curriculum; assess student engagement, participation, and learning; and build a holistic learning environment like that of the physical classroom.

The human aspect is indispensable in any e-resilience system, but there is no denying that the core to effective e-resiliency lies in connectivity and infrastructure. Based on advancements in digitalization, Nepal and Nigeria fall under countries at the *digital awakening* stage, while the U.K. falls under the *digital maturity* stage. Countries with a high level of digitalization had an effective COVID-19 response strategy, including remote education. Therefore, the U.K. was able to rely on online classes using internet-based platforms to carry out remote learning after COVID-19 for the most part while Nepal and Nigeria had to rely on radio and TV to deliver e-education in remote and rural parts of the country. Radio and TV learning are definitely good forms of e-learning, but they do not allow real-time feedback or participation of students. Most rural areas of Nepal and Nigeria do not have broadband connectivity, but both nations are committed to building a robust connectivity infrastructure within the next five to ten years. As the U.K. plans to have 5G connectivity in most premises by 2027, Nepal and Nigeria still struggle in having 4G across the entire country. People from rural areas with 3G and 4G connectivity in Nigeria and Nepal have been reluctant to use mobile data for remote learning as it is an expensive option. In 2018, Educating Nepal piloted the MDRU for rural e-education. MDRU enabled internal networking within the rural community and the school. The students could access digital content from the MDRU server's repository, video conference with a teacher for online classes, and use a parent's smartphone to share photos in order to submit assignments. As these rural communities are not yet well connected with high-speed broadband internet, these innovative solutions are an important milestone for remote learning.

Another aspect that needs serious consideration is *digital poverty*. Remote learning requires technological devices for both teachers and learners. Laptops, smartphones, tablets, and so forth are quite expensive and are an item of luxury in low-income countries. Smartphones, to an extent, have bridged the gap for digital poverty as the majority of households in Nepal and Nigeria have at least one smartphone per household. Other than that, the majority of children in both countries do not have access to digital devices. The U.K. government hailed the delivery of 1 million laptops to needy and vulnerable students by mentioning that the total number of laptops delivered was taller than Mount Everest, heavier than almost 200 elephants, and enough for every person in Liverpool and Leicester combined. [73] Even so, students were using their parents' devices for remote learning, and

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[73] UK Department for Education, "Taller than Mount Everest, heavier than almost 200 elephants and enough for every person in Liverpool and Leicester combined – find out more about the million laptops we have delivered to young people," The Education Hub (blog), Feb. 16, 2021, https://educationhub.blog.gov.uk/2021/02/16/taller-than-mount-everest-heavier-than-almost-200-elephants-and-enough-for-every-person-in-liverpool-and-leicester-combined-find-out-more-about-the-million-laptops-we-have-delivered-to-youn/.

for families with two or more children, it was a difficult time.

Open universities around the world provide distance learning through MOOCs and Moodle. The re-imagination of remote education at the school level after COVID-19 has really tested institutional preparedness. Before the pandemic, the policies regarding ICT use in education only addressed it as supplementary practice over existing, traditional modes of teaching. Requirements for holistic quality education delivery through ICT and monitoring its effectiveness do not appear to have been stated explicitly in any policy guidelines before the pandemic. This must be the reason—as the UNICEF remote learning reachability report reported—one-third (at least) of school children globally and two-thirds of school children in Nepal were unable to access remote learning when schools shut down after COVID-19.[74] Data showed that only three out of ten children had access to TV, radio, or ICT devices to use with the internet in Nepal. Among the one-third of children with access in Nepal, only 80% of children were actually taking classes from home. Moreover, there is no strong evidence to support the effectiveness of online classes for students. Many students appeared in virtual classes, but their focus was easily diverted toward social media sites or online games. The situation is similar for sub-Saharan Africa where 50% of children cannot be reached with remote learning. In the U.K., Ofcom[75] estimates that approximately 2 million children do not have access to devices for taking classes from home and 7% of households must rely on expensive mobile internet. The digital divide between Nepal and Nigeria is immense, and implementing equitable and quality e-education requires interventions to bridge the gap.

Language has an immense impact on learning, especially for young children. Nepal and Nigeria are multilingual countries with diverse ethnic groups. Tools and platforms for e-education are developed primarily in high-income countries with support mostly for popular world languages. English is a priority language in both Nepal and Nigeria, and a lot of digital learning content made in foreign countries is adapted for teaching and learning. It seems necessary to contextualize local culture in learning content to provide a better learning experience for students. Localization of content is perhaps one of the most neglected areas in e-education even though education policies have set provisions for learning using students' native language.

There seems to be a majority of populations in developing nations that are digitally excluded. Exclusion is mostly due to a lack of infrastructure, connectivity, and devices and is often a result of a lack of capability in using available resources for e-education. Incorporating the special needs of vulnerable students, children with disabilities, refugees, and children displaced by conflicts, along with special consideration for gender, is largely

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[74] UNICEF, "COVID-19: At least a third of the world's and two-thirds of Nepal's schoolchildren unable to access remote learning during school closures, new UNICEF report says," press release, August 28, 2020, https://www.unicef.org/nepal/press-releases/covid-19-least-third-worlds-and-two-thirds-nepals-schoolchildren-unable-access.
[75] Ofcom, "Online Nation, 2021 Report," Jun 9, 2021, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/220414/online-nation-2021-report.pdf.

missing from the planning and designing phases of e-learning. The EdTech platforms now come with various accessibility features of which educators may not be well informed. Students with disabilities in developing nations do not appear to have the assistive technology necessary for remote education. The digital content uploaded to various websites does not seem to adhere to web accessibility guidelines. Furthermore, the digital educational content seems to disregard the individual learning needs of students, for example, the needs of students with learning disabilities. In Nepal and Nigeria, implementing remote education in itself was a mountainous task, making it inclusive would demand more e-resiliency within the entire education system. In the U.K., significant efforts by the DfE to accommodate the learning needs of all students could be observed, but many barriers still exist to establishing quality and inclusive remote learning for all.

13. RECOMMENDATION

Through a comparative analysis of existing standards, guidelines, and toolkits from Nepal, Nigeria, and the U.K. along with numerous resources from UNESCO, the authors are able to make some recommendations for effective implementation of e-education across the globe. As they reimagine newer forms of education, e-education will go a long way, even in the blended format of education, and make the system resilient during unforeseeable disasters in the future.

13.1. IMPROVE NATIONAL DIGITAL LITERACY

Digital literacy for all citizens of a country is important not just for e-education but also for employment, the economy, and other social aspects of life. As technology advances, ICT will be integrated into all aspects of life, and, therefore, all citizens must be equipped with the necessary digital skills. It is important for governments of low- and middle-income economies to expand their digital literacy programs with particular attention to vulnerable and marginalized populations, which are mostly in rural communities.

13.2. DEVELOPING HUMAN CAPABILITY FOR ICT

Educators, administrators, teacher trainers, teachers, and parents play an important role in the implementation of ICT in education. The disruption of education by COVID-19 and the implementation of remote learning put many teachers under psychological stress. It was particularly difficult for teachers to create content in line with the curriculum. The teachers used available resources even if they were not particularly relevant. National governments must prioritize training educators and teachers for the effective use of ICT in education and also help them in the implementation of this knowledge in the classroom. Government and private-sector educators

must also motivate students to pursue courses in IT and programming so that they can contribute to developing digital content, tools, and platforms useful for local contexts.

13.3. EXPAND AND INVEST IN NATIONAL ICT INFRASTRUCTURE

Research has already shown that countries with good ICT infrastructure and connectivity provided more effective remote learning during the COVID-19 pandemic. The outreach of e-education for countries like Nepal and Nigeria was low mostly because they lacked proper ICT infrastructure beyond cities. The national ICT broadband and economic policies must quickly expand connectivity to rural areas of the country. ITU, UNESCO, and other international stakeholders need to strategically prioritize excluded populations and build partnerships with government and nongovernmental organizations to achieve that goal.

13.4. ELIMINATING DIGITAL POVERTY AND BRIDGING THE DIGITAL DIVIDE

The majority of households in developing nations do not have access to digital equipment like laptops, tablets, and other types of PCs. Most families have access to at least one smartphone per household as a communication device. Mobile internet for rural areas in developing nations is sluggish and expensive too. If the authors are to move swiftly toward creating highly skilled human resources for the digital economy, it is time to find ways to end digital poverty. Students must be given access to digital devices for remote learning from school or with support from the related line ministry. Internet use must also be affordable to bridge the digital divide.

13.5. POLICIES FOR E-EDUCATION INTEGRATED IN THE NATIONAL CURRICULUM

The recent pandemic has already shown us that the role of ICT is indispensable for education in the future. Remote learning, blended learning, or hybrid classrooms—all of them will integrate e-education in some form. The implementation of e-learning, even within the classroom, is truly the way forward in modernizing EFA. National governments must implement policies to integrate e-education into their national curriculums so that respective departments and the school sector can produce localized digital content in local languages. Various digital pedagogy methodologies can be adopted. Tools and techniques for digital assessment of student performance can be implemented in line with curriculum guidelines.

13.6. EVALUATION OF EFFECTIVENESS OF E-EDUCATION

COVID-19 gave education systems a huge opportunity to test the real effectiveness of remote learning and, afterward, to address the shortcomings that may be experienced during the entire teaching/learning experience. There has not been substantial empirical evidence to support the actual impact remote education can have on children, especially primary- and preprimary-school-aged children. A resilient framework for monitoring and evaluating e-education at every step must be in place so that its effectiveness can be assessed. Special attention must be given to promoting student participation, engagement, and learning outcomes while implementing the digital mode for education.

13.7. INCLUSIVE E-EDUCATION POLICIES, TOOLS, AND PLATFORMS

Remote learning after COVID-19 apparently excluded vulnerable children, refugees, internally displaced children, and, most importantly, children with disabilities, mostly in developing countries. Despite existing guidelines by UNESCO and national policies, making e-education inclusive is far from easy for countries like Nepal and Nigeria. Teachers need more training on the use and accessibility features of EdTech platforms. Educational content should be mindful of web accessibility guidelines. Children must be provided with the necessary assistive devices for remote learning. Tools and apps that are exclusively designed to meet the special needs of children must be considered in order to accommodate the learning needs of children. Students who do not have access to devices and the internet must be given alternative modalities of offline learning. Vulnerable children, especially girls, must be considered seriously while providing e-education.

13.8. AWARENESS AND SAFE USE OF ICT FOR E-EDUCATION

Digital literacy programs have a huge role to play in making people aware of the safe use of ICT for all users, including children. All forms of gender-based discrimination for using ICT must end. Various norms for the online safety of children during e-learning must be formulated, including screen time and overall time spent with digital devices. People must also be made aware of the importance of e-education in preparing a skilled human workforce for the digital economy of the future.

14. CONCLUSION

The global pandemic has created an opportunity to reinvent the global education delivery system for the future. However, there are many challenges for low- and middle-income economies to establish a resilient e-education system. There exists an inherent threat of an increase in digital poverty and the widening of the digital divide if effective intervention is not taken. In order to make e-education equitable and inclusive, national governments need a proactive approach in their policy and investment strategy. There is a need to develop more standards, guidelines, and effective toolkits by partnering with CSOs, and private sector and international development agencies as per the local needs of the country. As the world reimagines a blended education system for the future, e-resiliency in EFA nations stands out as a priority for meeting the targets of the Education Agenda 2030 in SDG 4.

15. HIGH-LEVEL FRAMEWORK

Operations		UNESCO	GEI	IOE	Nepal	Nigeria	U.K.
1. National digital literacy frameworks for distance/online learning for educators, learners, and administrators.	Standards	✓			✓	✓	✓
	Policy guidelines/guidelines	✓			✓	✓	✓
	Toolkits	✓		✓	✓		✓
2. National framework for administration, monitoring, and evaluation for online, remote classrooms, and distance learning systems	Standards						
	Policy guidelines/guidelines	✓			✓	✓	✓
	Toolkits	✓					
3. National framework for digital literacy and skills for educators, learners, and administrators, including reference to gender sensitivity, marginalized communities, IDPs, and refugees	Standards						
	Policy guidelines/guidelines	✓			✓	✓	✓
	Toolkits	✓					
4. Digital infrastructure for education institutions	Standards						
	Policy guidelines/guidelines	✓			✓	✓	✓
	Toolkits						
5. Digital connectivity for education institutions	Standards						
	Policy guidelines/guidelines	✓			✓	✓	✓
	Toolkits						
6. Holistic regulation for e-education systems (quality of service, affordability, and accessibility)	Standards						
	Policy guidelines/guidelines	✓					✓
	Toolkits	✓					
7. Digital content for educators, learners, and administrators	Standards						
	Policy guidelines/guidelines	✓			✓	✓	✓
	Toolkits	✓		✓			✓
8. Technology solutions for online education delivery across diverse geographical areas	Standards						
	Policy guidelines/guidelines	✓			✓	✓	
	Toolkits						
9. Localization of digital content in local languages	Standards						
	Policy guidelines/guidelines	✓			✓	✓	
	Toolkits						
10. Digital educational tools and resources for learners with disabilities	Standards						
	Policy guidelines/guidelines	✓			✓	✓	✓
	Toolkits	✓					✓

ANNEXES

ANNEX A: ICT COMPETENCY FRAMEWORK

Source: Kerangka Kerja Kompetensi TIK Guru Menurut UNESCO, Oleh Admin/October 29, 2019/Artikel

Figure A.1   UNESCO ICT-CFTs

ANNEX B: ISTE STANDARDS

Table B.1   ISTE Standards Categories

Students	Teachers	Administrators
• Empowered learner • Digital citizen • Knowledge constructor • Innovative designer • Computational thinker • Creative communicator • Global collaborator	• Learner • Leader • Citizen • Collaborator • Designer • Facilitator • Analyst	• Equity and citizenship advocate • Visionary planner • Empowering leader • Systems designer • Connected learner

ANNEX C: DQ FRAMEWORK

The DQ Framework is illustrated in Figure C.1 and Figure C.2.

Figure C.1   DQ Competencies

Figure C.2   DQ Global Standards

ANNEX D: E-SCHOOL FRAMEWORK
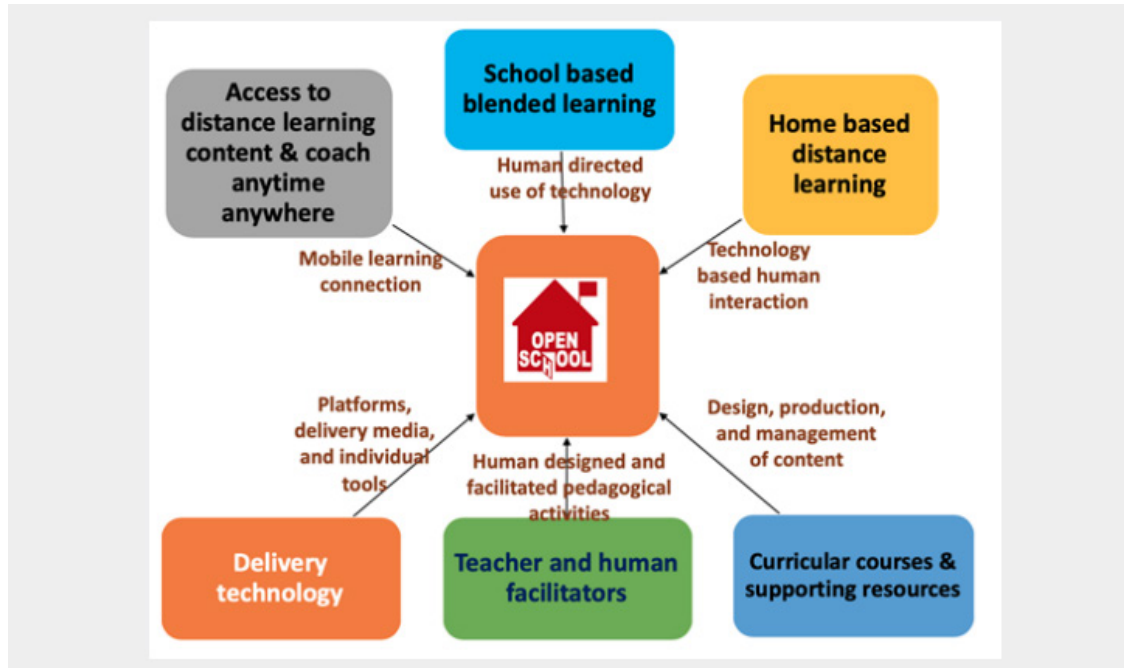
Figure D.1   UNESCO's e-School Initiative Framework
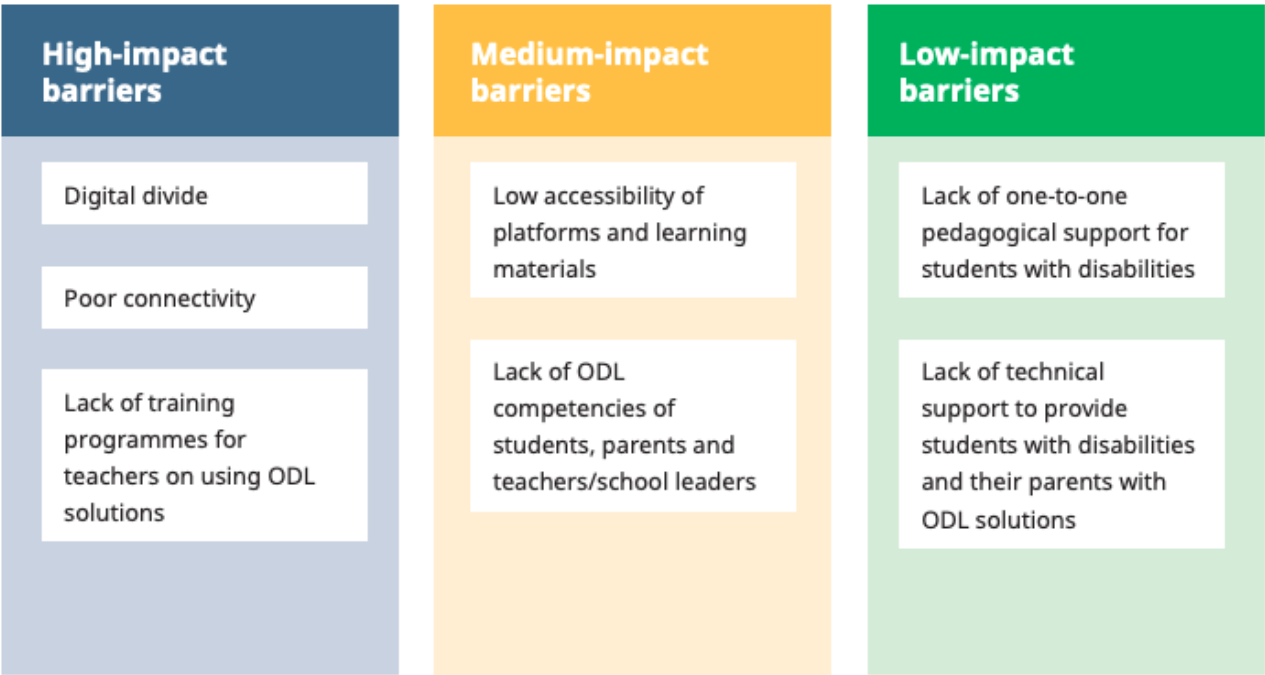
ANNEX E:
REMOTE LEARNING PLATFORMS
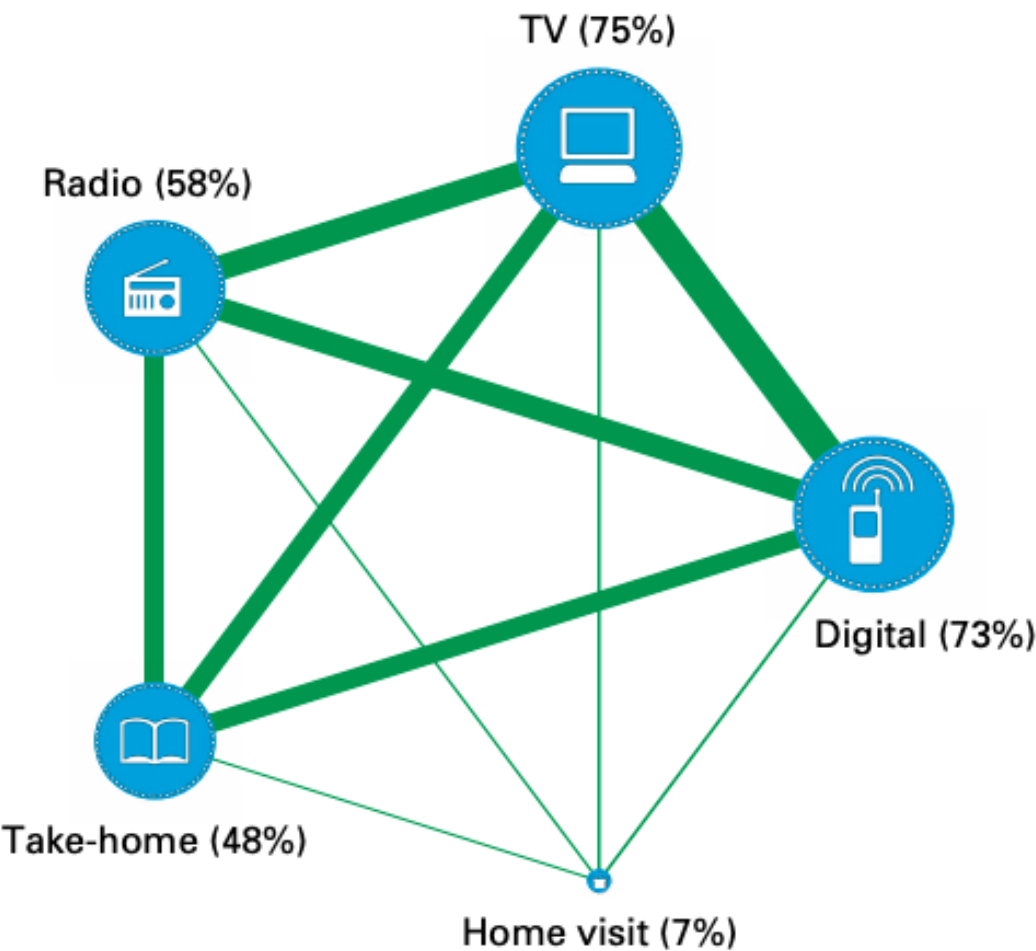
Source: Remote Learning after COVID-19, UNICEF

Figure E.1   Platforms Used for Remote Learning after COVID-19

ANNEX F:
REMOTE LEARNING BARRIERS

High-impact barriers	Medium-impact barriers	Low-impact barriers
Digital divide	Low accessibility of platforms and learning materials	Lack of one-to-one pedagogical support for students with disabilities
Poor connectivity	Lack of ODL competencies of students, parents and teachers/school leaders	Lack of technical support to provide students with disabilities and their parents with ODL solutions
Lack of training programmes for teachers on using ODL solutions		

Source: United Nations, UNPRPD

Figure F.1   UNPRPD Matrix of Barriers for PWD in Remote Learning

ANNEX G
UNESCO TOOL RECOMMENDATIONS

Table G.1   UNESCO-Recommended Tools for Inclusive RemoteLearning

Accessibility Tool Provider	Tools	Link
Apple	Apple accessibility features	https://www.apple.com/accessibility/
Google	Google accessibility features	https://www.google.com/accessibility/products-features/
Microsoft	Microsoft accessibility features	https://www.microsoft.com/en-us/accessibility
Mada	Digital access for all	https://mada.org.qa/
New South Wales Government	Disability learning and support	https://education.nsw.gov.au/teaching-and-learning/disability-learning-and-support/resources/assistive-technology
Starfish Labs	Accessibility apps	https://starfishlabs.co.uk/products/
OptiKey	Accessibility interface	https://github.com/OptiKey/OptiKey/wiki
UNESCO	Learning for all: Guidelines on the inclusion of learners with disabilities in open and distance learning	https://unesdoc.unesco.org/ark:/48223/pf0000244355
UNESCO	Model policy for inclusive IOCTs in education for PWDs	https://unesdoc.unesco.org/ark:/48223/pf0000227229
W3C	W3C web design and applications: Accessibility	https://www.w3.org/WAI/redesign/2011/w3-sketch1.html

RAISING THE WORLD'S STANDARDS

3 Park Avenue, New York, NY 10016-5997 USA   http://standards.ieee.org

Tel.+1732-981-0060 Fax+1732-562-1571